LONGHORN ARMY AMMUNITION PLANT KARNACK, TEXAS

ADMINISTRATIVE RECORD

Volume 4

2014

Bate Stamp Numbers
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Prepared for
Department of the Army
Longhorn Army Ammunition Plant

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LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS
ADMINISTRATIVE RECORD – CHRONOLOGICAL INDEX

VOLUME 4

2014

A. Title: Meeting Minutes – Longhorn Army Ammunition Plant Restoration Advisory Board (RAB) Meeting Minutes
Author(s): AECOM Technical Services
Recipient: All Stakeholders
Date: July 16, 2013
Bate Stamp: 00191513 – 00191560

B. Title: Position Paper – Longhorn Army Ammunition Plant Issues in Dispute Under FFA
Author(s): Hershell E. Wolfe, Deputy Assistant Secretary of the Army (Environment, Safety and Occupational Health)
Recipient: Gina McCarthy, Administrator of the USEPA and Richard A. Hyde, Executive Director of the TCEQ
Date: March 18, 2014
Bate Stamp: 00191561 – 00192522

C. Title: Meeting Minutes – Longhorn Army Ammunition Plant Restoration Advisory Board (RAB) Meeting Minutes
Author(s): AECOM Technical Services
Recipient: All Stakeholders
Date: May 15, 2014
Bate Stamp: 00192523 – 00192656

D. Title: Meeting Minutes – Longhorn Army Ammunition Plant Monthly Managers' Meeting Minutes
Author(s): AECOM Technical Services
Recipient: All Stakeholders
Date: October 14, 2014
Bate Stamp: 00192657 – 00192716

E. Title: Transmittal of Final Dispute Decision
Author(s): Gina McCarthy, Administrator of the EPA
Recipient: John M. McHugh, Secretary of the Army and Bryan W. Shaw, Chairman of the TCEQ
Date: October 31, 2014
Bate Stamp: 00192717 – 00192750

LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS
ADMINISTRATIVE RECORD – CHRONOLOGICAL INDEX

VOLUME 4

2014

F. Title: Meeting Minutes – Longhorn Army Ammunition Plant Monthly Managers' Meeting Minutes
Author(s): AECOM Technical Services
Recipient: All Stakeholders
Date: November 20, 2014
Bate Stamp: 00192751 – 00192759

G. Title: Delegation of Dispute Decision Response to Katharine Hammack, Assistant Secretary of the Army - Installations, Energy and Environment
Author(s): John M. McHugh, Secretary of the Army
Recipient: Gina McCarthy, Administrator of the EPA
Date: November 25, 2014
Bate Stamp: 00192760

H. Title: Notice of Intent to Elevate the Dispute to OMB
Author(s): Katharine Hammack, Assistant Secretary of the Army- Installations, Energy and Environment
Recipient: Gina McCarthy, Administrator of the EPA
Date: November 25, 2014
Bate Stamp: 00192761

I. Title: Report - Final 2013 Remedial Action Operation Report, Landfill 12 (LHAAP-12), Longhorn Army Ammunition Plant, Karnack, Texas
Author(s): AECOM Technical Services
Recipient: U.S. Army Corps of Engineers
Date: November 27, 2014
Bate Stamp: 00192762 – 00193503

AECOM

Subject:	**Final Minutes, Quarterly Restoration Advisory Board (RAB) Meeting, Longhorn Army Ammunition Plant (LHAAP)**
Location of Meeting:	**Karnack Community Center, Karnack, Texas**
Date of Meeting:	**July 16, 2013, 6:00 – 8:00 PM**

Meeting Participants:

LHAAP/BRAC:	Rose M. Zeiler
USACE:	Aaron Williams
USAEC:	Marilyn Plitnik, Robin Paul
AECOM:`	Dave Wacker, Gretchen McDonnell
TCEQ:	April Palmie
USEPA Region 6:	Rich Mayer, Stephen Tzhone, Janetta Coats, Kent Becher (USGS)
USFWS:	Paul Bruckwicki
RAB:	**Present:** Paul Fortune, Carol Fortune, Richard LeTourneau, Tom Walker, Nigel Shivers **Absent:** Judy Vandeventer, Ken Burkhalter, Ted Kurz, Jim Lambright, Charles Dixon, Pickens Winters, Judith Johnson, Robert Cargill, Lee Guice
Public:	Dawn Orsack, CLI-TAG

An agenda for the RAB meeting was distributed prior to the meeting. Paul Fortune called the meeting to order.

Welcome – Rose Zeiler

Ms. Zeiler welcomed attendees to the meeting. Mr. Wacker advised attendees that there were handouts providing information on various sites at the entry tables.

Open Items – Rose Zeiler

RAB Administrative Issues

New Members

Membership applications were received from Terry Britt and John Pollard. A membership application was provided to Glenn Burkel through Mr. Fortune, but has not been returned. AECOM will send the two applications received to all the RAB members for consideration. RAB members will deliberate prior to the October RAB meeting to decide on installation of the applicants, with the possibility that the new members will be installed during the October RAB meeting.

Community Involvement Plan / Community Relations Plan
No comments have been received from the RAB. Mr. Fortune stated that there is little community interest in the LHAAP RAB and, consequentially, little interest in the Community Relations Plan. Ms. Coats suggested that the RAB send an email to Ms. Zeiler (copy to Ms. Coats, Mr. Mayer and Ms. Palmie) stating that the RAB has no comments. Then USACE will move to finalize the Community Relations Plan. Mr. Fortune agreed, asking that Ms. Zeiler send an email to him copying the others so that he would have their email addresses.

Minutes
Ms. Fortune made a motion to approve all the April 2013 RAB meeting minutes. Motion seconded by Mr. Walker.

Website
Ms. McDonnell gave an overview of the SharePoint website to give RAB members direct access online to pertinent documentation for documents under public review. CDs containing the historical LHAAP Administrative Record through 2012 were distributed to RAB members in attendance to give easier access to historical documentation. In the future, AECOM may issue to RAB members CDs with the Administrative Record documents sorted site-by-site. The SharePoint site is a work in progress so additional items can be added to the site. Ms. Zeiler asked for the addition of 1) the RAB meeting wall map; 2) a map of nearby public water supply wells, surface water sampling locations, and perimeter well locations; and, 3) a RAB meeting folder containing the recent RAB agendas and minutes. The RAB members can also provide requests for things that they might want to have added to the site. Mr. Mayer asked if the CERCLA phase process diagram could be added to the site.

Defense Environmental Restoration Program (DERP) Update – AECOM (Dave Wacker)

Fieldwork Completed and Upcoming Field Activities Planned
AECOM will be doing field work at three primary sites over the next few months; LHAAP-37, LHAAP-50 and LHAAP-58.

Additionally, wells recently installed at LHAAP-46, LHAAP-67 and LHAAP-18/24 will be surveyed, and IDW from recently installed wells will be removed to the disposal site.

<u>LHAAP-35B(37) – Chemical Laboratory</u>
The bioplug study is being performed by APG to treat VOCs in that area, and will run for approximately another year. APG will be presenting information to the RAB at the October RAB meeting.

AECOM's work is separate from the APG bioplug study. For a relative comparison, this site has VOC concentrations greater than LHAAP-46 and LHAAP-67, but much less than that at

LHAAP-18/24. DPT will be used to position permanent wells for monitoring of the remediation.

Mr. Fortune asked what was done at the Chemical Lab to create contamination. Ms. Zeiler stated that it's not confirmed what caused the impacts in that area. She stated that the PCE plume looks like it originated at the sump that was located outside the lab, but that the TCE plume source has not been identified.

Mr. Mayer stated that the bioplug work requires oxygenated conditions, while the AECOM MNA requires reducing conditions. If the bioplug approach does not reduce contaminants to acceptable levels, the aquifer will be restored to reducing conditions by the Bioplug contractor before AECOM begins MNA work.

<u>LHAAP-50 Former Sump Water Tank</u>

Soil and groundwater impacts at this site will be addressed. Two areas of perchlorate-impacted soil will be excavated to a depth of one foot (approximately 150 cubic yards), and disposed at an off-site landfill. Confirmation samples will be taken and excavation continued until all material exceeding the clean-up goal is removed. An additional location across the street will be assessed for potential perchlorate impacts to soils and will be excavated if impacts are found.

Mr. Mayer asked where certified clean backfill soil is obtained from. Mr. Wacker stated that Mr. Matt Munden has a local soil source that is currently being used.

Groundwater at this site is impacted with perchlorate. Additional DPT will be done to guide wells installation.

LHAAP-47 is just to the north of LHAAP-50 and the potential for interaction between the perchlorate plumes for each of these sites will be investigated further.

<u>LHAAP-58 Shops Area</u>

Multiple services were conducted in this area and could have contributed to contamination at the site. VOC impacts to groundwater is the issue at the site. There are two groundwater plumes; “eastern plume” and “western plume”, each with their own remediation strategy. In the heart of the east plume, where concentrations are on the order of a few thousand micrograms per liter (µg/L), In-Situ Bioremediation (ISB) will be conducted to more aggressively treat those higher concentration impacts.

Continued Discussion of In-Site Bioremediation

Mr. Wacker provided follow-on information on how ISB is employed. Basic information on the LHAAP-58 treatability study was reviewed. Both substrates tested were effective, but sodium lactate was more efficient and is planned for use at the site.

Document Status/Environmental Sites

AECOM will be doing field work at LHAAP-37, LHAAP-50 and LHAAP-58 over the next few months. Field work has been finished on LHAAP-46, LHAAP-67 and LHAAP-18/24.

<u>LHAAP-46 Plant 2 Area Update</u>

Primary contaminant is trichloroethene with levels less than 100 ug/L, with a clean-up level of 5 ug/L. There are shallow (to 25') and intermediate (25-50') groundwater zone plumes. The remedy is MNA, so additional wells were installed earlier this year and the initial monitoring round conducted. Analytical data will be presented at the next RAB meeting. The monitoring well network was designed to complete delineation of the intermediate plume, so the new data should result in an updated plume map.

LHAAP-67 AST Farm

This site has TCE concentrations similar to the LHAAP-46 site. MNA for trichloroethene is the remedy. Additional wells have been installed and the initial monitoring round conducted. New data will be presented at the next RAB meeting.

The process for getting data from a new well takes several weeks. After installation, the well is allowed to "rest" and equilibrate for two weeks before sampling. After sampling, it takes 21 days for lab to provide data, and an additional 2-4 weeks to validate the data to ensure quality.

Groundwater at both LHAAP-46 and LHAAP-67 will be sampled quarterly for 2 years and then the MNA remedy will be assessed. These sites are in the Remedial Action Operation phase, which is the long, final phase of remediation of a site.

LHAAP-18/24 Burning Ground 3 & Unlined Evaporation Pond

The Groundwater Treatment Plant (GWTP) addresses impacts at this site. A data gap investigation report detailing findings of recent field work will be issued to agencies within the next month. Additional products (cross-sections, etc.) will be produced and be shared with the RAB, likely during the next meeting.

Mr. Walker recalled that the UEP "pond" area is actually a hill. Ms. Zeiler stated that the UEP was filled and covered as part of the closure, so now is a hill versus a depression. Mr. Walker asked how much contaminant material has actually been removed. Mr. Williams stated that 30,000 cubic yards of soil was removed and thermally treated. Ms. Palmie added that contaminant material is also removed from the groundwater. Volumes treated are running about 700,000 gallons per month, and currently removal rates are on the order of pounds per month. AECOM will add contaminant mass removal information to the quarterly RAB handouts. The GWTP treats the groundwater through a multi-stage process, with treated water discharged to Harrison Bayou or back to the surface of the site through sprinklers, and treatment sludge that is generated at a rate of one roll-off every 6 months disposed of off-site. Mr. Walker asked how perchlorates are being addressed in the system. AECOM will do a tutorial on the GWTP process for the next meeting.

Mr. Wacker stated that chlorinated volatiles will be treated through ISB providing food for soil microbes that encourages them to destroy the contaminant when they eat. Additionally, the correct microbes can be added if they don't already exist in the subsurface. Lab studies are done prior to implementation in the field to ensure the process will work in the field.

Of note, a well was installed on the north side of the Bayou to determine whether contamination had gone under Harrison Bayou. The preliminary data from that well shows no impacts in that well indicating the LHAAP-18/24 plume does not appear to extend under Harrison Bayou.

One of the objectives of the LHAAP-18/24 data gap investigation work was to determine whether additional source areas exist within the containment area, and whether contamination extends outside the containment area. The data developed through this investigation work will help answer those questions.

<u>CERCLA 5-Year Review Process for Multiple Sites</u>
The 5-Year review has been performed and the document is planned for submittal to the agencies next week.

<u>LHAAP-03</u>
Record of Decision is in progress, currently under EPA and TCEQ review. Excavation work is planned for the late fall.

<u>LHAAP-12 and LHAAP-16</u>
Continuing operation and maintenance activities have been performed at these landfill sites. Areas of minor erosion and subsidence have been identified and are being addressed with the application of additional soil cover material.

<u>GWTP</u>
The GWTP continues to operate to contain the groundwater plumes at LHAAP-18/24 and LHAAP-16. See attached AECOM PowerPoint Presentation for more detail. A groundwater extraction data chart was presented. AECOM will add a contaminant mass calculation to future handouts.

<u>Surface Water</u> - Recent surface water sampling results were presented for Goose Prairie Creek and Harrison Bayou.

Other DERP Environmental Restoration Update – Rose Zeiler

LHAAP-37 Bioplug Demonstration Project

Ms. Plitnik advised that a presentation on the initial results for the project is anticipated for the RAB meeting to be held in October.

EPA Quality Assurance Sampling (Kent Becher, USGS)

Mr. Mayer introduced Mr. Becher as a USGS liason to EPA acting as technical support for EPA, providing quality assurance. Mr. Becher is particularly involved in split sampling at Longhorn. Mr. Becher provided information on the recent work in the split sampling program for LHAAP. EPA observes the Army's sampling efforts and provides a field report of their observations and recommendations, and compares analytical results.

The September 2012 sampling event was observed. A few minor deviations from the standard operating procedures were observed, but were corrected by Army during the event. The April 2013 sampling event for the emerging contaminant 1,4-dioxane was also observed.

The term "relative percent difference" was explained. Army and EPA samples correlated well for the most part.

1,4-dioxane is an emerging contaminant that EPA is now interested in looking at. It's a stabilizer associated with chlorinated solvents like 1,1,1-trichloroethane. This is a potential carcinogen that is more mobile in water than associated solvents and it degrades slowly. Army volunteered to sample 43 Longhorn wells for this analyte. Some low levels of 1,4-dioxane were found within sites that were thought most likely to have it (i.e., if 1,1,1-trichloroethane was known to be present). Although the Army used an appropriate laboratory method, the EPA split samples resulted in higher values because they were analyzed by a different method. 1,4-dioxane method guidance are currently being developed and refined by EPA.

In summary, Mr. Becher stated that Army and AECOM have been mostly accepting of recommendations EPA has provided, and they are doing a good job.

Other Environmental Restoration Issues – Rose Zeiler

Dispute Resolution
Dispute resolution continues. Nothing specific to update since last RAB meeting.

Look Ahead at the Schedule

Next RAB meeting is tentatively scheduled for Tuesday, October 29th from 6PM – 8PM at the Karnack Community Center.

A motion to adjourn was made by Mr. Fortune and seconded by Mr. LeTourneau.

Adjourn

July Meeting Attachments and Handouts:

- *Meeting Agenda*
- *Minutes from April meeting*
- *AECOM Powerpoint Presentation*
- *GWTP Treated Groundwater Volumes Handout*

Acronyms

AECOM	AECOM Technical Services, Inc.
BRAC	Base Realignment and Closure
CERCLA	Comprehensive, Environmental Response, Compensation, and Liability Act
CLI	Caddo Lake Institute
DERP	Defense Environment Response Program
DPT	Direct Push Technology
GWTP	Groundwater Treatment Plant
ISB	In-Situ Bioremediation
LHAAP	Longhorn Army Ammunition Plant
MNA	Monitored Natural Attenuation
RAB	Restoration Advisory Board
TAG	Technical Assistance Grant
TCEQ	Texas Commission on Environmental Quality
UEP	Unlined Evaporation Pond

USACE	United States Army Corps of Engineers
USAEC	United States Army Environmental Center
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
µg/L	micrograms per liter

LONGHORN ARMY AMMUNITION PLANT
RESTORATION ADVISORY BOARD
Karnack, Texas
(479) 635-0110

AGENDA

DATE: Tuesday, July 16, 2013
TIME: 6:00 – 8:00 PM
PLACE: Karnack Community Center, Karnack, Texas

06:00 Welcome and Introduction

06:05 Open items {RMZ}
- RAB Administrative Issues
- New Members
- Minutes
- Website – discuss types of documents available

06:35 Defense Environmental Restoration Program (DERP) Update {AECOM}
- Fieldwork completed and upcoming field activities planned
- Groundwater Treatment Plant (GWTP) Update
- Continued discussion of in-situ bioremediation

07:15 Other DERP Environmental Restoration Update {RMZ}
- Status of Demonstration at Site 37
- Sitewide LUC Management Plan Update

07:20 EPA Quality Assurance Sampling (KB)

07:45 Other Environmental Restoration Issues {RMZ}
- CRP/CIP status
- Dispute Resolution

07:50 Look Ahead at the Schedule

08:00 Adjourn {RMZ}

Subject:	**Draft Minutes, Quarterly Restoration Advisory Board (RAB) Meeting, Longhorn Army Ammunition Plant (LHAAP)**
Location of Meeting:	**Karnack Community Center, Karnack, Texas**
Date of Meeting:	**April 4, 2013, 4:30 – 6:00 PM**

Meeting Participants:

LHAAP/BRAC:	Rose M. Zeiler
USACE:	Aaron Williams, Wendy Lanier
AECOM:	Dave Wacker, Gretchen McDonnell
TCEQ:	April Palmie
USEPA Region 6:	Rich Mayer, Janetta Coats, Kent Becher (USGS)
USFWS:	Jason Roesner
RAB:	**Present:** Paul Fortune, Pickens Winters, Judy Van Deventer, Judith Johnson, Robert Cargill, Lee Guice, Richard LeTourneau, Tom Walker, **Absent:** Ken Burkhalter, Ted Kurz, Jim Lambright, Charles Dixon, Carol Fortune, Nigel Shivers
Public:	Terry Britt, Bill Mauthe, Two additional unidentified (illegible roster signatures)

An agenda for the RAB meeting was distributed prior to the meeting.

Welcome – Rose Zeiler

Ms. Zeiler welcomed attendees to the meeting. Mr. Wacker advised attendees that there were handouts providing information on various sites at the entry tables.

Open Items – Rose Zeiler

RAB Tour

The RAB tour of LHAAP sites was conducted today from 2PM to 4PM. Mr. Dave Wacker, AECOM led the tour and provided information at each of the various sites, including the ground water treatment plant, 18/24, 04, 12, 16, 17, 29 and several others. A review of the tour will be presented at the next RAB meeting.

Attending the tour were:

Rose Zeiler	Longhorn AAP
Paul Fortune, Judith Johnson, Judy Van Deventer, Pickens Winters, Richard LeTourneau, Terry Britt (prospective member)	RAB Members
April Palmie	TCEQ
Rich Mayer, Janetta Coats	USEPA
Wendy Lanier, Aaron Williams	USACE
Dave Wacker, Gretchen McDonnell	AECOM
Jason Roesner	USFWS
Dawn Orsak	Caddo Lake Institute – USEPA TAG

RAB Administrative Issues

New Member Solicitation – Membership applications will be provided to Terry Britt and Bill Mauthe. An application form for Glenn Burkel will be sent to Paul Fortune.

Minutes

Ms. Johnson made a motion to approve all the January 2013 RAB meeting minutes. Motion seconded by Paul Fortune.

Website

Army is working with AECOM to develop a website where RAB members can access key documents. This will be discussed further in coming weeks. RAB members will likely receive notification of availability of the website within the next few weeks.

Defense Environmental Restoration Program (DERP) Update – AECOM (Dave Wacker)

Document Status/Environmental Sites

Ms. McDonnell provided descriptions of field activities shown in a display of photos from recent field work at LHAAP-18/24, LHAAP-46 and LHAAP-67.

Ms. Johnson asked about the comparative cost and speed of groundwater pump and treat and potential other technologies that have been developed over recent years. Ms. Zeiler stated that the final remedies for sites currently served by the GWTP may well include other technologies that can clean up the site more quickly and more cost effectively.

CERCLA 5-Year Review Process Video. Mr. Mayer introduced and presented an USEPA video created to help the public understand the 5-year review process at Superfund sites. Ms. Zeiler stated that the Army retains the responsibility for conducting the future 5-year reviews regardless of whether the land is transferred. Mr. Mayer stated that USEPA conducts the 5-year reviews at private, non-Federal sites. Ms. Zeiler stated that the most recent 5-year review report is in the administrative record, and the next review report will be coming out later this year.

Mr. Winters asked if Longhorn cleanup operations will be impacted by sequestration. Ms. Zeiler stated that there is no impact expected on the environmental cleanup due to sequestration. However, it will impact the days that meetings are held since Federal staff will be on mandatory furlough on Fridays through the end of the fiscal year.

Status reviews were presented for sites with significant activities upcoming in the near-term. (See attached AECOM Powerpoint presentation.)

LHAAP-03 Proposed Plan._ The Proposed Plan public meeting date is tentatively June 11th, but may be rescheduled for May. This is a very small site, 30’ x 20’ which will likely be excavated. Thet Proposed Plan document will be coming to the RAB shortly.

Introduction to In-Situ Bioremediation. (See attached “Introduction to ISB” Powerpoint presentation.) ISB is one of the newer ways to remediate contamination. Mr. Winters asked if microbes and substrate could be injected at the same time. Mr. Wacker said they can be injected relatively close in time together, but would not be done during the same injection. The presentation covered topics such as bioaugmentation and contaminant breakdown products, and showed photos of ISB operations at other facilities. ISB will be used at LHAAP-04, LHAAP-47 and LHAAP-58, and may be used at LHAAP-18/24. AECOM will present some case studies showing remediation success with ISB at a future RAB meeting.

Groundwater Treatment Plant (GWTP) Update

The GWTP continues to operate to maintain containment of the plume at LHAAP-18/24. Treated water was has been released to Harrison Bayou for the last few months, since sufficient water flow has been present in the bayou. A handout showing surface water sample results was also provided and reviewed. (See attached Surface Water Sampling Results handout.) Ms. Zeiler stated that this information can be shared with the public by the RAB members to show that contaminants have not been released to Caddo Lake for quite some time. Ms. Palmie noted that Goose Prairie Creek was dry in January, so AECOM went back and sampled in February when water was first observed in that area. Mr. LeTourneau asked if treated water is discharged from the GWTP to Harrison Bayou on a continual basis during the rainy season. Ms. Zeiler responded that there is discharge to Harrison Bayou during the rainy season but that it is done based on flow in the Bayou to ensure discharge limits are not exceeded. Ms. Zeiler also referenced the surface water sampling handout to show that there has been no contaminant exceedance in the Bayou for quite some time.

Decision Document Sites Review

Mr. Williams provided a review of four non-residential use sites (LHAAP-19, LHAAP-56, LHAAP-65 and LHAAP-69) for which Decision Documents are being developed. (See attached AECOM presentation.) All four sites were determined to be suitable for non-residential use. No further action is required for these four sites. The sites will be evaluated every five years to confirm the use remains non-residential. Ms. Palmie clarified that TCEQ will be looking at these sites to ensure protectiveness every five years as part of the 5-year review process. Ms. Zeiler noted that the purpose of the Decision Document is to document for the record the decisions made, and agency concurrence with decisions made, for management of these sites.

Mr. Fortune asked about a historical allegation of mercury disposal at LHAAP-19. The allegation was that mercury switches were disposed of illegally at LHAAP-19. Ms. Zeiler stated that Army and USEPA both investigated the allegations and determined there was no validity and no basis.

Mr. Mauthe asked if Tulsa District USACE is run by Fort Worth District USACE. Ms. Zeiler and Ms. Lanier explained that Fort Worth District did manage the project historically, but Tulsa District has been managing for quite some time due to specialized expertise with CERCLA sites held by the personnel in the Tulsa District.

Upcoming Field Work
Field work for LHAAP-18/24, LHAAP-46 and LHAP-67 should be complete by the end of April. Routine compliance sampling will start in late April or early May, and will take a few weeks to complete. This summer, field work will be conducted at LHAAP-37, LHAAP-50 and LHAAP-58, similar in nature to that currently being done at LHAAP-46 and LHAAP-67.

Other DERP Environmental Restoration Update – Rose Zeiler
LHAAP-37 Bioplug Demonstration Project
Ms. Zeiler advised that a presentation on the initial results for the project is anticipated for the RAB meeting to be held in September/October.

Sitewide Land Use Controls (LUC) Management Plan Update
Ms. Zeiler stated that the update of this plan for the year was recently completed.

Community Involvement Plan (CIP) – The document has been provided to the RAB for review and comment. All comments should be submitted by or before the next RAB meeting.

Military Munitions Response Program (MMRP) – USACE
No update at this time.

Other Environmental Restoration Issues – Rose Zeiler
Dispute Resolution
Dispute resolution continues. Nothing specific to update since last RAB meeting.

Look Ahead at the Schedule
Next RAB meeting is scheduled for July 16th from 4PM – 6PM at the Karnack Community Center.

The LHAAP-03 Proposed Plan public meeting is anticipated for June 11th, but RAB members should watch their email for this to change to an earlier date.

A motion to adjourn was made by Mr. Cargill and seconded by Ms. Zeiler.

Adjourn

April Meeting Attachments and Handouts:
- *Meeting Agenda*
- *Minutes from January meeting*
- *AECOM Powerpoint Presentation*
- *Introduction to ISB Powerpoint Presentation*
- *Surface Water Sampling Results Handout*

- *GWTP Treated Groundwater Volumes Handout*

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LUC	Land Use Controls
MMRP	Military Munitions Response Program
RAB	Restoration Advisory Board
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TCEQ	Texas Commission on Environmental Quality
USACE	United States Army Corps of Engineers
USAEC	United States Army Environmental Center
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service

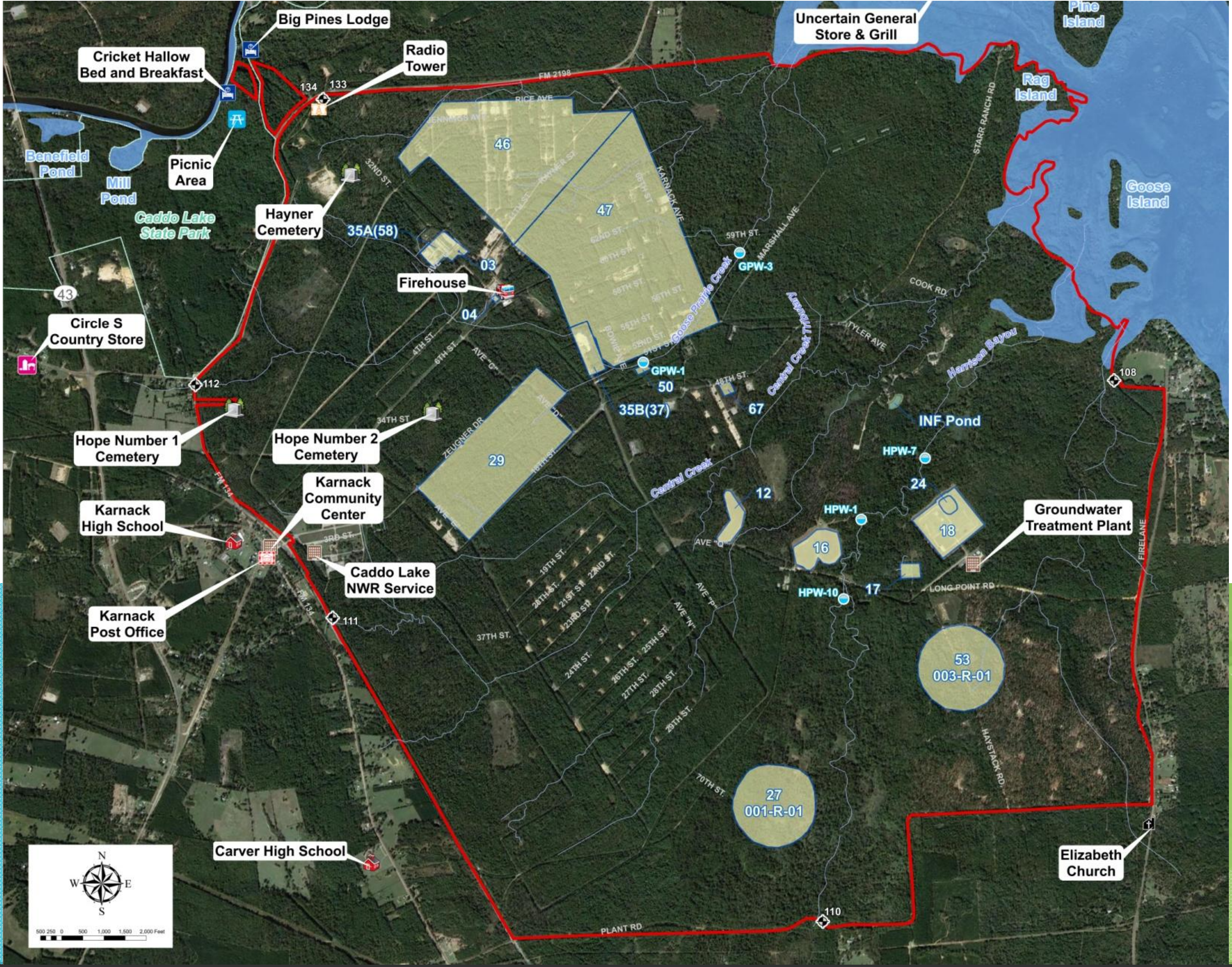
Longhorn Army Ammunition Plant Restoration Advisory Board Meeting
July 16, 2013

AECOM Environment

Agenda

1. RAB Administrative Issues
2. SharePoint Website
3. Field Activities Update of Environmental Sites (46, 67, 18/24, 37, 50, 58)
4. Groundwater Treatment Plant (GWTP)
5. Surface Water Sample Results
6. Status of Demonstration at Site 37
7. EPA Quality Assurance Sampling
8. Community Relations Plan/Community Involvement Plan (CRP/CIP) Status
9. Dispute Status and Projected Schedule

Longhorn Map

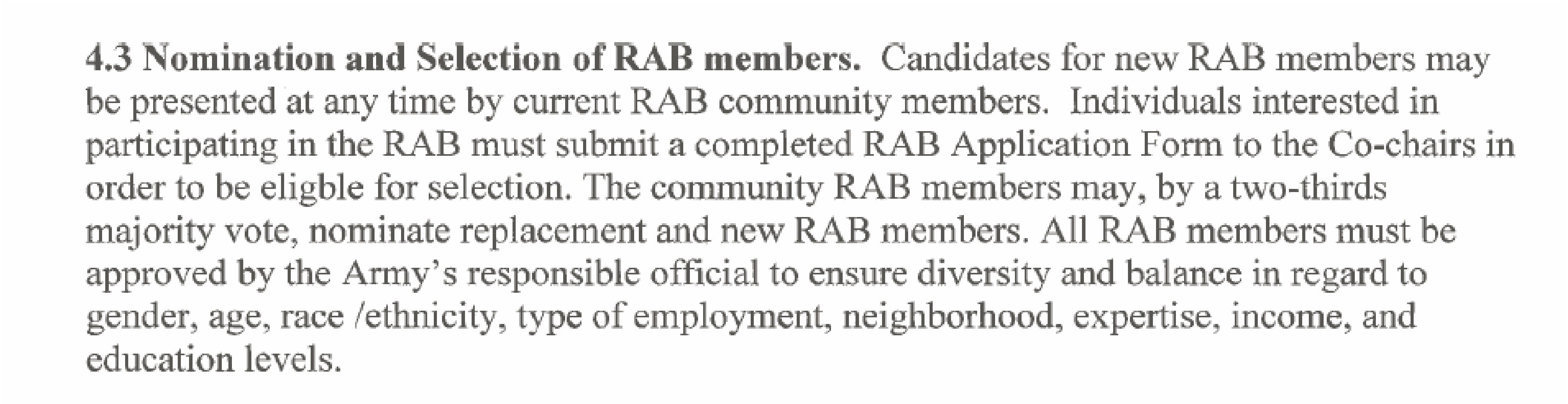


AECOM

AECOM Longhorn NPL Sites

LHAAP-03	Building 722 Paint Shop
LHAAP-04	Pilot Wastewater Treatment Plant
LHAAP-12	Landfill 12
LHAAP-16	Landfill 16
LHAAP-17	Burning Ground No.2/Flashing Area
LHAAP-18	Burning Ground No.3
LHAAP-24	Unlined Evaporation Pond
LHAAP-29	Former TNT Production Area
LHAAP-37	Chemical Laboratory Waste Pad
LHAAP-46	Plant Area 2
LHAAP-47	Plant Area 3
LHAAP-50	Former Sump Water Tank
LHAAP-58	Maintenance Complex
LHAAP-67	Aboveground Storage Tank Farm
LHAAP-001-R-01	South Test Area/Bomb Test Area
LHAAP-003-R-01	Ground Signal Test Area

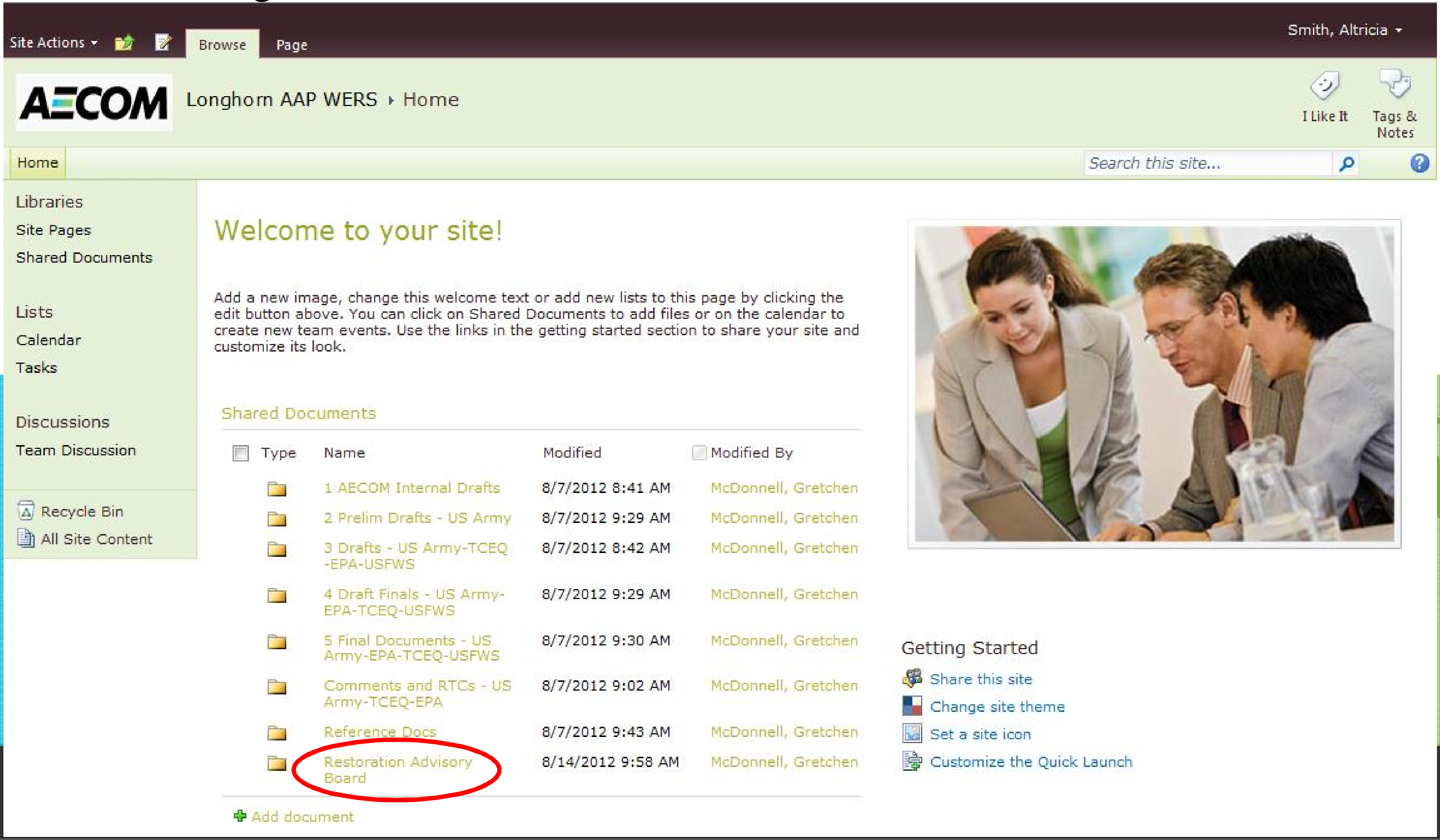
RAB Administrative Issues



4.3 Nomination and Selection of RAB members. Candidates for new RAB members may be presented at any time by current RAB community members. Individuals interested in participating in the RAB must submit a completed RAB Application Form to the Co-chairs in order to be eligble for selection. The community RAB members may, by a two-thirds majority vote, nominate replacement and new RAB members. All RAB members must be approved by the Army's responsible official to ensure diversity and balance in regard to gender, age, race /ethnicity, type of employment, neighborhood, expertise, income, and education levels.

SharePoint Website

- **https://extranet.aecom.com/sites/longhornaapwers**
- The Home Page



Longhorn AAP WERS › Home

Libraries
Site Pages
Shared Documents

Lists
Calendar
Tasks

Discussions
Team Discussion

Recycle Bin
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	1 AECOM Internal Drafts	8/7/2012 8:41 AM	McDonnell, Gretchen
	2 Prelim Drafts - US Army	8/7/2012 9:29 AM	McDonnell, Gretchen
	3 Drafts - US Army-TCEQ -EPA-USFWS	8/7/2012 8:42 AM	McDonnell, Gretchen
	4 Draft Finals - US Army-EPA-TCEQ-USFWS	8/7/2012 9:29 AM	McDonnell, Gretchen
	5 Final Documents - US Army-EPA-TCEQ-USFWS	8/7/2012 9:30 AM	McDonnell, Gretchen
	Comments and RTCs - US Army-TCEQ-EPA	8/7/2012 9:02 AM	McDonnell, Gretchen
	Reference Docs	8/7/2012 9:43 AM	McDonnell, Gretchen
	Restoration Advisory Board	8/14/2012 9:58 AM	McDonnell, Gretchen

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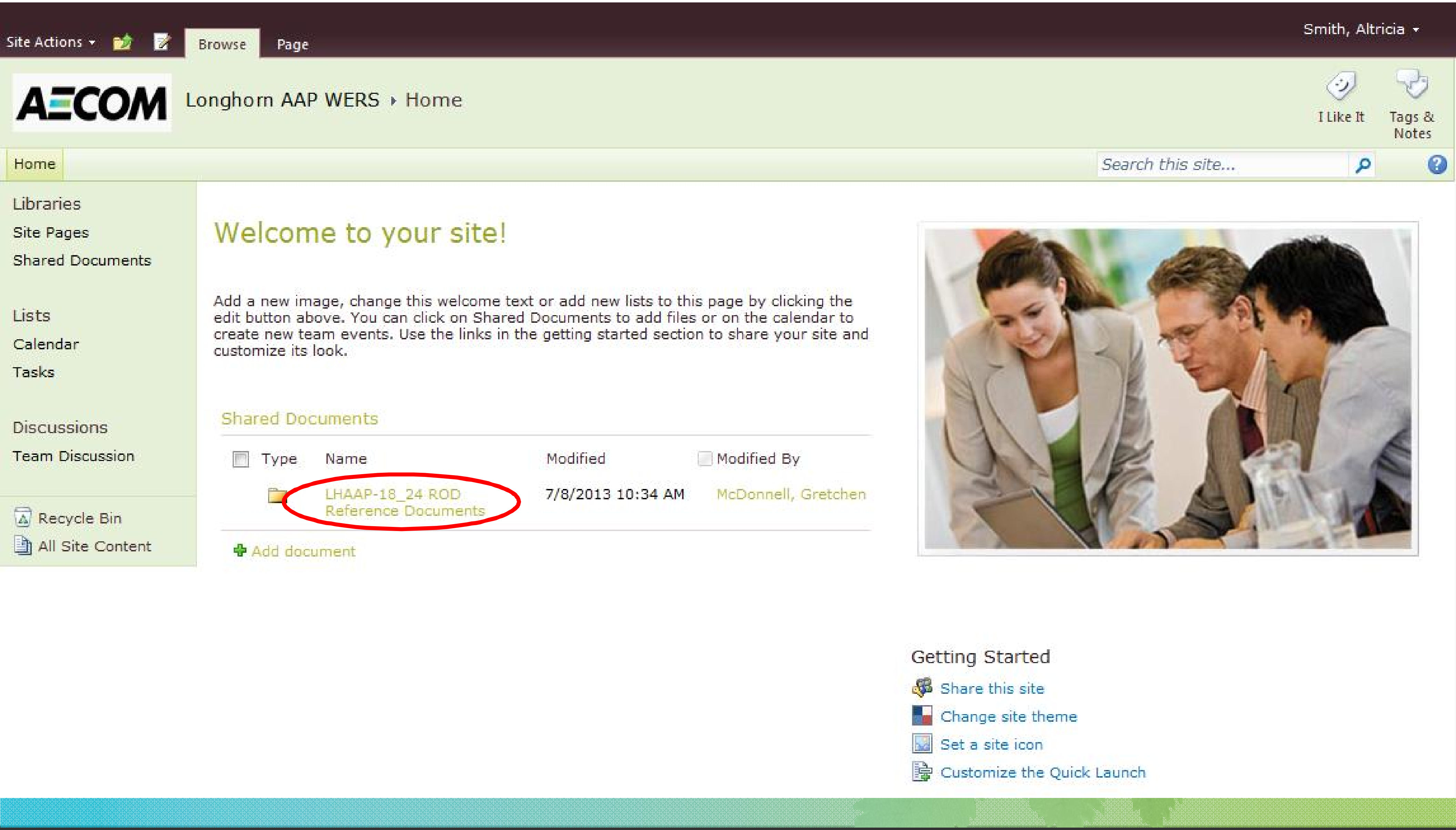

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Shared Documents

☐ Type	Name	Modified	☐ Modified By
📁	LHAAP-18_24 ROD Reference Documents	7/8/2013 10:34 AM	McDonnell, Gretchen

SharePoint Website

- Documents that can be found in the "LHAAP-18_24 ROD Reference Documents" folder:
  - Draft Final Feasibility Study, LHAAP-18/24, Burning Ground No. 3 and Unlined Evaporation Pond, Longhorn Army Ammunition Plant, Karnack, Texas
  - DOW Environmental, Inc. (DEI) (Formerly AWD Technologies, INC.) Pilot Study Report - Phase II March 1995
  - Environmental Site Assessment (Plexus, 2005)
  - Closure of Unlined Evaporation Pond, Kindle, Stone & Associates, July 15, 1984
  - Jacobs, Phase III, 1998
  - Jacobs, Phase II, 1995
  - Jacobs, Phase I, 1993

SharePoint Website – How to Use

- Your User Name
  - Domain\UserID
    - Example: John Doe would be “ACM\DoeJ”

Connecting to extranet.aecom.com.

SharePoint Website - Troubleshooting

- You are presented with the same screen
  - This means your login was unsuccessful

Connecting to extranet.aecom.com.

User name: acm\username

Password: •••••••••

☐ Remember my password

- 401 – Unauthorized
  - After three unsuccessful attempts, you will be presented with this error.
  - You will be unable to access the SharePoint for a few hours.
  - After a few hours have passed, you may attempt to log on again.

401 - Unauthorized: Access is denied due to invalid credentials.

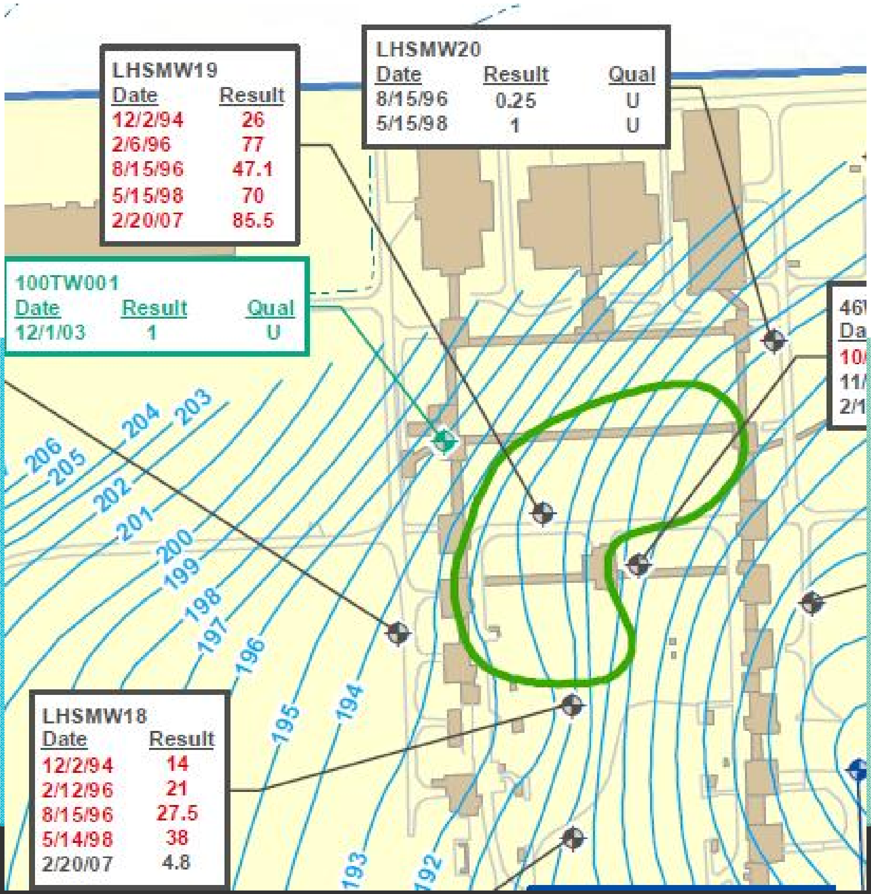
You do not have permission to view this directory or page using the credentials that you supplied.

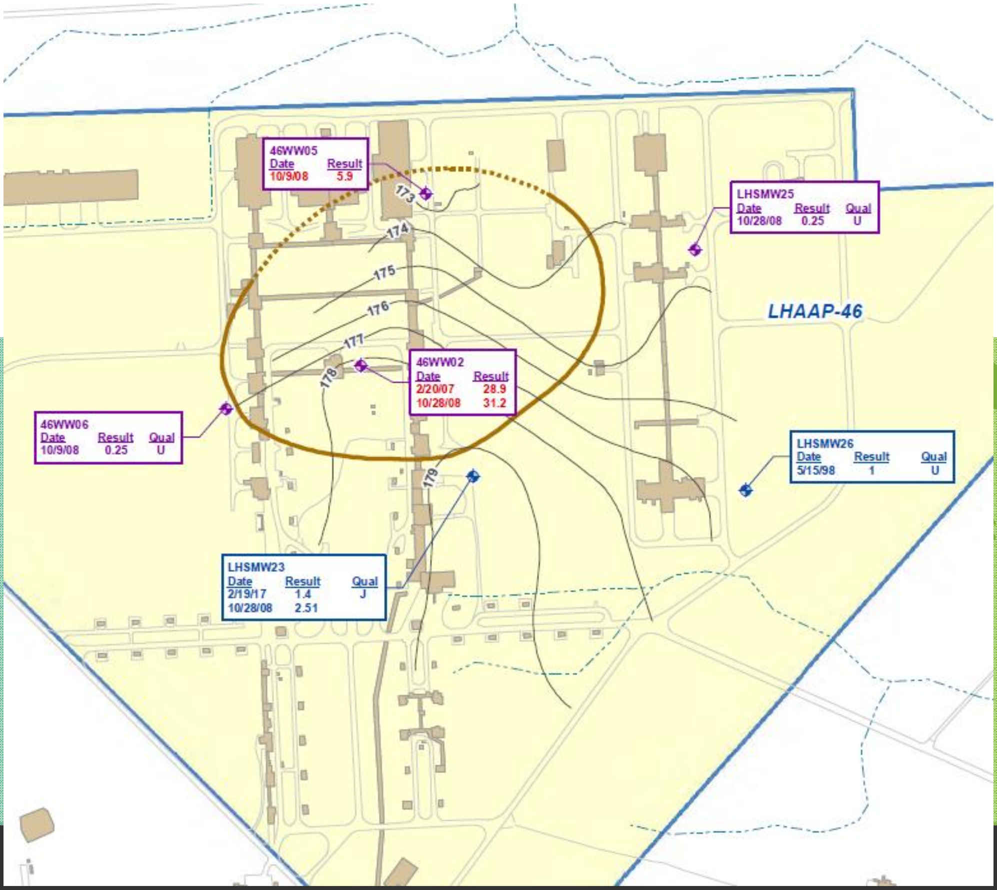
SharePoint Website – How to Use

- Your Password
  - Your password will be provided to you.
    - If you copy/paste your password, please be sure not to copy the space. It will count as a character and you will be denied access.
  - Passwords Valid for 6 months
    - First password will expire at end of September
    - New password will be issued at that time
  - Contact Gretchen McDonnell if you need your username or password

Status of Environmental Sites

- LHAAP-46 Plant Area 2 –
  - Remedial Action Work Plan Completed
  - Installed Wells, Began Quarterly Sampling for Monitored Natural Attenuation Evaluation over the next two years. ~shallow plume on left, intermediate depth plume on right below:

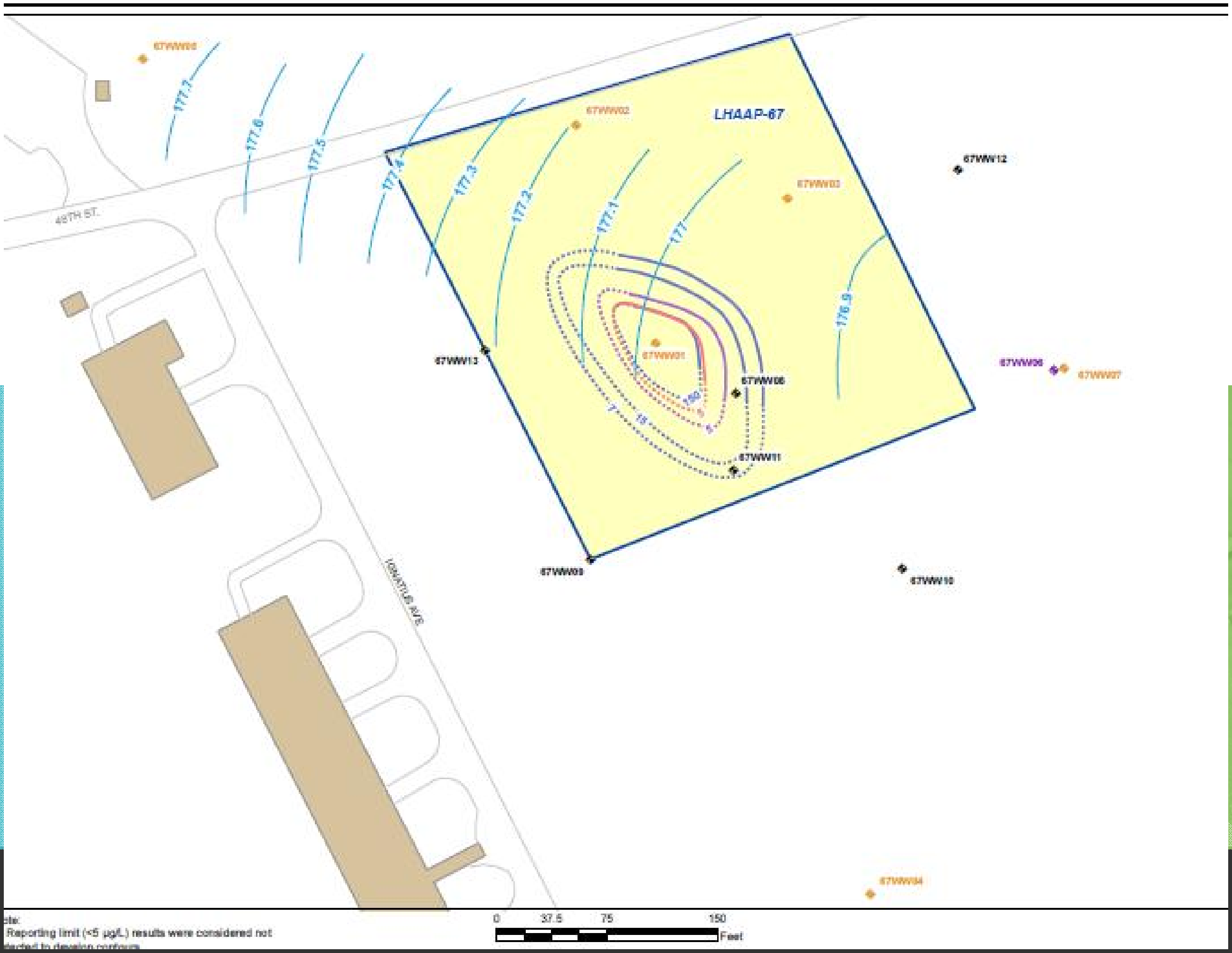




Status of Environmental Sites (cont)

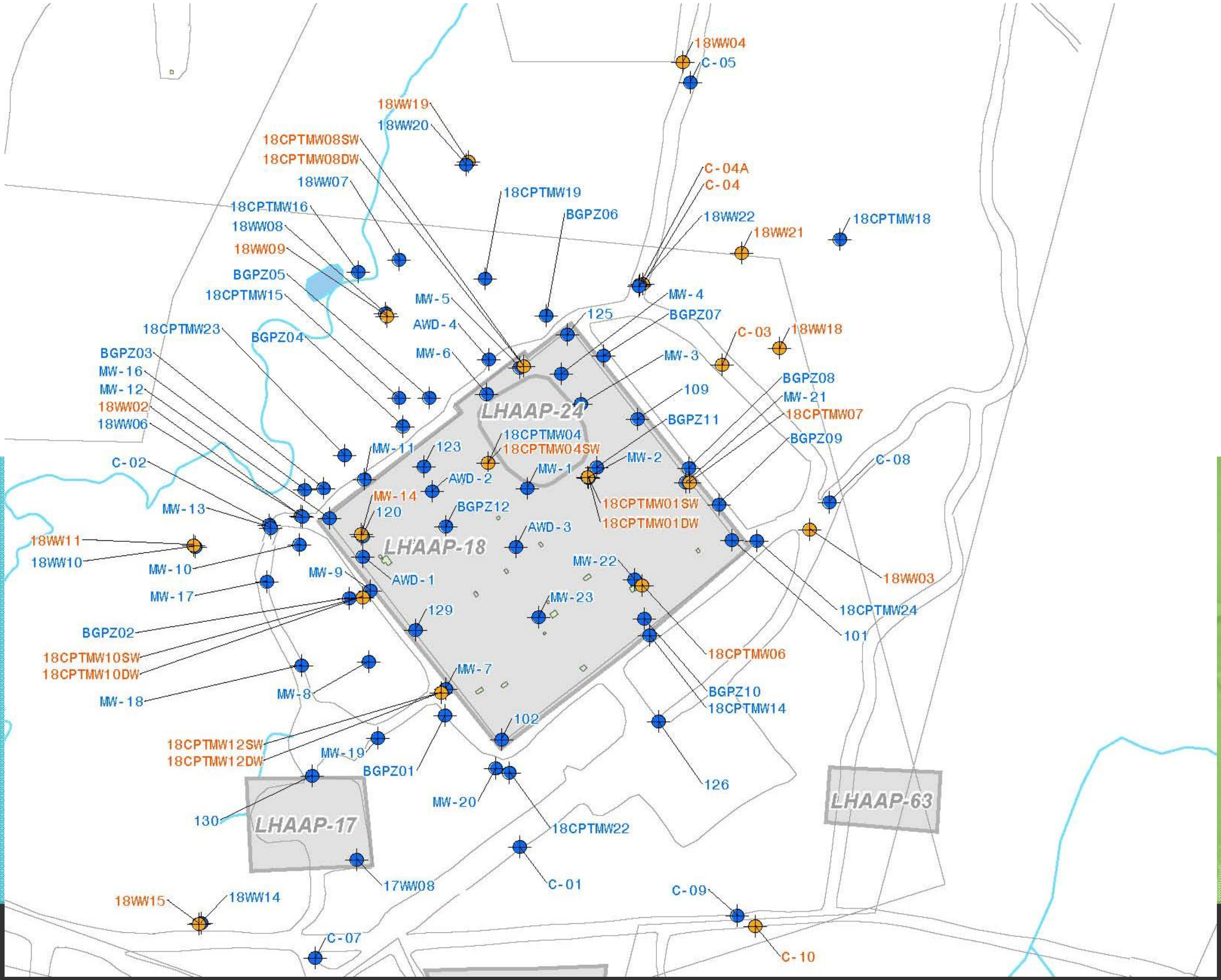
– LHAAP-67 Aboveground Storage Tank Farm –

- Well installation complete, Quarterly Sampling initiated and Monitored Natural Attenuation Evaluation to be completed over the next two years. Plumes shown below:



Status of Environmental Sites (cont)

- LHAAP-18/24 Burning Grounds #3 and Unlined Evaporation Pond –
  - Completed CPT, DPT, and installed Wells, collected soil and groundwater samples



Status of Environmental Sites (cont)

- LHAAP-35B (37) – Chemical Laboratory
  - Remedial Action Work Plan Complete
  - Bio-Plug Study on-going
  - Plan to Install Wells, Complete Sampling following completion of bio-plug study

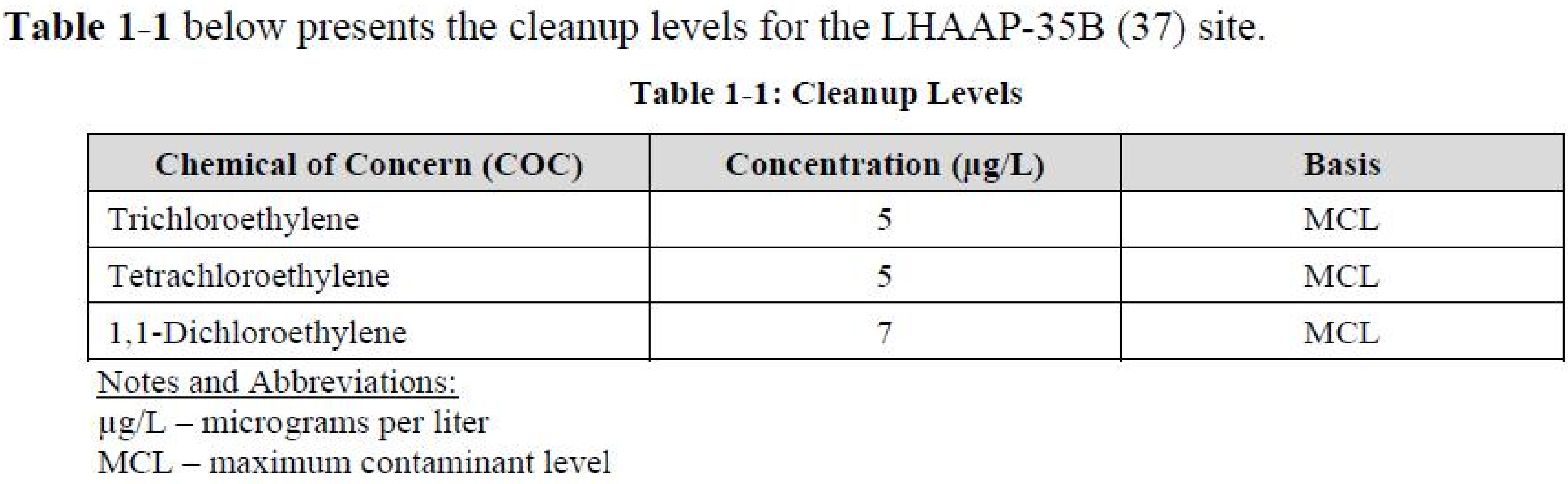


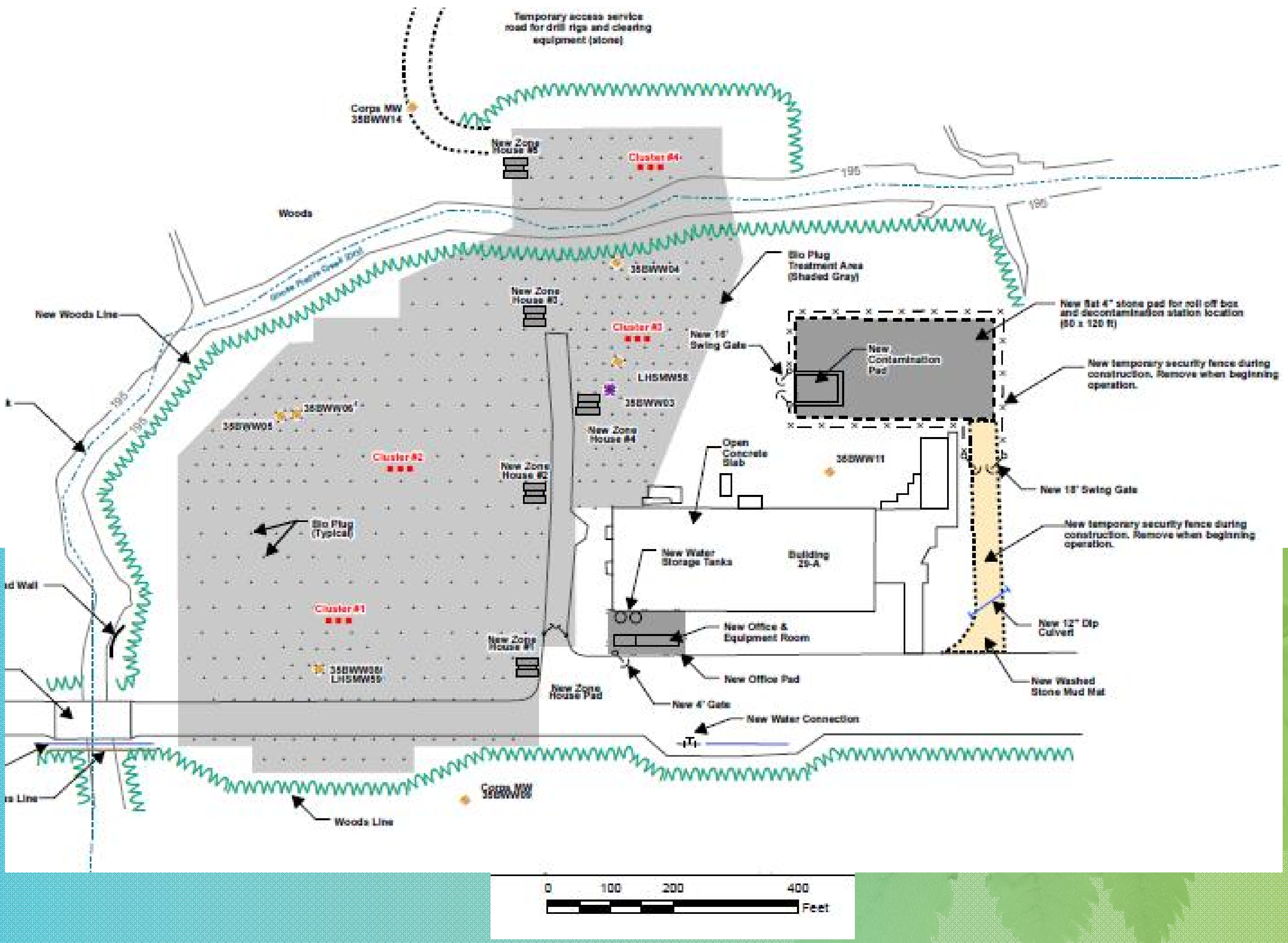
Table 1-1 below presents the cleanup levels for the LHAAP-35B (37) site.

Table 1-1: Cleanup Levels

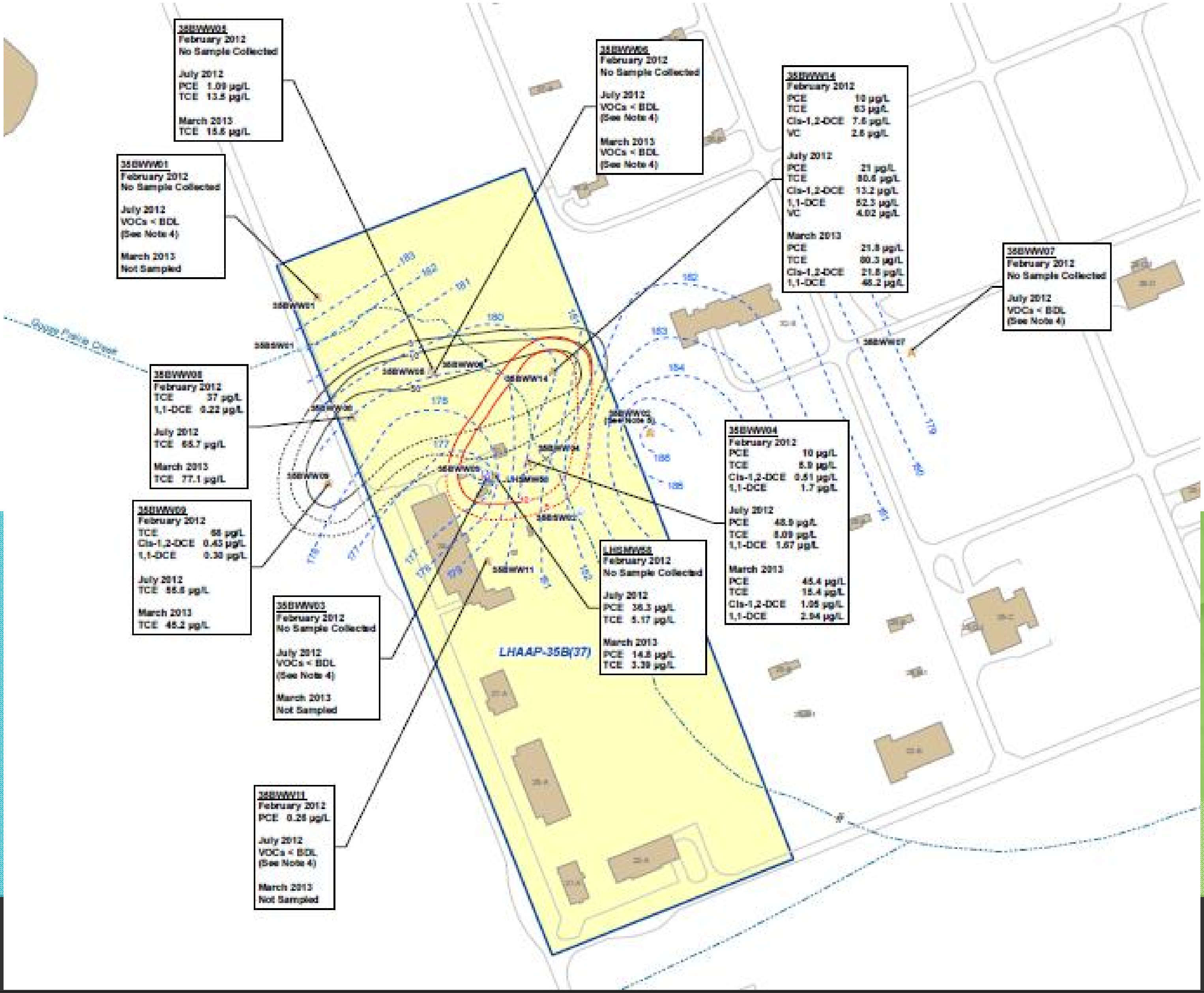
Chemical of Concern (COC)	Concentration (µg/L)	Basis
Trichloroethylene	5	MCL
Tetrachloroethylene	5	MCL
1,1-Dichloroethylene	7	MCL

Notes and Abbreviations:
µg/L – micrograms per liter
MCL – maximum contaminant level

Status of Environmental Sites (cont)



Status of Environmental Sites (cont)



35BWW05
February 2012
No Sample Collected

July 2012
PCE 1.09 µg/L
TCE 13.5 µg/L

March 2013
TCE 18.6 µg/L

35BWW01
February 2012
No Sample Collected

July 2012
VOCs < BDL
(See Note 4)

March 2013
Not Sampled

35BWW06
February 2012
No Sample Collected

July 2012
VOCs < BDL
(See Note 4)

March 2013
VOCs < BDL
(See Note 4)

35BWW14
February 2012
PCE 10 µg/L
TCE 63 µg/L
Cis-1,2-DCE 7.8 µg/L
VC 2.8 µg/L

July 2012
PCE 21 µg/L
TCE 80.6 µg/L
Cis-1,2-DCE 13.2 µg/L
1,1-DCE 52.3 µg/L
VC 4.02 µg/L

March 2013
PCE 21.8 µg/L
TCE 80.3 µg/L
Cis-1,2-DCE 21.8 µg/L
1,1-DCE 48.2 µg/L

35BWW07
February 2012
No Sample Collected

July 2012
VOCs < BDL
(See Note 4)

35BWW08
February 2012
TCE 37 µg/L
1,1-DCE 0.22 µg/L

July 2012
TCE 65.7 µg/L

March 2013
TCE 77.1 µg/L

35BWW09
February 2012
TCE 68 µg/L
Cis-1,2-DCE 0.43 µg/L
1,1-DCE 0.30 µg/L

July 2012
TCE 56.6 µg/L

March 2013
TCE 48.2 µg/L

35BWW04
February 2012
PCE 10 µg/L
TCE 8.9 µg/L
Cis-1,2-DCE 0.51 µg/L
1,1-DCE 1.7 µg/L

July 2012
PCE 48.9 µg/L
TCE 8.09 µg/L
1,1-DCE 1.67 µg/L

March 2013
PCE 45.4 µg/L
TCE 15.4 µg/L
Cis-1,2-DCE 1.08 µg/L
1,1-DCE 2.94 µg/L

LHSMW58
February 2012
No Sample Collected

July 2012
PCE 38.3 µg/L
TCE 5.17 µg/L

March 2013
PCE 14.8 µg/L
TCE 3.39 µg/L

35BWW03
February 2012
No Sample Collected

July 2012
VOCs < BDL
(See Note 4)

March 2013
Not Sampled

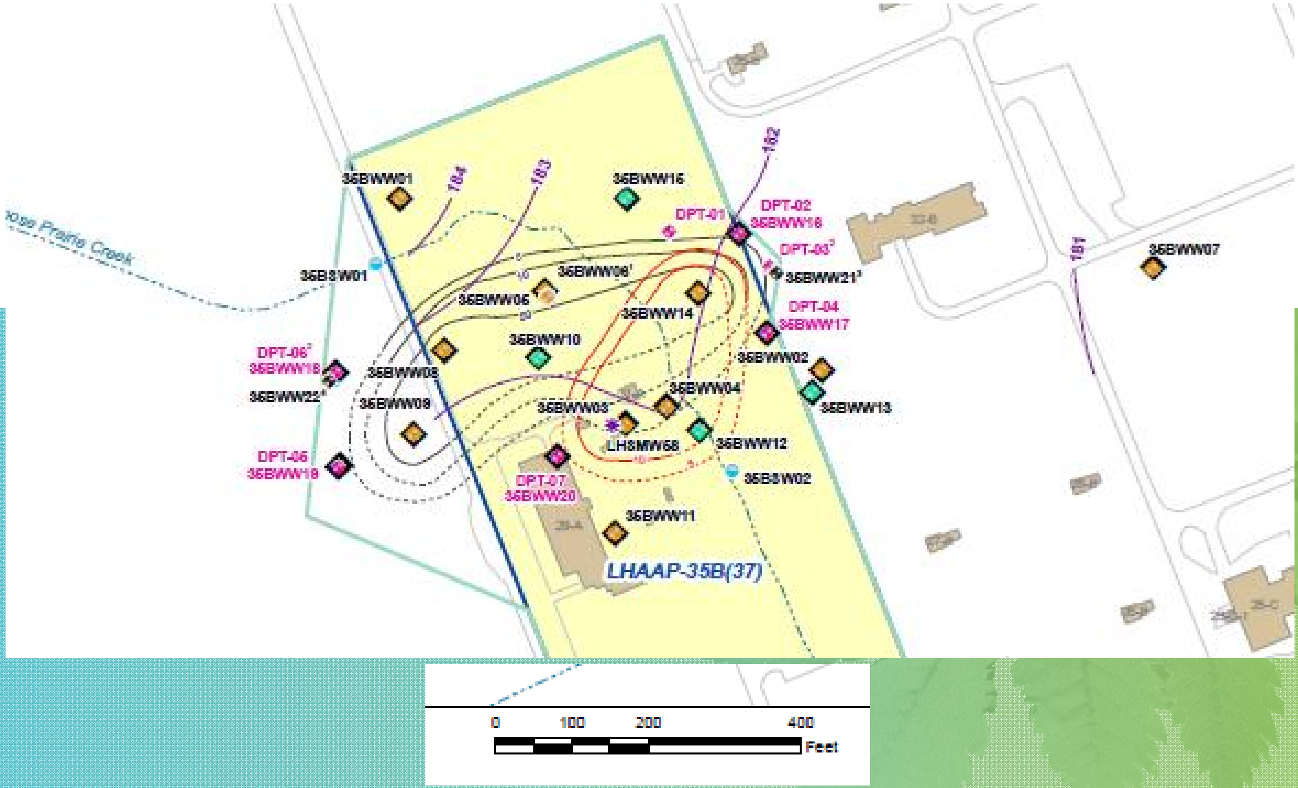
35BWW11
February 2012
PCE 0.28 µg/L

July 2012
VOCs < BDL
(See Note 4)

March 2013
Not Sampled

Status of Environmental Sites (cont)

- LHAAP-35B (37) –
  - Remedial Action Work Plan Complete
  - Plan to Install Wells, Complete Quarterly Sampling and perform Monitored Natural Attenuation Evaluation over the next two years. Shallow and intermediate plumes below:



Status of Environmental Sites (cont)

– LHAAP-50 – Former Sump Water Tank
  - Industrial waste production sump water received from throughout the plant at this site which also had a 47,000 gallon AST

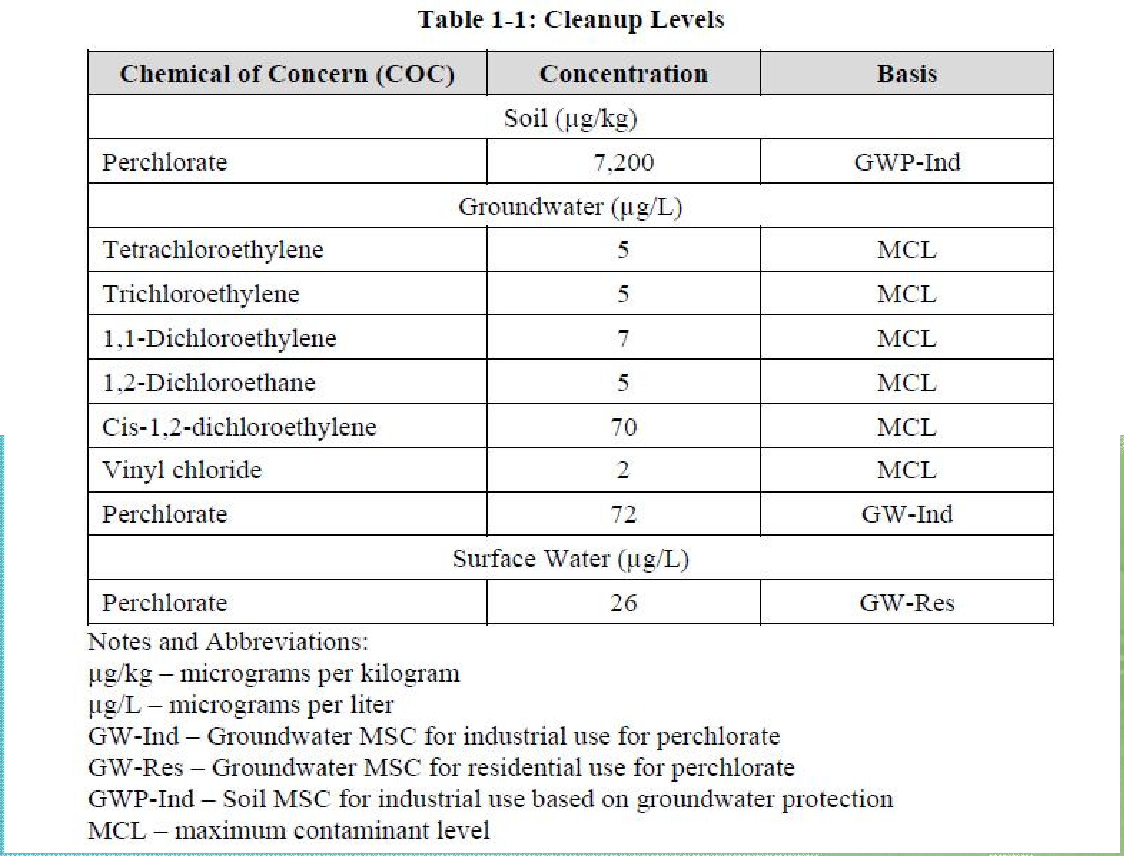


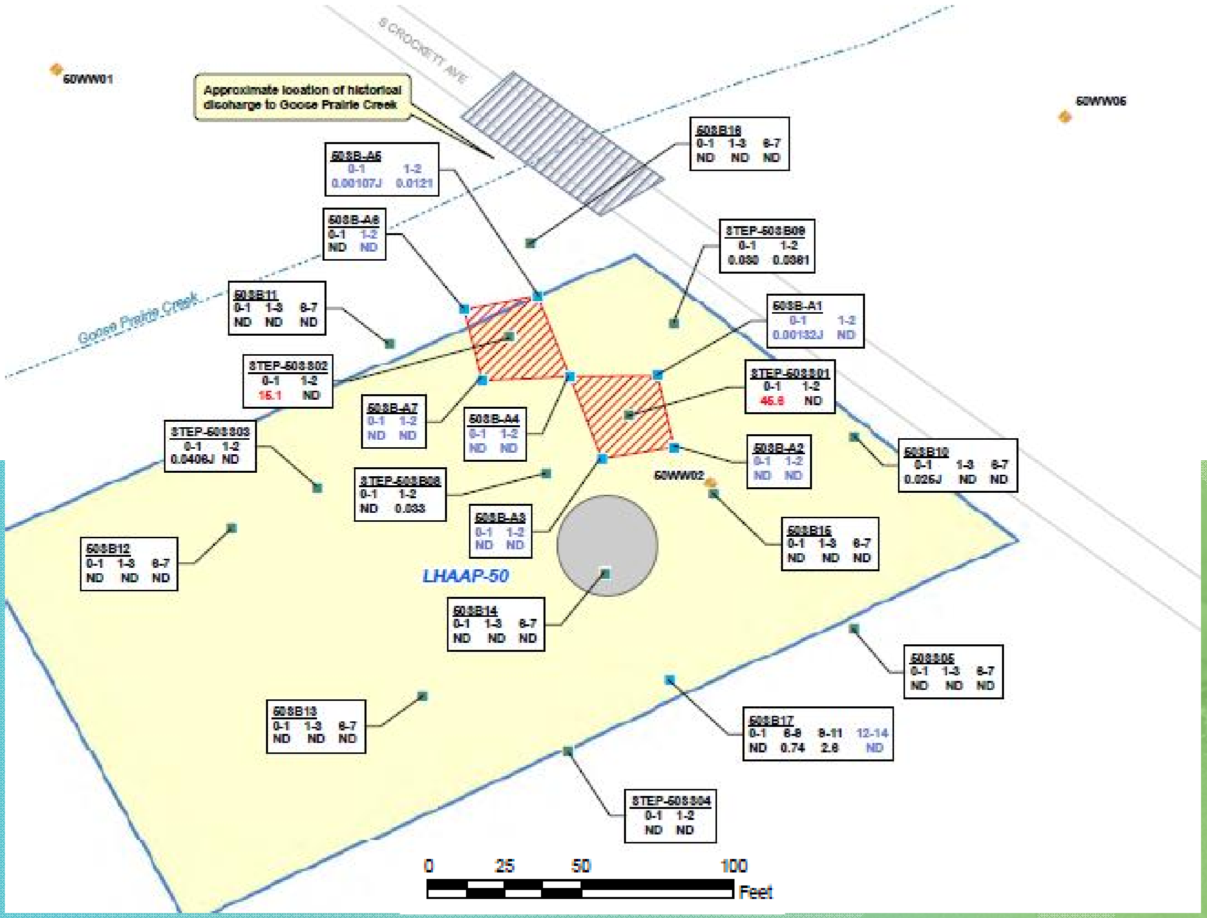
Table 1-1: Cleanup Levels

Chemical of Concern (COC)	Concentration	Basis
Soil (µg/kg)		
Perchlorate	7,200	GWP-Ind
Groundwater (µg/L)		
Tetrachloroethylene	5	MCL
Trichloroethylene	5	MCL
1,1-Dichloroethylene	7	MCL
1,2-Dichloroethane	5	MCL
Cis-1,2-dichloroethylene	70	MCL
Vinyl chloride	2	MCL
Perchlorate	72	GW-Ind
Surface Water (µg/L)		
Perchlorate	26	GW-Res

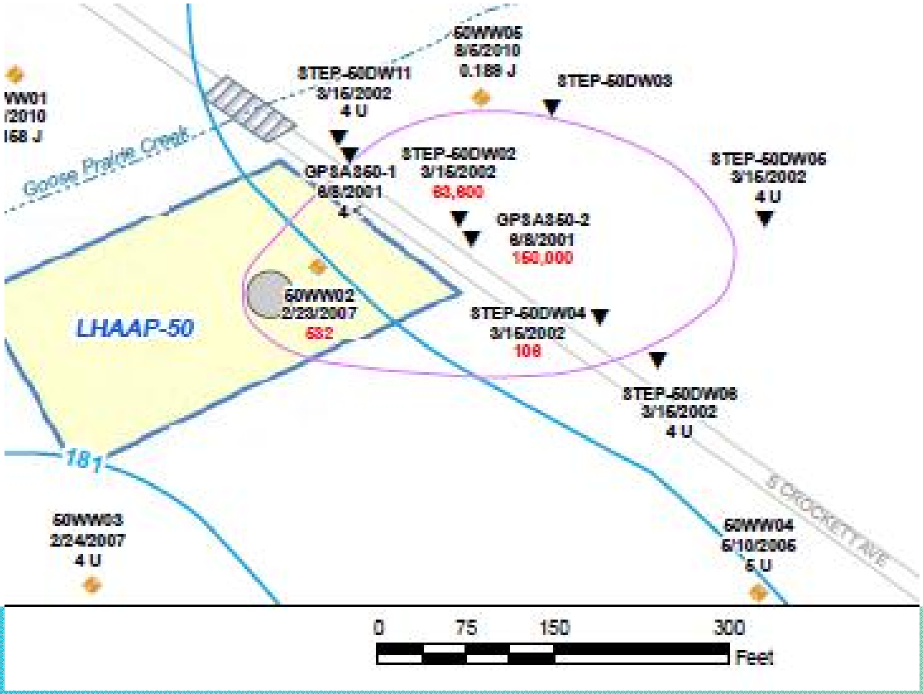
Notes and Abbreviations:
µg/kg – micrograms per kilogram
µg/L – micrograms per liter
GW-Ind – Groundwater MSC for industrial use for perchlorate
GW-Res – Groundwater MSC for residential use for perchlorate
GWP-Ind – Soil MSC for industrial use based on groundwater protection
MCL – maximum contaminant level

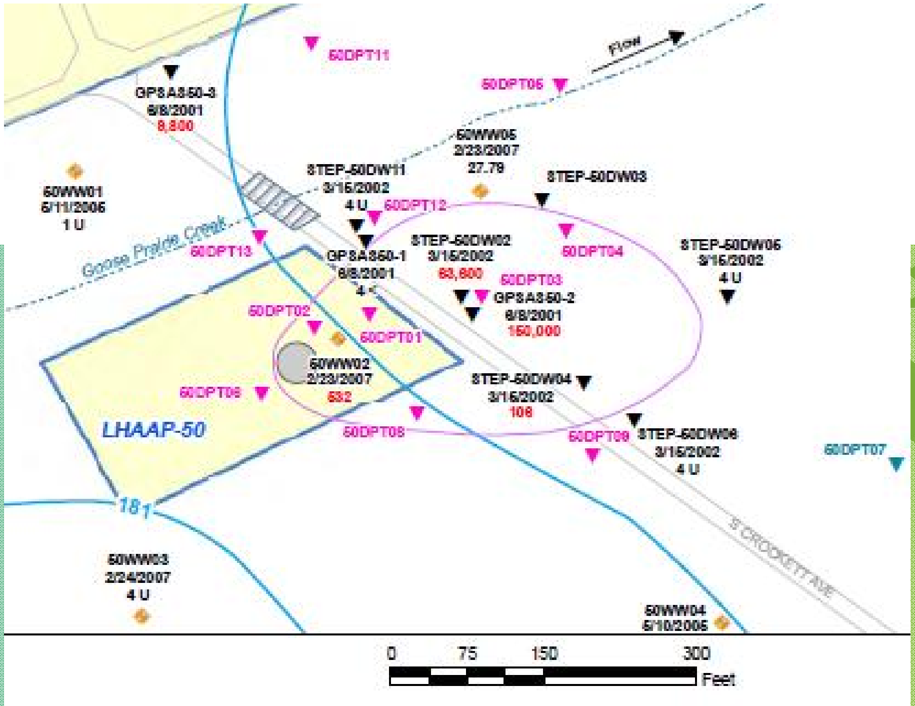
Status of Environmental Sites (cont)

- LHAAP-50 – Former Sump Water Tank
  - Area of soil contamination



Status of Environmental Sites (cont)





Status of Environmental Sites (cont)

- LHAAP-58 Shops Area –
  - Plant operated laundry, automotive, woodworking, metal working, painting, refrigeration, and electrical services operated in this area

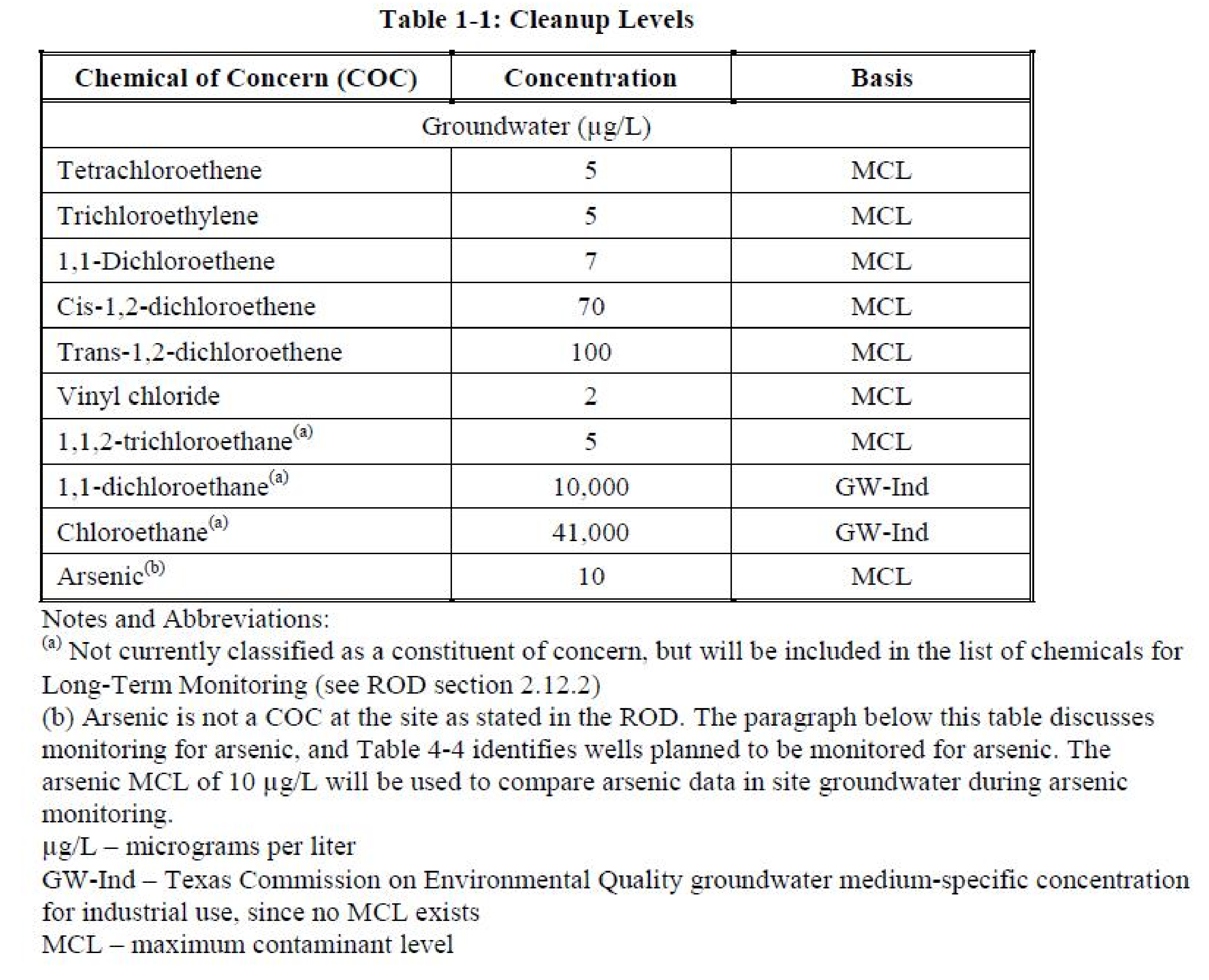


Table 1-1: Cleanup Levels

Chemical of Concern (COC)	Concentration	Basis
Groundwater (µg/L)		
Tetrachloroethene	5	MCL
Trichloroethylene	5	MCL
1,1-Dichloroethene	7	MCL
Cis-1,2-dichloroethene	70	MCL
Trans-1,2-dichloroethene	100	MCL
Vinyl chloride	2	MCL
1,1,2-trichloroethane(a)	5	MCL
1,1-dichloroethane(a)	10,000	GW-Ind
Chloroethane(a)	41,000	GW-Ind
Arsenic(b)	10	MCL

Notes and Abbreviations:

(a) Not currently classified as a constituent of concern, but will be included in the list of chemicals for Long-Term Monitoring (see ROD section 2.12.2)

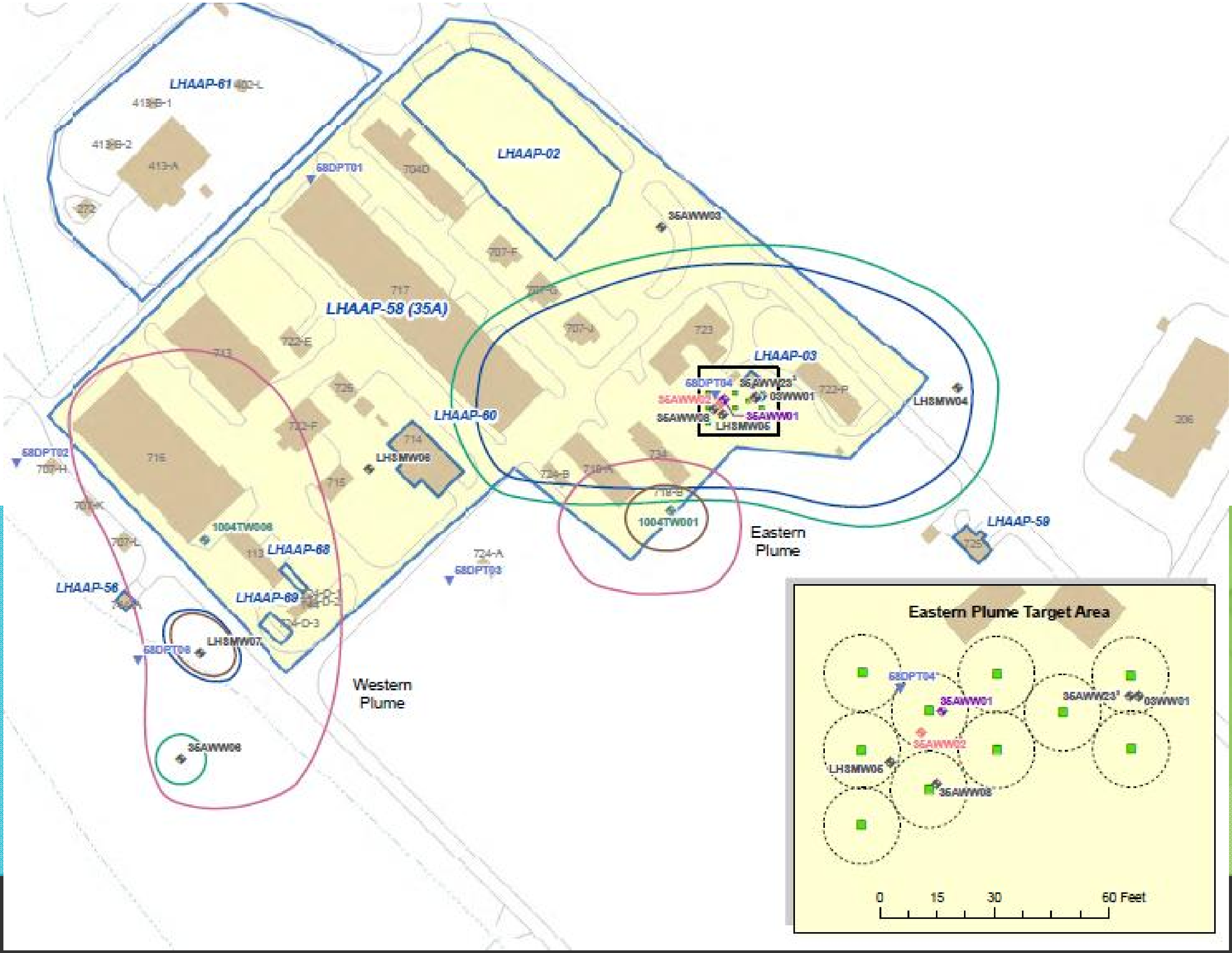
(b) Arsenic is not a COC at the site as stated in the ROD. The paragraph below this table discusses monitoring for arsenic, and Table 4-4 identifies wells planned to be monitored for arsenic. The arsenic MCL of 10 µg/L will be used to compare arsenic data in site groundwater during arsenic monitoring.

µg/L – micrograms per liter

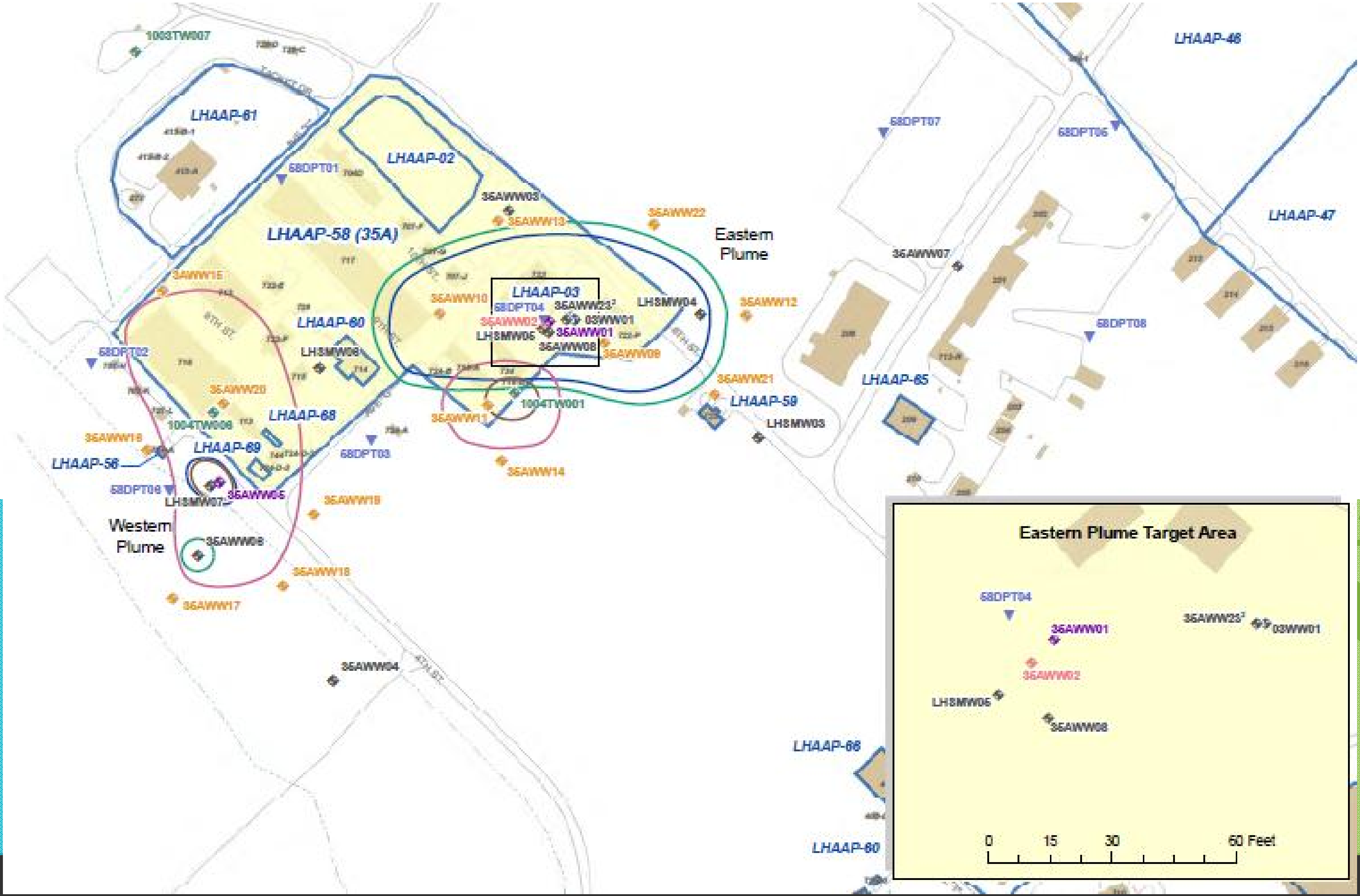
GW-Ind – Texas Commission on Environmental Quality groundwater medium-specific concentration for industrial use, since no MCL exists

MCL – maximum contaminant level

Status of Environmental Sites (cont)



Status of Environmental Sites (cont)



Status of Environmental Sites (cont)

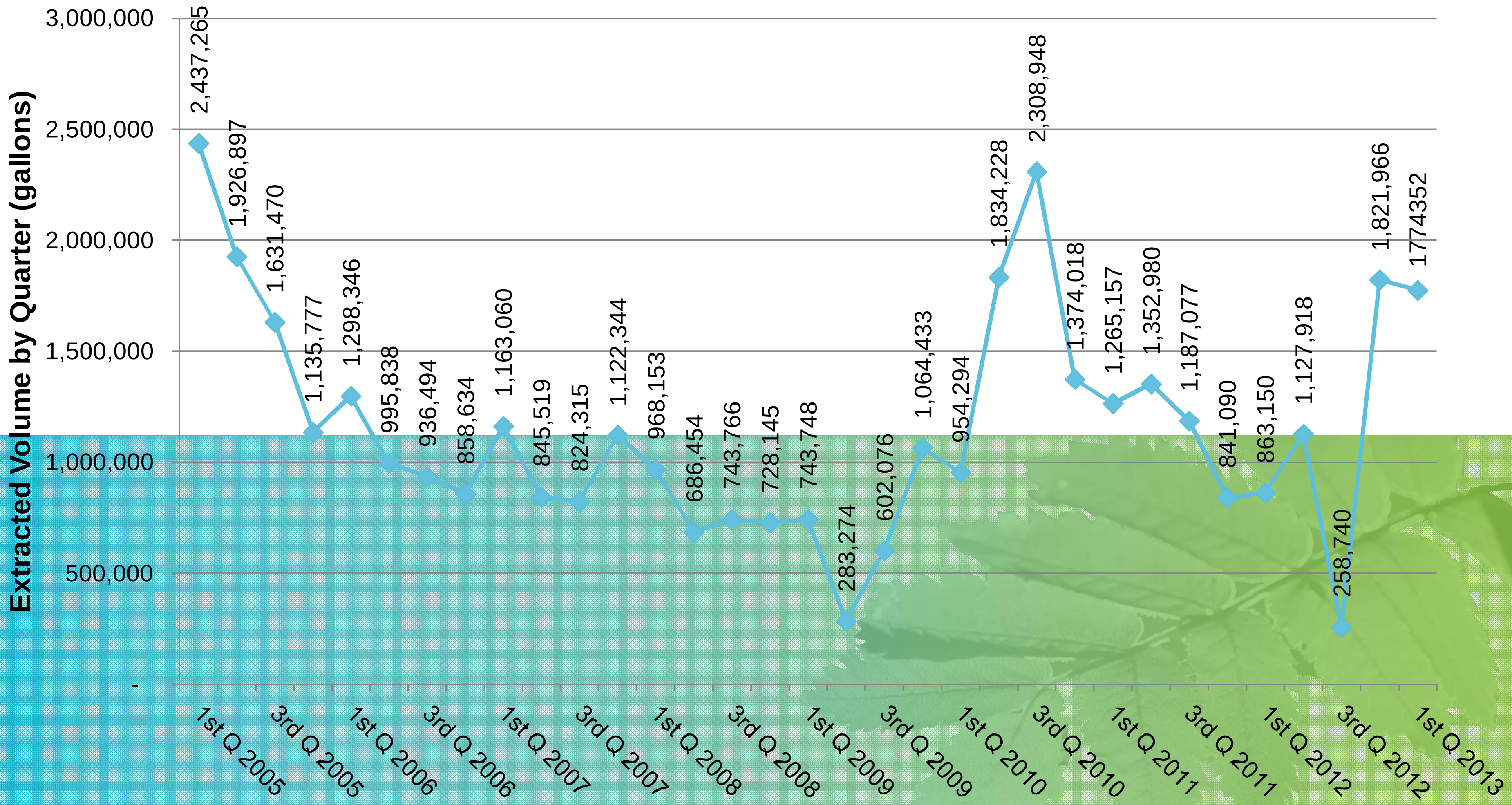
- LHAAP-37, LHAAP-50, LHAAP-58
  - RAWPs approved, fieldwork mobilized July 9
  - Completing DPT, well installation and groundwater sampling for MNA for groundwater
  - Completing soil excavation at LHAAP-50 (~150 cubic yards)
- CERCLA 5 Year Review Process for Multiple Sites
  - TCEQ and EPA review later this month
- LHAAP-03
  - ROD in progress, EPA and TCEQ reviewing, planned excavation in late fall
- LHAAP-12/LHAAP-16
  - Completing O&M mowing, sign maintenance, etc…
  - Repaired Areas Requiring Additional Soil
  - Maintenance of Wells (painting, fixing locks and hinges)

Groundwater Treatment Plant Operations and Management

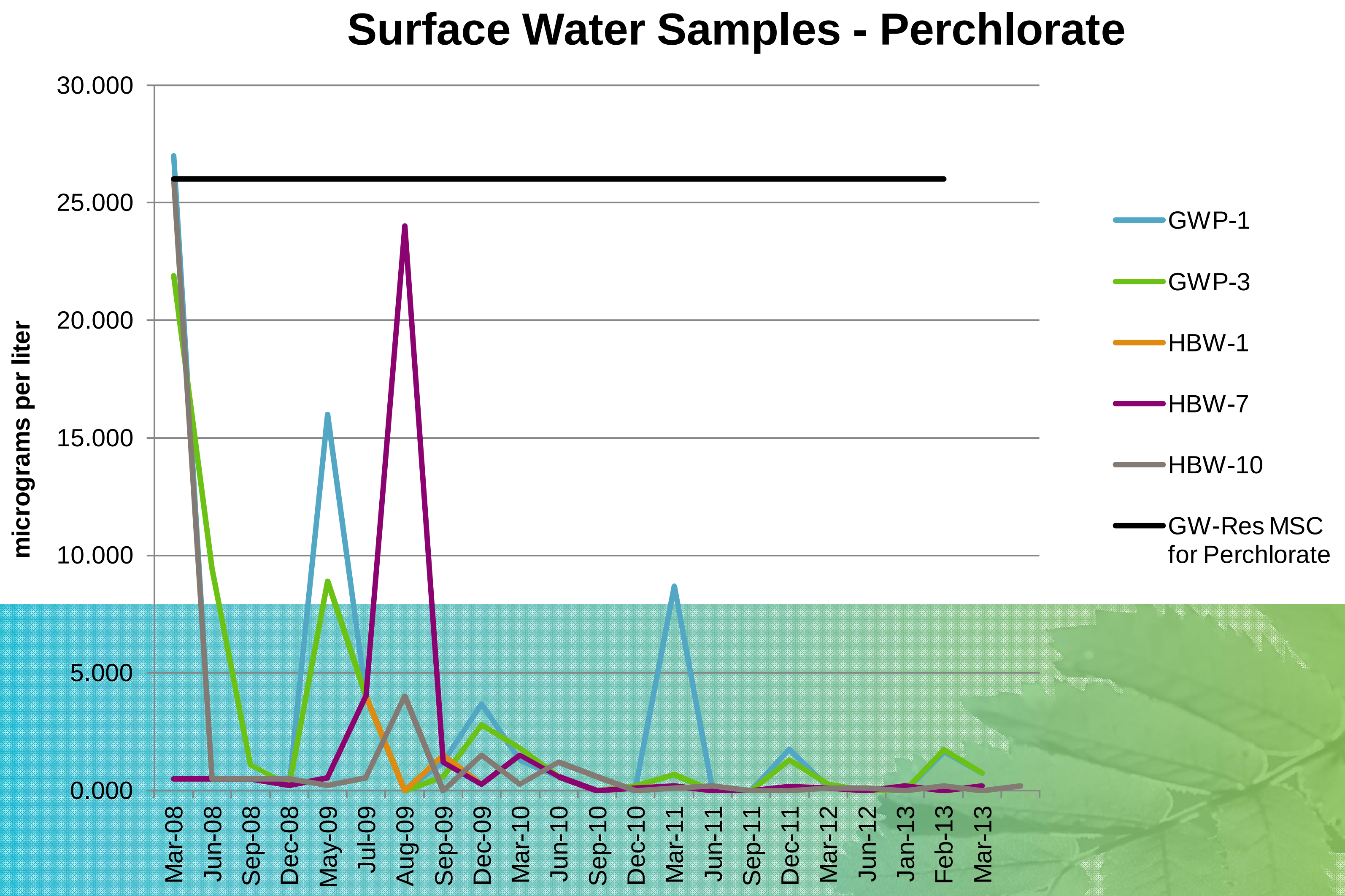
- The Groundwater Treatment Plant continues to operate to contain the plume at LHAAP-18/24 and LHAAP-16
- Water continues to be returned to LHAAP-18/24 or into Harrison Bayou depending on the amount of water in the bayou
- Compliance monitoring continues per existing sampling plan
- Maintenance and repairs of wells, pumps, tanks, and ancillary equipment is on-going

GWTP O&M (cont)

Quarterly Extraction Rate



Surface Water Sample Results



GPW – Goose Prairie Creek

HBW – Harrison Bayou

Continued Discussion of In-Situ Bioremediation

- Treatability Study (TS) at LHAAP-58
  - Groundwater was collected from monitoring well 35AWW08 and a soil sample was collected near the well using direct push technology.
  - One lactate based carbon source (e.g. sodium lactate) and one vegetable oil based carbon source (e.g. emulsified vegetable oil (EVO)) were evaluated during the TS.

  - The following environments were constructed in the laboratory:
    - Anaerobic sterile control
    - Anaerobic active control
    - Treatment microcosm with lactate-based carbon source
    - Treatment microcosm with EVO-based carbon source.
  - Seven post-baseline events were performed to document the progress of the TS. These included:
    - Microcosm Sampling
    - Chemicals of concern
    - pH
    - Anion parameters
    - Volatile fatty acids
    - Total organic carbon
    - Chlorinated volatile organic compound and dissolved hydrocarbon gasses

Continued Discussion of In-Situ Bioremediation Cont.

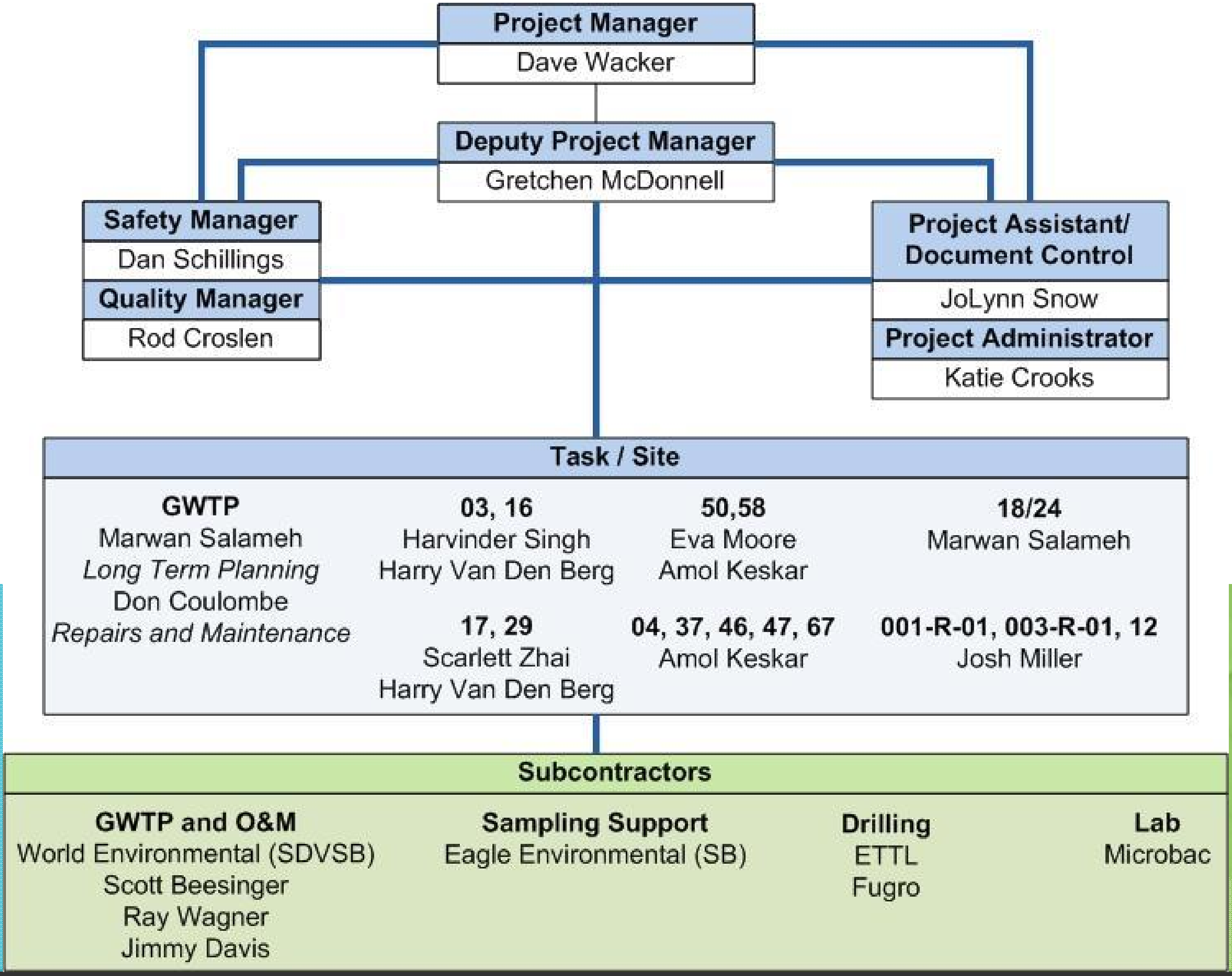
- Treatability Study (TS) at Site 58
  - The results of the TS indicated that both treatment microcosms achieved completed dechlorination (reduction of PCE/TCE to ethene). The chlorinated VOCs in the control microcosms remained stable as expected. Similarly, reductions in sulfate concentrations were observed in both treatment microcosms.
  - The lactate-based amendment is a relatively fast substrate compared to the EVO-type substrates as evidenced by the TS data and is proposed for use as a carbon source during remedial action for LHAAP-58 groundwater, as needed.

Upcoming Fieldwork, Meetings, and Documents

1. Surveying of wells and DPT locations and IDW mgmt at LHAAP-18/24, 46, and 67.
2. Well installation and Direct Push Technology at LHAAP-37, 50, 58.
3. Excavation at LHAAP-50
4. EISB at LHAAP-58

Back-up Slides

AECOM Longhorn Project Organization Chart



Project Manager
Dave Wacker

Deputy Project Manager
Gretchen McDonnell

Safety Manager
Dan Schillings

Quality Manager
Rod Croslen

Project Assistant/ Document Control
JoLynn Snow

Project Administrator
Katie Crooks

Task / Site

GWTP
Marwan Salameh
Long Term Planning
Don Coulombe
Repairs and Maintenance

03, 16
Harvinder Singh
Harry Van Den Berg

17, 29
Scarlett Zhai
Harry Van Den Berg

50,58
Eva Moore
Amol Keskar

04, 37, 46, 47, 67
Amol Keskar

18/24
Marwan Salameh

001-R-01, 003-R-01, 12
Josh Miller

Subcontractors

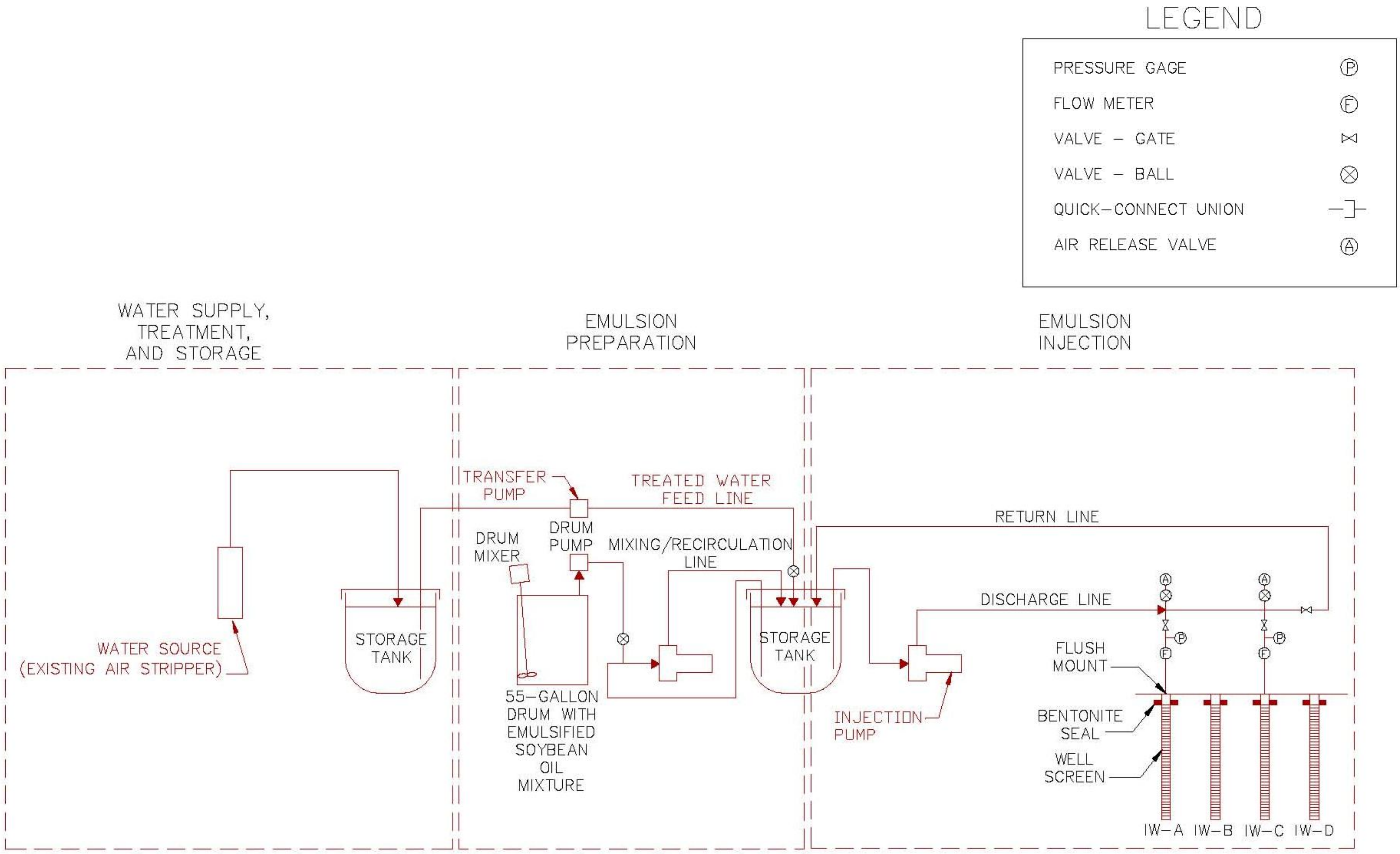
GWTP and O&M
World Environmental (SDVSB)
Scott Beesinger
Ray Wagner
Jimmy Davis

Sampling Support
Eagle Environmental (SB)

Drilling
ETTL
Fugro

Lab
Microbac

In-situ Bioremediation



Groundwater Treatment Plant - Treated Groundwater Volumes

The amount of groundwater treated is determined by measuring the number of gallons of treated water returned to LHAAP-18/24, released to the INF Pond, or discharged to Harrison Bayou. The Army is currently completing a study to confirm flow numbers and material balance for the Groundwater Treatment Plant. This sheet will be updated with any new findings.

Treated Water Data

(in gallons)

Oct-07	Nov-07	Dec-07	Jan-08	Feb-08	Mar-08	Apr-08	May-08	Jun-08	Jul-08	Aug-08	Sep-08
1,041,491	848,356	804,822	792,148	665,883	818,872	791,306	568,812	776,904	748,377	690,052	617,199

Oct-08	Nov-08	Dec-08	Jan-09	Feb-09	Mar-09	Apr-09	May-09	Jun-09	Jul-09	Aug-09	Sep-09
655,059	619,274	726,118	552,299	598,144	433,800	488,807	526,958	387,644	0	414,853	735,716

Oct-09	Nov-09	Dec-09	Jan-10	Feb-10	Mar-10	Apr-10	May-10	Jun-10	Jul-10	Aug-10	Sep-10
808,322	636,306	727,492	391,898	695,343	802,656	894,731	962,121	1,257,977	1,314,924	1,041,495	1,136,547

Oct-10	Nov-10	Dec-10	Jan-11	Feb-11	Mar-11	Apr-11	May-11	Jun-11	Jul-11	Aug-11	Sep-11
956,567	705,805	849,712	811,679	668,281	1,090,348	817,325	900,338	916,552	784,369	652,524	733,456

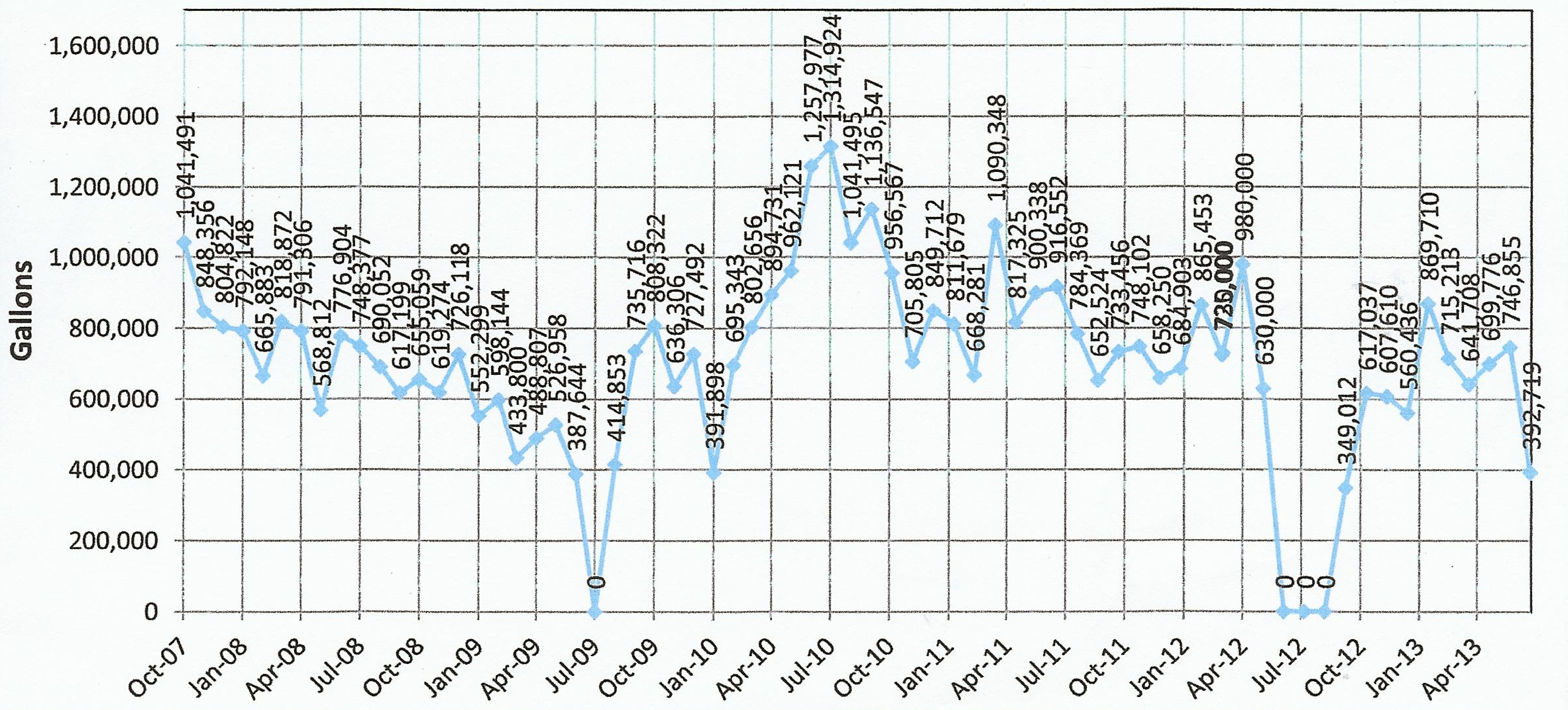
Oct-11	Nov-11	Dec-11	Jan-12	Feb-12	Mar-12	Apr-12	May-12	Jun-12	Jul-12	Aug-12	Sep-12
748,102	658,250	684,903	865,453	725,000*	730,000*	980,000*	630,000*	0	0	0	349,012

Oct-12	Nov-12	Dec-12	Jan-13	Feb-13	Mar-13	Apr-13	May-13	Jun-13
617,037	607,610	560,436	869,710	751,213	641,708	699,776	746,885	392,719

* Indicates estimate

Figure ES-3

Water Treated Monthly from October 2007 through March 2013



DEPARTMENT OF DEFENSE
UNITED STATES OF AMERICA

DEPARTMENT OF THE ARMY
OFFICE OF THE ASSISTANT SECRETARY OF THE ARMY
INSTALLATIONS, ENERGY AND ENVIRONMENT
110 ARMY PENTAGON
WASHINGTON DC 20310-0110

MAR 18 2014

The Honorable Gina McCarthy
Administrator
US Environmental Protection Agency
William Jefferson Clinton Building North (WJC North)
Mail Code: 4101M
1200 Pennsylvania Avenue N.W.
Washington, DC 20004

Dear Ms. McCarthy:

This concerns the Longhorn Army Ammunition Plant (LHAAP) in Texas, and the dispute resolution process under way regarding certain issues that have been elevated for consideration under the Federal Facilities Agreement between our three agencies. The Assistant Secretary of the Army for Installations, Energy and Environment, the Honorable Katherine Hammack, is scheduled to meet with you and discuss these issues on March 25, 2014, at 3:30 p.m.

Enclosed please find a binder that includes the Army's statement of position on the matters in dispute, a set of maps and photographs of the LHAAP location, sites, and surrounding area, and supporting documents for the Army's position paper. We are eager to meet with you to try to reach an agreement to resolve these matters and allow the remedies at the LHAAP to be completed.

Sincerely,

for Aaron J. [illegible], COL, USA
Hershell E. Wolfe
Deputy Assistant Secretary of the Army
(Environment, Safety and Occupational Health)

Enclosure

cc:
Richard A. Hyde, P.E., Executive Director, Texas Commission on Environmental Quality

DEPARTMENT OF DEFENSE
UNITED STATES OF AMERICA

DEPARTMENT OF THE ARMY
OFFICE OF THE ASSISTANT SECRETARY OF THE ARMY
INSTALLATIONS, ENERGY AND ENVIRONMENT
110 ARMY PENTAGON
WASHINGTON DC 20310-0110

MAR 18 2014

Richard A. Hyde, P.E.
Executive Director
Texas Commission on Environmental Quality
MC 109
12100 Park 35 Circle
Austin, TX 78753

Dear Mr. Hyde:

This concerns the Longhorn Army Ammunition Plant (LHAAP) in Texas, and the dispute resolution process under way regarding certain issues that have been elevated for consideration under the Federal Facilities Agreement between our three agencies. The Assistant Secretary of the Army for Installations, Energy and Environment, the Honorable Katherine Hammack, is scheduled to meet with you and discuss these issues on March 25, 2014, at 3:30 p.m.

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Sincerely,

for Aaron J. Silver, COL, USA
Hershell E. Wolfe
Deputy Assistant Secretary of the Army
(Environment, Safety and Occupational Health)

Enclosure

cc:
The Honorable Gina McCarthy, Administrator, US Environmental Protection Agency

ARMY POSITION PAPER

LONGHORN AAP

ISSUES IN DISPUTE UNDER FFA

ARMY POSITION PAPER MARCH 2014

INTRODUCTION

This dispute under the Longhorn Army Ammunition Plant (LHAAP) Federal Facilities Agreement (FFA) is perplexing to the Army. The Army, EPA Region 6, and TCEQ had an agreed path for final remedies consistent with the Comprehensive Environmental Response, Compensation and Liability Act, 42 U.S.C. 9601 et seq. (CERCLA) at LHAAP Sites 16, 17, and the Munitions and Explosives of Concern (MEC) sites 001-R-01 and 003-R-01, established by the agencies in the period from 1999 to the mid-2000s. The Army carried out removal and interim remedial actions (IRAs) or pre-remedy studies at these sites with a common understanding of the planned final remedies to be established in three final Records of Decision (RODs). EPA Region 6 and TCEQ agreed with the Army's Remedial Investigations (RIs), Feasibility Studies (FSs), Removal Actions, Proposed Plans (PPs) with public comment and agency responses, and the wording of draft RODs for these sites (*see*, attached documents). However, late comments from EPA HQ demanded changes in these three RODs for the four sites (*see*, attached schedule for ROD comments). These comments sought no changes to any basic component of the remedial actions, but only to language in the RODs. When the Army objected to some of these late comments, EPA sought to use the stipulated penalties provision of the FFA to force adoption of their comments, rather than allowing senior officials of the three agencies to seek agreement under the FFA dispute resolution. The remaining disputed issues arising from the EPA HQ comments and those raised later during the dispute resolution process should be resolved by returning the agencies to the long agreed plan for remediation of these sites at LHAAP.

EPA DISPUTED ISSUE 1: PERCHLORATE, NICKEL AND MANGANESE REMEDIATION GOALS (RG) FOR LHAAP 16 AND 17 RODS.

SUMMARY

EPA HQ: Use the Texas Risk Reduction Program residential (TRRP) standards for groundwater remediation of perchlorate, nickel and manganese, based on the NCP goal for groundwater beneficial reuse.

ARMY: (1) Use the Texas Risk Reduction Rule (TRRR) nonresidential standard for remediation of perchlorate in groundwater as an agreed State ARAR because the future use of the property will only be for wildlife conservation, and all three agencies accepted this in writing for LHAAP Sites 16 and 17. Indeed, EPA insisted on it just a few weeks before initiating this dispute. (2) CERCLA and the National Oil and Hazardous Substances Pollution Contingency Plan, 40 CFR Part 300 (NCP) require use of the non-residential ("industrial") TRRR as an Applicable or Relevant and Appropriate Requirement (ARAR) consistent with its application to other non-federal entities.

DISCUSSION

(1) Use the Texas Risk Reduction Rule (TRRR) nonresidential standard for remediation of perchlorate in groundwater as an agreed State ARAR because the future use of the property will only be for wildlife conservation, and all three agencies accepted this in writing for LHAAP Sites 16 and 17. Indeed, EPA insisted on it just a few weeks before initiating this dispute.

In 2000, the Army, EPA Region 6, and TCEQ agreed to the use of the Texas Risk Reduction Rule's (TRRR) standard for perchlorate in groundwater as an Applicable or Relevant and Appropriate Requirement (ARAR) establishing the Remediation Goal (RG) for the groundwater at all of Longhorn.[1] (See supporting documents.) Even though the Texas Risk Reduction Program (TRRP) was promulgated on September 17, 1999, all parties recognized the TRRR as the appropriate ARAR pursuant to a "grandfather" provision available to all owners of contaminated property if their Remedial Investigation was complete on or before May 1, 2001. (See supporting documents.) This is the case for all of the sites at issue in this dispute.

The TRRR sets out two groundwater standards: *industrial* (i.e. non-residential) and *residential*. (See supporting documents.) Both standards adopt the federal Maximum Contaminant Level (MCL) for drinking water where the federal government has promulgated an MCL. Where no federal MCL is promulgated, state-specific standards are adopted. Generally, the TRRR industrial standard is set at approximately three times the residential level. The industrial groundwater standard (GW-Ind) for perchlorate is 72 ppb. The residential perchlorate groundwater standard (GW-Res) is 26 ppb.

The parties agreed to use the TRRR *industrial* groundwater standard because of the property's non-residential use as a Federally-owned wildlife refuge – a use that will continue into the foreseeable future. *Industrial* is the appropriate classification of this property under the TRRR. These two agreements, to use the TRRR and the industrial use classification, were relied upon by the Army, EPA Region 6, and TCEQ throughout the entire CERCLA process, including the Remedial Goals used in the RODs involved in this dispute. EPA even submitted comments to the Army on August 17, 2011 directing the Army to use the TRRR *industrial* standard for groundwater. (See supporting documents.) Comment 12 stated

> Delete the second paragraph of this Section and modify/replace with, "As it concerns the contaminated groundwater at LHAAP-16, a SDWA MCL has been identified for each COC with the exception of perchlorate, manganese and nickel. For those COCs and by-product (i.e., daughter) contaminants that have an MCL, the MCL constitutes the groundwater cleanup level to be attained. If no MCL exists for a COC or by-product contaminant found in the contaminated groundwater, the MSCs for GW-Ind as authorized under 30 TAC 335.559(d), constitutes the groundwater cleanup standard to be attained."

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[1] The TRRR residential standard for perchlorate was agreed by the three agencies to be used in a few specific wells adjacent to a surface water stream that flows into Caddo Lake, a drinking water source for residents in the area. This use is consistent with the 30 TAC 335.559(b) requirement to use the TRRR GW-Res standard as a surface water remediation standard for constituents with no ambient surface water quality criteria or federal MCL. The Draft Final RODs include the GW-Res as an ARAR for surface water. The three agencies agreed that all other areas of groundwater would be subject to the TRRR industrial standards for the CoCs.

EPA comments 20, 24, 31, 32, 33, and 34 provided similar concurrences. Chapter 335 of 30 TAC is the Texas Risk Reduction Rule (TRRR). The Texas Risk Reduction Program is promulgated under Chapter 350 of 30 TAC.

EPA Region 6 continued to recognize the TRRR as the appropriate ARAR even after submittal of the Draft Final RODs. In Comment 14 of its October 13, 2011 letter from the EPA RPM to the Army PM (see supporting documents), the same day that EPA assessed its stipulated penalties, EPA Region 6 commented upon, but left undisturbed, text that required "a map showing the areas of groundwater restriction at the site, *in accordance with 30 TAC 335.565*." (Emphasis added.) 30 TAC Chapter 335 is the TRRR.

Despite over a decade of agreement and EPA's clear direction that the Army use the TRRR *industrial* groundwater standard in these RODs, EPA's October 2011 Written Statement of Dispute cites Army's failure to incorporate the TRRR *residential* groundwater standard as a violation of CERCLA, the NCP, and the Longhorn AAP Federal Facility Agreement. Although EPA assessed its stipulated penalty based in part on Army's failure to use the TRRR residential standard, EPA would choose a different standard before finally choosing yet another standard in the Administrator's decision issued April 5, 2013.

Only six weeks after issuing its Written Statement of Dispute, during a December 7, 2011 meeting of the formal Dispute Resolution Committee (DRC), EPA revised its position for the second time by choosing EPA's non-promulgated Health Advisory Levels as the ARARs for perchlorate, manganese, and nickel. At this meeting, EPA Region 6 stated that its choice was directed by EPA HQ. Finally, in the Regional Administrator's decision rendered April 5, 2013, EPA changed its position for a third time, asserting the TRRP residential groundwater cleanup standard is the appropriate ARAR, although even this choice carries the caveat that it may again need to be changed if EPA promulgates an MCL for perchlorate.

EPA is apparently asserting that the Army's failure to use one or more of the various standards chosen by EPA during the course of this dispute allegedly resulted in the submittal of "draft final RODs [that] do not comply with CERCLA, the NCP, and EPA guidance, as required by the FFA" and that this was, according to the EPA, "the basis for this assessment of stipulated penalties." Samuel Coleman to COL Clarence D. Turner, "Notice of Violations and Stipulated Penalties Assessment" (Oct 13, 2011).

It is particularly troublesome that a standard that was agreed upon by all parties for over a decade, was presented to the public by all three agencies as the governing RG for these remedial actions, and that was incorporated in the RODs consistent with EPA's direction no more than 45-days prior to their submittal, is now a basis for the EPA assessment of stipulated penalties.

In the long-term, the EPA position on this issue also threatens the timely, orderly, and fiscally responsible conduct of the remedial program at Longhorn if, as will be discussed in part *(2)* below, long-held standards can be changed by EPA's policy choices. EPA's latest comments on two Draft RODs at Longhorn (Sites 4 and 47) clearly demonstrate EPA's intent to force a residential TRRP standard for all environmental media on all of Longhorn, including completed sites. This will require Army to re-evaluate all past actions and potentially redo much of the work already completed. This has the potential to work a particular hardship upon the Longhorn remedial program, where approximately 60% of the work is completed, all remedial investigations and all but one of the feasibility studies are completed, all but one of the Proposed Plans are completed and concurred in by EPA, and all but one ROD is either final or has been submitted to EPA in draft form. As discussed further below, EPA seeks to require all of this not because of unacceptable risk, but because of the imposition of a single EPA HQ policy expectation notwithstanding years of site specific agreements on the RGs. The Army objects to these EPA demanded changes in the Longhorn remedial program without a demonstrated need to eliminate unacceptable risk or achieve protectiveness.

(2) CERCLA and the NCP require use of the non-residential ("industrial") Texas Risk Reduction Rule (TRRR) as an Applicable or Relevant and Appropriate Requirement (ARAR) consistent with its application to other non-federal entities.

Because there is no federally promulgated standard for remediation of the contaminants of concern (CoCs) relevant to this issue, the Texas statutes and regulations are the ARARs for the groundwater cleanup goals. As discussed in part *(1)*, in 1999 and at later times, the Army, EPA Region 6, and TCEQ agreed in written communications to use the TRRR industrial groundwater standard for perchlorate as the RG at Longhorn AAP. As discussed above, EPA's varying ARAR choices for perchlorate during the course of the dispute occurred as follows:

• August 17, 2011	EPA comments call for the Army to use the **72 ppb** perchlorate *TRRR industrial* groundwater standard;
• October 27, 2011	EPA disputes the Army's use of the *TRRR industrial* standard and directs use of the **26 ppb** perchlorate *TRRR residential standard;*
• December 7, 2011	EPA informs the Army that ***EPA HQ*** directs use of the unpromulgated **15 ppb** perchlorate *Health Advisory Level* (see supporting documents) and EPA uses this level for all subsequent dispute discussions at the DRC level; and,
• April 5, 2013	EPA Region 6 Administrator issues decision that directs use of the **17 ppb** perchlorate *TRRP residential* standard.[2]

Similar inconsistent positions were taken by EPA regarding RGs for manganese, zinc, and nickel over the course of this dispute.

The Health Advisory Levels advocated at the December 7 meeting as the required RGs for these RODs continued to be advocated by EPA over the next year-and-a-half throughout much of the DRC discussions and the entirety of the Senior Executive Committee (SEC) dispute resolution discussions before being abandoned, without any prior notice to Army, in the Region 6 Administrator's decision. This occurred notwithstanding that the EPA guidance states that it is

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[2] The TRRP residential standard for perchlorate has been 17 ppb since 2007, contrary to the implication in the Regional Administrator's April 5 decision that it was either new or updated in 2012. If EPA believed that the TRRP residential standard of 17 ppb was appropriate for use at Longhorn, it could have raised the issue at that time when a significant portion of the Proposed Pans and RODs remained to be drafted and approved. As discussed above, EPA comments called for the use of the TRRR GW-Ind standard in 2007 and for the following years until this dispute, and recognized the proper use of the TRRR as late as the very same day EPA issued its Notice of Violations and Stipulated Penalties Assessment.

not for use at sites where this is an ARAR. During the year-and-a-half-long discussion between Army and EPA, Army argued that EPA guidance on states that the Health Advisory Level should be considered only if there is no state ARAR for a remedial action, and that it is not a binding regulatory requirement. *See*, U.S. EPA, "Interim Drinking Water Health Advisory for Perchlorate," Office of Water, Jan. 8, 2009, at pg. 1.

However, at no time during this lengthy dispute resolution process did EPA discuss with the Army and allow the Army an opportunity to respond regarding the purported ARAR that was ultimately and incorrectly chosen by the Region 6 Administrator. As is discussed below, the Army believes that the Region 6 Administrator's decision is not based on a State ARAR that is consistently applied to other parties in similar circumstances, but rather on an EPA policy choice to restore the groundwater resource to a specific beneficial use.

CERCLA and the NCP require that the "degree of cleanup" for a remedial action be based on ARARs if they are available, as they are assumed by law to represent risk-based protective standards. *See* CERCLA Section 121(d)(2). Federal ARARs are defined in CERCLA as substantive standards, requirements, criteria, or limitations under Federal environmental laws regarding residual hazardous substances, pollutants or contaminants. The NCP extends this to substantive standards in promulgated regulations issued under those laws. CERCLA Section 121(d)(2)(A)(i), and NCP Section 300.5. ARARs also include State environmental or facility siting laws and promulgated regulations that establish standards, requirements, criteria or limitations for hazardous substances, pollutants of contaminants that will remain after the remedy is complete. CERCLA Section 121(d)(2)(A)(ii), and NCP Section 300.5.

The use of more stringent promulgated State ARARs as remedial cleanup standards is mandatory when the State has indentified and justified them in a timely manner during the course of the remedial investigation (RI) and feasibility study (FS). CERCLA Section 121(d)(2)(A)(ii), and NCP Section 300.5.

With respect to perchlorate, manganese, and nickel, EPA has not promulgated MCLs for these chemicals to guide groundwater responses, whereas the State of Texas has promulgated four different standards for each chemical. While certain of these State standards are "more stringent" than others, all of the State standards are more stringent since there are no federal MCLs for these chemicals.

The Texas Administrative Code (TAC) identifies two promulgated rules establishing groundwater standards for perchlorate, manganese, and nickel. The TRRR was promulgated in 1993 at 30 TAC Chapter 335 and the TRRP was promulgated in 1999 at 30 TAC Chapter 350. Between 1993 and 1999, the TRRR was the ARAR used to establish the RGs where there was no federal ARAR or a less stringent federal ARAR. When the TRRP was promulgated in 1999, the parties considered which standard, the TRRR or TRRP, should apply as the State ARAR. The TRRR provided that any person who had initiated a response prior to the effective date of May 1, 2001 and who met certain enumerated criteria would qualify to continue that response under the TRRR. 30 TAC 350.2(m). This opportunity to continue under the TRRR was available to all qualifying persons. The Administrative Record establishes that the Longhorn facility was and remains a qualifying person, and the TCEQ accepted this in writing.

CERCLA ***requires*** that,

> all guidelines, rules, regulations, and criteria which are … applicable to remedial actions at such facilities shall also be applicable to facilities which are owned or operated by a department, agency, or instrumentality of the United States in the same manner and to the same extent as such guidelines, rules regulations, and criteria are applicable to other facilities.

CERCLA Section 120 (a)(2). These statutory conditions form the elements of the waiver of United States sovereign immunity. If these elements are not in all respects satisfied, then the guideline, rule, regulation, or criteria is not legally applicable to a Federal agency.

With respect to State standards, CERCLA makes clear that State laws are not required to be designated as ARARs if "with respect to a State standard, requirement, criteria, or limitation, the State has not consistently applied (or demonstrated the intention to consistently apply) the standard, requirement, criteria, or limitation in similar circumstances at other remedial actions within the State." CERCLA Section 121 (d)(4)(E).

These two provisions of CERCLA dictate that the TRRR continue to be the ARAR for perchlorate, manganese, and nickel in groundwater at LHAAP Sites 16 and 17, as evaluated and proposed in the mutually agreed upon FS and PP for these sites.

- The Longhorn facility is a qualifying person under 30 TAC 350.2(m)(2) eligible to continue its remedial actions under the existing TRRR, and TCEQ applies it to all remedial actions for which the RI was completed by 1 May 2001. *See*, attached regulation. CERCLA dictates that the state rule ***shall*** apply to the Longhorn facility in the same manner that it applies to all other similarly situated facilities in Texas. The TRRR applies to similarly situated qualifying facilities in Texas. CERCLA therefore ***requires*** that the TRRR shall apply to response actions at the Longhorn facility consistent with its application at other remedial action sites in Texas.

- If the TRRP were applied to the Longhorn facility, then the standards would not be consistently applied to the Federal facility as to other similarly situated facilities. CERCLA exempts from those potential State ARARs a standard that is not applied consistently with a standard applicable to facilities not owned or operated by the federal government. On the other hand, CERCLA ***requires*** the designation of a State standard as an ARAR if it is consistently applied to other similarly situated remedial action sites and if it was timely identified by the State. The TRRR was timely identified by TCEQ as an ARAR for LHAAP Sites 16 and 17 and thus it is the ***required*** ARAR for these RODs.

The State of Texas identified the TRRR non-residential standards as the ARAR for groundwater remediation at sites 16 and 17. The Army and EPA agreed with this and incorporated these standards into the FS for evaluation of alternatives under the CERCLA and NCP remedy selection criteria, discussed these ARARs before the public in the PP that evaluated the alternatives against these standards as the RGs for the remedy, and discussed these ARARs with the regulatory agencies and the Restoration Advisory Board (RAB) for LHAAP during the development of the draft RODs for the final remedy for sites 16 and 17. Throughout the course of the development and review of the draft RODs under the Consultation provisions of the FFA, all parties agreed to groundwater RGs based on the TRRR non-residential standards, and the two regulatory agencies indicated their agreement in their review of and comment on the draft RODs.

Pursuant to the enforceable schedule developed under the FFA, the Army was required to submit the draft final RODs not later than 30 September 2011. The Army prepared the RODs consistent with the decade-long agreement on groundwater RGs, consistent with the representations made to the public in the PP, and consistent with EPA's August 2011 comments on the Draft Final RODs. (See supporting documents.) It is Army's position that the Region 6 Administrator's choice of the TRRP residential standards as the ARARs for perchlorate, manganese, and nickel in groundwater is contrary to law because CERCLA requires that the TRRR apply to response actions at the Longhorn facility.

Only after the Draft Final RODs were reviewed at HQ EPA did an issue arise regarding the RGs for groundwater. (See timeline and late comments in supporting documents.) This is such a significant change to the scope of the proposed remedy that it will substantially affect the length of time necessary to achieve the RGs, will increase the cost of the remedy because of the associated demands made by EPA under issue 2, and may require that a new PP be presented to the public under the public comment requirements of the NCP. *See* 40 CFR part 300.430 (f)(3)(ii)(B).

EPA does not base its demand to change the groundwater RG for sites 16 and 17 on an analysis of the appropriate ARAR for these sites as required by CERCLA and the NCP. Rather EPA relies on its policy to generally consider restoration of "usable ground waters to their beneficial uses wherever practicable," even though this is not a requirement of CERCLA or the NCP. NCP Section 300.430(a)(1)(iii)(F). CERCLA and the NCP both require that remedies achieve "protectiveness" by taking actions that are necessary to reduce risk to humans and the environment from exposure to hazardous substances, pollutants or contaminants. *See* CERCLA Section 104 (a)(1) and NCP 300.430(a)(1). This EPA policy choice is supported only by an "expectation" that the remedial alternative development process include alternatives that seek to restore environmental resources to their beneficial uses in the following terms.

> (iii) *Expectations.* EPA generally shall consider the following expectations in developing appropriate remedial alternatives:
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> . . .
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> (F) EPA expects to return usable ground waters to their beneficial uses wherever practicable, within a timeframe that is reasonable given the particular circumstances of the site. When restoration of ground water to beneficial uses is not practicable, EPA expects to prevent further migration of the plume, prevent exposure to the contaminated ground water, and evaluate further risk reduction.

NCP 300.430(a)(1)(iii) and (iii)(F). In this same subparagraph (iii), EPA states it will also consider the following additional expectations when developing alternatives for consideration: treatment, engineering controls, combinations of methods, institutional controls, and use of innovative technology. There is nothing remarkable distinguishing the restoration to beneficial uses from the rest. It is merely one of six. It is not a requirement and, in fact, it is never again mentioned in NCP Section 300.430 or elsewhere in these regulations.

CERCLA instead requires and the NCP establishes as its Program Goal that remedies achieve "protectiveness" by taking actions that are necessary to reduce risk to humans and the environment from exposure to hazardous substances, pollutants of contaminants. *See* CERCLA Section 104 (a)(1) and NCP 300.430(a)(1). The statute and the NCP provisions on RGs ***require*** that the "degree of cleanup" be based on ARARs whenever they are available. CERCLA Section 121(d)(2)(A) and NCP 300.430(e)(2)(i)(A).

EPA's expectation that the lead agency consider these six factors in developing remedial alternatives, a process that occurs in the FS phase, cannot change the requirement that the selected remedy achieve the standard of protectiveness or the "degree of cleanup" that is established under the law. In other words, there is no requirement under CERCLA or the NCP to satisfy a "degree of cleanup" exceeding the ARARs established in accordance with statute and regulation. To decide otherwise makes CERCLA's remedy selection requirements of protecting human health and the environment in a cost-effective and timely manner subservient to an EPA expectation for natural resource damage restoration through the specific performance of remedy implementation. At these sites, EPA preferences for use restrictions have also led to LUCs that will eliminate other beneficial uses of the groundwater at LHAAP for the foreseeable future.

The groundwater remedies proposed by Army in the Site 16 and Site 17 RODs achieve the CERCLA requirement and NCP Program Goal of protecting human health and the environment by controlling human exposure to unacceptable levels of COCs in groundwater and by preventing further migration of and reducing the groundwater contaminant plume by the active treatment processes that are components of the groundwater remedial actions. The impact to the LHAAP project of accepting the EPA HQ new demands for use of the TRRP residential criteria will increase the annual costs of these remedies and the length of time required to complete these remedies. Based on recent comments from EPA submitted on other LHAAP documents, including those with fully signed RODs and remedies in place, EPA will be seeking to reopen many of these RODs and remedies, asking for additional soil remediation to meet residential standards and likely adding new COCs that are currently below the TRRR industrial screening levels. If successfully imposed, these demands will require the Army to go back to the RI stage at many LHAAP sites and will exponentially increase the cost of the remedies, notwithstanding the fact that there is no reasonably anticipated residential land use at LHAAP. These demands would also delay by many years the Army's transfer of the remaining real property at LHAAP to the FWS without any basis in eliminating unacceptable risk to human health or the environment.

The Army reviewed cost data for the LHAAP sites that would be reopened if EPA's demands are accepted on this disputed issue, and on Issue 2. The cost to reopen sites and apply the TRRP residential levels in soils and groundwater, requiring a new RI phase to characterize to lower standards, are in the range of $135,000 to $195,000 per site. The cost to implement remedial actions, including excavation, additional groundwater treatment and long-term monitoring to meet the residential TRRP standards is estimated to range from $327,000 to $14,000,000 per site. With at least 37 sites impacted and additional operation and maintenance of existing systems, the total additional estimated time to achieve these new standards is 100 to 150 years, and the additional cost to the Army would be $136,000,000 to $197,000,000. Such a burden on the Army and the taxpayer, unrelated to reasonably anticipated land use or risk, is patently unreasonable.

The draft final RODs presented by the Army to the regulators under the Consultation process of the FFA include the ARARs that the three agencies agreed upon years earlier during the RI, had relied upon during the FS to evaluate remedial alternatives, presented to the public in the PP, and in which EPA had concurred by comment while finalizing the RODs for sites 16 and 17. EPA HQ now seeks to compel the change of the RGs to levels that are not based on an ARARs analysis under CERCLA and the NCP, but rather are based on an after-the-fact justification for the use of criteria other than ARARs, so late in fact that they did not come up with this demand until the final decision of the Regional Administrator of Region 6. This demand is not based on the remedy selection criteria in the law or promulgated regulations, and does not represent a requirement that is enforceable upon the Army. For these reasons, the EPA Administrator should accept the ARARs and RGs proposed by the Army in the draft final RODs for sites 16 and 17, thereby allowing the Army to finalize these RODs and put these final remedies in place. This will allow the Army to proceed with the transfer of these properties to the FWS and facilitate the permanent establishment of the wildlife conservation area, thereby allowing for the beneficial use of all the environmental resources on the property.

EPA DISPUTED ISSUE 2: LUCs FOR MAINTENANCE OF GROUNDWATER MONITORING SYSTEM

SUMMARY

EPA HQ: The ROD must have maintenance of the groundwater monitoring system as a LUC.

ARMY: Protection and maintenance of the groundwater monitoring system is an element of the remedy, but is not a LUC as that term is used in guidance from DoD or an IC in EPA guidance, nor does EPA require this of other parties for RODs at non-DoD NPL sites. Army has provided for maintenance of all remedy components, including groundwater monitoring systems as part of the O&M phase, and this is the normal practice across the nation.

DISCUSSION

EPA HQ first submitted comments on the draft final ROD for Site 17 in August 2011, seeking to define the maintenance of the groundwater monitoring system as a Land Use Control (LUC). (See supporting documents.) The remedies for sites 16 and 17 have always included monitoring as an element of the remedy to demonstrate plume containment and natural attenuation/degradation of contaminant levels in the groundwater under these sites. These plumes are contained well within the boundary of the Federal real property and are not expected to migrate outside of Federal property areas that will be used for wildlife conservation purposes.

There is no residential use of the property, nor is such use reasonably foreseeable in the future, and there is no drinking water use of the groundwater or any reasonably foreseeable drinking water use of the groundwater. The only unacceptable exposure risk associated with perchlorate in this groundwater is in a hypothetical drinking water use scenario, which is highly unlikely due to the shallow nature of the contaminated groundwater at issue and the use restrictions that were already included in these remedial actions. The Refuge does not use any shallow groundwater and they are in the process of connecting to the nearby Karnak municipal water supply system The uncontaminated deeper groundwater could have some use for the United States and the pubic for other purposes that carry no unacceptable risk, such as for fire protection for FWS structures and personnel and for the flora and fauna on the property in the event of a wildfire, for protection of the native species on the property in the event of a severe drought, for dust control, equipment washing, or other non-drinking purposes.

EPA insists that all the groundwater may only be used for monitoring and testing for purposes of remedy implementation. The Army agreed to EPA's position, and agreed to monitor the groundwater until it achieves the ARARs, the Texas non-residential TRRR standard for perchlorate. As is normal for groundwater monitoring remedies, the Army has always intended that the groundwater monitoring system will be maintained in usable condition. The Remedial Design will include the details of the monitoring system and maintenance of the monitoring system will be included in the Operation and Maintenance (O&M) Plan.[3] This has been normal remedy implementation practice for groundwater monitoring systems for many years and is consistent with EPA practice on Superfund lead sites and on NPL sites where entities other than DoD are implementing groundwater monitoring.

The final remedies for sites 16 and 17 include the Land Use Controls agreed to by the three agencies in the FS, presented to the public in the PP, and agreed among the agencies in review of the draft ROD. (See supporting documents.) LUC is a term that originated with the Department of Defense in the late 1990's, while EPA documents usually refer to the more narrow term "institutional controls." In DoD issuances, a LUC may include a physical control, an administrative control, or a legal control which prevents exposure to contaminants at levels that create an unacceptable risk. *See* DoD Guidance on Land Use Control Agreement with Environmental Regulatory Agencies, March 2, 2001, and DoD Manual 4715.20, Defense Environmental Restoration Program (DERP) Management, March 9, 2012, Glossary. EPA defines an institutional control as only the administrative or legal controls that prevent unacceptable exposure. *See* EPA OSWER 9355.0-74FS-P, Institutional Controls: A Site Manager's Guide to Identifying, Evaluating and Selecting Institutional Controls at Superfund and RCRA Corrective Action Cleanups, Sep. 2000. The NCP states that program expectations for remedies include the following, "EPA expects to use institutional controls such as water use and deed restrictions to supplement engineering controls as appropriate for short- and long-term management to prevent or limit exposure to hazardous substances, pollutants, or contaminants." NCP 300.430(a)(2)(iii)(D). The NCP clearly refers to the use of administrative or legal mechanisms that prevent exposure by prohibiting activities that would allow direct contact with contaminants at unacceptable levels. The NCP also discusses different O&M measures as part of the remedy implementation phase, which should be addressed in the RD and implemented after a remedy is in place. It particularly addresses O&M for groundwater contamination, since an extended period of remedy implementation is often inherent in such remedies. NCP 300.435(f)(1). The NCP term is defined as "*Operation and maintenance* (O&M) means measures required to maintain the effectiveness of response actions." NCP 300.5. The NCP

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[3] There is an operating groundwater treatment system for Site 16 that has been in place since 1997, and maintenance has been regularly provided by the Army for this system. Maintenance of the monitoring system will be included in the final remedy O&M plan. In addition, other sites at LHAAP that are in the remedial action operation phase do have O&M plans, some of which include groundwater monitoring systems. The RODs for these remedies did not designate maintenance of these systems as a LUC, however maintenance is considered by all parties as a requirement of the O&M phase. The Army has been conducting this maintenance without issue for several years. These O&M plans are available upon request. (Examples are included in the supporting documents.)

unequivocally considers O&M to be a phase of remedy implementation after a remedial action is in place and operational, and not as a separate element of a remedy.

The Army has always intended that maintenance of the groundwater monitoring system would be needed. As part of their design, permanent wells are protected by engineered, highly visible structures and their locations are required to be recorded in the state's well database. Nonetheless, wellheads may be damaged by natural events such as a tornado, or by human action such as hunting or vehicular traffic. Excess iron may clog or corrode well screens requiring well replacement. If the water level drops in a drought below the level of the well screen, a well may have to be plugged and abandoned and a new well installed to a lower depth or moved to a more appropriate nearby location.[4] Even if there were a drinking water use of the groundwater at the Refuge, none of these activities would create unacceptable human or environmental exposure to groundwater, result in a remedy failure, or create a change to the remedy component of groundwater monitoring. This is because the integrity of the remedy is not affected by the integrity of the well, but by the integrity of the groundwater sample that is collected from the well. As part of the groundwater sampling protocol, wells are inspected and assessed prior to sample collection. If the well is damaged or not functioning as designed, it will be repaired or restored to a satisfactory state prior to sampling. That is a function of the groundwater sampling protocol which is also clearly not a LUC.

Many EPA RODs do not even mention maintenance of a groundwater monitoring or treatment system, let along require it as a component of a remedy. We can find no example of an EPA lead ROD for a groundwater remedy that places maintenance of a groundwater monitoring system as a component of a remedy, and none which considers it part of the institutional controls or LUCs for a remedy.

Two EPA Region 6 RODs are relevant to this issue. At the North Cavalcade Street Superfund Site in Houston, Harris County, Texas, a site with two groundwater zones that are contaminated, in an active industrial area that is bounded in part by residential use and has offsite areas of groundwater contamination, EPA issued a PP for a ROD Amendment in July 2011, shortly before this dispute was initiated. (See supporting documents.) This remedy provides a "technical impracticability" (TI) waiver that eliminates the requirement that the contaminated groundwater ever achieve the RGs at this site, provides for containment of the contaminant plumes through "natural processes" and monitoring of the plumes to verify containment. The institutional controls for this remedy involve preventing the installation of only new water supply wells in the contaminated groundwater. *See* ROD Amendment, page 8. No mention is made of maintenance of the monitoring system, or of institutional controls that would protect or maintain the monitoring system. Since the remedy includes monitoring, the parties implementing the remedy will need to maintain the monitoring system, provide repairs in the event of damage, and over time may need to make changes to the monitoring system equipment as subsurface conditions vary.

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[4] These scenarios have already occurred at LHAAP because groundwater levels have dropped during the severe drought conditions in Texas over the past few years. Well repairs and replacement at sites with RODs, as well as those still in the pre-ROD phases, have been conducted without any designation of maintenance in the ROD as a LUC, or even a request from EPA for such a designation until the Sites 16 and 17 draft final RODs.

A second example is the ROD for the Molycorp, Inc. site in Questa, New Mexico, issued in December 2010. (See supporting documents.) This is a mine site where mine waste has caused soil and groundwater contamination, and is located in an area near a residential community. Groundwater at the site is used for worker drinking water, as well as mine operations. The groundwater remedy involves maintaining low underground mine water levels and treatment of groundwater to meet RGs based on ARARs or site specific risk-based levels for contaminants with no ARARs. The remedy includes institutional controls to temporarily prohibit issuance of only new water well permits until groundwater RGs are met. The remedy does not include a component for groundwater monitoring, and the institutional controls do not include maintenance of the groundwater monitoring system. Nevertheless, an inherent part of this remedy is that monitoring will be required to demonstrate if the contaminant levels in the groundwater are being reduced and that the mine water levels are not rising above the allowed elevation and the equipment associated with groundwater treatment and monitoring will require maintenance until the RGs are achieved.

EPA simply does not require that RODs for non-DoD sites contain the prescribed language that is demanded in the EPA Regional Administrator's decision for the LHAAP sites 16 and 17. EPA does not require for its own Superfund lead sites or PRP implemented remedies that groundwater monitoring system maintenance be considered an institutional control or LUC. When combined with the EPA demand for the use of the new TRRP residential concentration levels for perchlorate, nickel, and manganese in Issue 1, EPA demands that the Army maintain groundwater monitoring systems and continue sampling until residential RGs are met would extend these requirements for as much as 100 to 150 years longer than would be required if the non-residential TRRR standards are used as the RGs for the groundwater at sites 16 and 17.

As noted for Issue 1, above, recent EPA comments indicate an intent to demand that the Army reopen many sites with RODs in place, and even several with remedies in place, to require the use of TRRP residential standards in soils, as well as groundwater, to require starting over at the RI stage, and still requiring the designation of traditional remedy maintenance functions as LUCs. The additional cost of this work through a reopened RI phase would be in the range of an extra $135,000 to $195,000 estimated per site. The additional remedial action and long-term monitoring costs are estimated in the range of $327,000 to $14,000,000 per site. Considering all 37 LHAAP sites that would be affected, this would cost an additional Federal expenditure of $136,000,000 to $197,000,000. EPA does not impose these requirements at its own Superfund lead sites or at NPL sites where private parties are implementing a remedy. The law does not require EPA's demanded treatment of groundwater monitoring system maintenance as a LUC, the NCP does not contemplate this approach to groundwater monitoring, and this contributes nothing to enhanced protectiveness or risk reduction for these sites.

EPA DISPUTED ISSUE 3: LUCs REMAIN IN PLACE UNTIL UNLIMITED USE AND UNRESTRICTED EXPOSURE IN ATTAINED (UU/UE)

SUMMARY

EPA HQ: RG must require proving no potential for exposure to MEC, and the remedy must include a LUC to prohibit intrusion below surface unless approved by EPA and the Army.

ARMY: The subsurface clearance for MEC at these sites has eliminated unacceptable threat of explosion hazard, and the EPA standard is impossible and renders MEC clearance a waste of time. As a precedent, this would eliminate use of nearly all MMRP sites, with significant policy and financial ramifications.

DISCUSSION

The EPA HQ's comments on this issue originally sought statements of duration for the LUCs that were otherwise addressed in all three RODs involved in this dispute, and had no other substantive requirements for this issue. This was confusing to Army because the Draft Final RODs contained clear duration statements indicating that the residential use restrictions would remain in place until surface and subsurface soil achieved UU/UE, and that groundwater use restrictions would remain until UU/UE was achieved.

At the December 7, 2011 DRC meeting, TCEQ explained that their regulations require the residential land use restriction to remain in place until both soil and groundwater contaminant levels achieved UU/UE. The Army agreed to add language in all three RODs that the residential use restriction LUC would remain in place until UU/UE conditions were met for both soil and groundwater. The Army left the DRC meeting understanding that this issue had been resolved, but EPA elevated the issue further to the SEC. Then in the summer of 2012, EPA revisited the language for the LUCs in the ROD for the Munitions Response Sites (MRS) LHAAP-001-R and LHAAP-003-R (the MRS ROD) and demanded that there could be no intrusion below the surface at these sites until it is demonstrated that there are no explosive hazards, unless subsurface activities are approved by EPA and the Army and will be conducted by qualified explosives safety personnel. The issues associated with the dispute regarding the groundwater monitoring system maintenance as a LUC are discussed above, so they will not be repeated here. The Army does not object to the LUCs in the draft final site 16 and 17 RODs being in place until UU/UE. The Army does object to the recent EPA demands for the MRS ROD.

The sites that are the subject of the MRS ROD were not Army firing range impact areas. They were test areas for the Army Ammunition Plant, where ordnance was tested for production quality control purposes on above ground platforms or on the ground surface. Some munitions were burned for demilitarization. Most of the munitions tested were illumination bombs or flares for lighting the battlefield, and the demilitarized items were generally mortars and rocket motors from which propellant was removed and burned for treaty compliance purposes. After site investigation in the early 2000's, removal actions were conducted by the Army at these sites in 2007 that provided clearance throughout these areas on the surface and clearance to depth in the subsurface of the OB/OD area. Ordnance found in these removal actions consisted of a few dozen flares and hundreds of pounds of munitions debris. No high explosives or fused military munitions were recovered. All items were either blown in place first as a safety precaution or removed as waste for offsite disposal. In 2007, EPA instructed the Army to issue a No Further Action ROD after the removal actions were complete, and the Army proceeded with this understanding. Only in the late EPA comments in August 2011 did EPA change its position on this ROD. (See supporting documents.)

Residual soil sampling for munitions constituents revealed that no contamination requiring further response action remained in place. These sites do not pose an unacceptable threat from either ordnance or chemical contamination. Because the area is intended for perpetual Federal ownership as a wildlife conservation area, the Army agreed that the LUCs prohibiting residential use and requiring a demonstration of no substantial explosion hazard would be included in the MRS ROD. EPA is now demanding use restrictions that would essentially preclude any reuse unless approved by EPA, notwithstanding the thorough clearance of the area and the lack of residual unacceptable risk.

The standard demanded by EPA at this site would create a new standard for DoD Military Munitions Response Program (MMRP) sites that would essentially render these properties useless in perpetuity for any development that could allow the slightest intrusion below the surface. Across the nation, and around the world, there are millions of acres where military munitions have been tested, trained with, or used, and where safe and productive use is made of the property. In the United States, there are millions of acres of former battlefields, former DoD training areas, and closed testing and training areas that are being put to productive uses and have been safely used for many decades. There would be no reason for DoD to undertake any clearance of MMRP sites if the end result is a virtual no-use restriction in perpetuity whether the sites are cleared or not. Huge areas of the United States not subject to use restrictions could be subject to the imposition of extreme restrictions, virtually eliminating the value of the property. Property that DoD has cleared in BRAC installations and designated for transfer and use by new developers to create jobs would lack any value and could only be held by Federal agencies with no allowable use of the property that could involve intrusion of any amount below the surface. EPA provides no justification for this extreme position eliminating the usefulness of large amounts of land other than a desire to avoid any concern whatsoever regarding the possibility that a piece of a munitions item may someday be found. CERCLA and the NCP do not require this and the Army does not believe that valuable land should be rendered useless simply because some past use involved military munitions.

CERCLA and the NCP require only that unacceptable risks be eliminated. Military munitions are not "hazardous substances" under CERCLA per se, but are generally treated by DoD as "pollutants or contaminants." The response processes and actions taken under the DERP statutes are consistent with CERCLA and the NCP, and DoD and EPA have agreed that this consistent approach for the Military Munitions Response Program is appropriate. CERCLA provides Federal response authority for pollutants or contaminants released into the environment "which may present an imminent and substantial endangerment to the public health or welfare." CERCLA Section 104(a)(1). For chemical pollutants, the NCP requires that remedies satisfy RGs that are either based on ARARs or on an acceptable risk from exposure that is no greater than 1 in 10,000, or "$1\text{x}10^{-4}$." NCP 300.430(e)(2)(i)(A)(2).

This risk-based standard does not require that the remedy eliminate any possibility of any adverse effect. The NCP's establishment of an acceptable risk level recognizes that some low level of risk is acceptable under the circumstances at the site. Whether an unacceptable risk exists is not based on the presumption that there will be an exposure and that its worst possible harm will occur, but on whether there is a reasonable expectation of an exposure, based on current and reasonably anticipated future use, and an evaluation of the reasonable maximum harm that could result. Put in terms of military munitions, the existence of an unacceptable risk is not determined by presuming a theoretical piece of ordnance will be found resulting in catastrophic harm, but on evaluation of whether there is a reasonable expectation that the ordnance exists and is accessible, the probability that it might be encountered, and an evaluation of the reasonable maximum harm that could result if encountered.

The sites addressed in the MRS ROD do not present an unacceptable threat of an explosive hazard. EPA and TCEQ agreed that the planned final remedy for the MRS ROD was acceptable by agreeing to the FS, the PP that was presented to the public as a consensus preferred remedy, and agreed to in the draft MRS ROD. Indeed, the Army thought even the DRC had agreed to this, but EPA HQ added new demands in the summer of 2012. These new demands would require that the Army prove the negative, that there can be no potential explosive hazard. They would also impose a post-ROD use approval role for EPA and the Army. The Army at least has no such regulatory authority.

As a matter of precedent for other MMRP sites, EPA's demands at Longhorn will balloon the cost of military munitions responses for all the DERP programs, unnecessarily label as "unsafe for any use" much land that was long since transferred out of DoD jurisdiction, including much private land now in use across the nation, and render BRAC lands with MMRP projects worthless for transfer purposes. The Army does not believe this is required by CERCLA or the NCP, and imposes a zero risk standard that is not required by EPA for any other CERCLA pollutant or contaminant. The Army urges the EPA Administrator to accept the Army's language for the MRS ROD based on analysis of risk for these sites that is consistent with CERCLA and the NCP.

ARMY DISPUTED ISSUE: STIPULATED PENALTIES

SUMMARY

EPA HQ: Assesses stipulated penalty of $1,185,000 and counting, for alleged failure to comply with law, regulation, and EPA policy.

ARMY: The assessment of stipulated penalties is not provided for by the FFA in this situation. It is inconsistent with the FFA Dispute Resolution process and good faith engagement in dispute resolution negotiation to assess penalties because the Army disagreed with EPA HQ comments.

DISCUSSION

The authority for any assessment of stipulated penalties for these LHAAP RODs is the FFA the Army, EPA, and Texas entered into in 1991. (See supporting documents.) It allows EPA to assess stipulated penalties upon the Army only under limited circumstances. These circumstances occur only when the Army fails to submit a Primary Document (identified in the FFA) on the date required by a timetable or deadline established in accordance with the FFA, or if the Army fails to comply with a term or condition of the FFA that relates to an OU or final remedial action. FFA, Section XXIV, para. A.

The first ground for a penalty is unequivocally based on mandatory deadlines for the listed Primary Documents. A ROD is a Primary Document under the FFA, so the submission of the draft ROD for Consultation under Section VIII of the FFA on the established deadline is subject to stipulated penalties. The agencies developed an agreed schedule for the submission of these three draft final RODs. The EPA reviews of the draft RODs had gone on long after their review periods provided in the Consultation Section of the FFA, including especially the late

EPA HQ comments.[5] (See supporting documents.) EPA Region 6 had scheduled submittal of the draft final versions of these three RODs by 30 September 2011 in order to meet certain EPA goals for completion of milestones on NPL Sites. As this date approached, Region 6 and Army, with TCEQ, worked to address, and did satisfactorily address, all Region 6 and TCEQ comments on the draft final RODs so that all parties were in agreement with the content of the documents. However, EPA HQ submitted additional comments to EPA Region 6 and Army seeking substantial changes on a number of matters including some of the issues discussed above. (See supporting documents.) Although Army and EPA Region 6 had been through numerous rounds of comments, submission of these RODs prior to the end of the fiscal year was necessary in order for Region 6 to meet its goals. EPA Region 6 therefore required that Army submit the RODs in their draft final form so that EPA HQ's late comments could be addressed under the dispute resolution process. While the Army was forced to prepare draft final versions of these RODs and submit them on the deadline date or be subject to stipulated penalties for late submission, the Army was never informed that EPA HQ planned to immediately assess stipulated penalties if the RODs did not incorporate all EPA HQ comments. The Army submitted the draft final RODs about three days before the deadline.

The FFA Consultation section provides a process for dispute resolution that the parties may use if a draft final Primary Document is not changed by the Army as requested in review comments by EPA or TCEQ. EPA or TCEQ may raise a dispute on the draft final Primary document at this stage, and not before. FFA, Article VIII, paras. C.2. and H.1. "Dispute resolution shall be available to the Parties for draft final primary reports as set forth in Section XV (Dispute Resolution)." *Id.* The next paragraph discusses the finalization of Primary Documents, including those for which there is no dispute (draft final becomes the final), and those for which the dispute resolution process is invoked (revised draft final report is required based on the outcome of dispute resolution). The Dispute Resolution provision allows a party to invoke dispute resolution within thirty days after issuance of a draft final Primary Document that is wishes to dispute. Section XV, para. B. Upon completion of the dispute resolution process, the resolution of the dispute would be incorporated into the appropriate plan, schedule or procedure. Section XV, para. J.

In sum, the FFA provides a detailed process for the three agencies to review Primary Documents, submit comments, address them and revise the documents as deemed appropriate by the Army, and for the other Parties to invoke dispute resolution if they are unsatisfied with the draft final Primary Document. These provisions make no mention whatsoever of stipulated penalties during this Consultation and Dispute Resolution process. In a disingenuous effort to support its assessment of stipulated penalties, EPA contends that the documents Region 6 and TCEQ had concurred in were so deficient that these RODs did not constitute draft final documents, even though they conform with EPA guidance on the format of a ROD and they included the very remedies to which EPA agreed at the PP stage and presented along with the Army to the public as the preferred alternatives.

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[5] Contrary to the FFA's Consultation clause, EPA has consistently directed the Army to label Draft Final primary documents as "Draft" in order to allow multiple rounds of EPA comments. Additionally, EPA has engaged in the practice of submitting comments on Draft Final primary documents. It did so on October 13, 2011 for the RODs at issue.

These FFA provisions are closely based on the DoD and EPA agreed model FFA provisions on these subjects that were established in 1988. For 25 years, the Army and DoD have understood that a disagreement over the text of a primary document could be disputed, but that a stipulated penalty could not be assessed for the very same issue that is the subject of the dispute. The purpose of the Consultation and Dispute Resolution clauses to promote interagency collaboration with a goal of agreement to the extent possible, and the interrelationship of these clauses, would be undermined if EPA could assess stipulated penalties because the Army disagreed with their comments on a primary document. The purpose of consultation and collaboration was completely undermined when the Army, EPA Region 6, and TCEQ had reached agreement on those agencies' timely-submitted comments, but EPA HQ interjected new and sometimes contradictory comments long after the comment submittal dates established under the FFA's Consultation clause passed. Then EPA used the assessment of stipulated penalties in an attempt to force Army's acceptance of those untimely comments.

In its October 13, 2011 letter assessing stipulated penalties, EPA Region 6 alleges that Army failed to meet the deadline for Draft Final ROD submittal because "the submitted draft final RODs do not comply with CERCLA, the NCP, and EPA guidance, as required by the FFA." This apparently means that EPA alleges that the documents were so defective that they could not be considered to be draft final RODs. Army agrees that the RODs did not incorporate all of EPA HQ's late comments. But it begs the question of how EPA could find the documents so deficient as to not constitute draft final RODs when EPA Region 6's own staff (as well as TCEQ staff) concurred in their contents?

The assessment of stipulated penalties by EPA in this case instead is a blunt attempt to force the Army to accept EPA HQ's language for these three RODs as stated in EPA HQ's comments or suffer financial harm for disagreement. During the course of dispute resolution, EPA two times has stayed the continuing assessment of penalties and accept a specified penalty sum if the Army would agree to their then demanded language as expressed in quotes, and if the Army would agree to pay stipulated penalties up to the period of their demand. This can be viewed in no other way than as punishment for disagreement with EPA comments. Under this theory, the only way the Army could avoid penalties is to adopt EPA comments on the draft final Primary Document in whole, even if the Army believes they are incorrect, as the Army does in this case. The dispute resolution process would offer no opportunity for the Army to present its views and thus becomes a meaningless part of the FFA. These FFA clauses are not meaningless, and they do allow for the agencies to disagree, to attempt to reach agreement, and ultimately to decide if an issue is significant enough to raise as a dispute under the dispute resolution process. The assessment of penalties even before dispute resolution is attempted undermines the decision authority of the successively higher level offices at the DRC and the SEC and eventually the EPA Administrator to determine that any specific comment submitted by any EPA employee was incorrect. These higher level dispute resolution officials have the responsibility and the authority to engage in an independent review of the issues and comments at each stage of the dispute resolution process and to reach a decision different than the opinion expressed in any single EPA comment. Any other view on this matter undermines their authority and eliminates the good faith element of dispute resolution that each official should bring to the table.

This is contrary to long-standing Federal policy promoting the use of informal dispute resolution processes in lieu of enforcement actions or litigation. Administrative Dispute

Resolution Act of 1996, 5 U.S.C. 571 – 584 (as amended, 2005) (ADRA). Both EPA and DoD have formal policies that implement the ADRA and support its purpose. DoD Directive 5145.5, "Alternative Dispute Resolution (ADR)" Apr. 22, 1996, Nov. 21, 2003. EPA "Policy on Alternative Dispute Resolution", 65 FR 81858 (Dec. 27, 2000). The Alternate Dispute Resolution Act of 1998, 28 U.S.C. 651 (Oct. 30, 1998), requires all Federal District Courts to have ADR programs for their civil action dockets. Rule 16(c)(9) of the Federal Rules of Civil Procedure, requires the consideration in the pretrial conference of special procedures for dispute resolution as an alternative to proceeding to litigation in all civil cases. The President has directed all Federal agencies and departments to use dispute resolution procedures "whenever feasible" in lieu of resolving disputes in formal proceedings. Executive Order No. 12,988, "Civil Justice Reform", 61 F.R. 4727 (Feb. 7, 1996). The Executive Branch has formal policy on Environmental Collaboration and Conflict Resolution (ECCR), which has just this past year been renewed by the current Administration. U.S. Office of Management and Budget and President's Council on Environmental Quality, "Memorandum on Environmental Collaboration and Conflict Resolution", Sep 7, 2012. (See supporting documents.) The EPA Regional Administrator's letter of 5 April 2013 asserts that "the use of the voluntary Environmental Conflict Resolution (sic) process is inconsistent with the FFA dispute resolution process and is not a prerequisite to the assessment of stipulated penalties under the FFA." The Army fails to see how the ECCR policy is "inconsistent" with the FFA dispute resolution procedure, inasmuch as that procedure requires the parties to make a good faith effort to reach consensus, a fundamentally collaborative process, at both the DRC and SEC levels of review. Nor are we suggesting that Federal ECCR policy prohibits the assessment of stipulated penalties, when such penalties are in fact properly available under Section XXIV of the FFA. What we are suggesting is that ECCR is a fundamental policy choice, reflecting the realities of the time and policy preferences that can and should be read in consonance with the FFA. It is the strong view of the Army leadership, and of the current Administration as expressed in the revised ECCR policy, that environmental disputes between Federal agencies should always be resolved by seeking agreement without financial penalty for engaging in a collaborative dispute resolution process.

The penalties EPA demands for this dispute now amount to $1,185,000 and apparently continue to accrue even as the Army has attempted to resolve as many issues as possible and has sought higher level review of the fundamental issues discussed above. The assessment of penalties in this situation accomplishes nothing for the environment, as the basic elements of the remedies in all three of these RODs have been agreed among the three agencies for many years. These penalties do nothing but penalize the Army for daring to disagree with EPA on these issues.

EPA has attempted to assert in the 5 April 2013 letter that the Army RODs "fail(s) to comply with a term or condition of the [FFA] which relates to an operable unit or final remedial action." This clause means that a required element of a ***remedial action*** is not carried out for an OU or a final remedy. The LHAAP FFA is constructed as a process to carry out remedial actions for OUs and a final remedial action. "Section IV. Purpose," of the FFA calls for the parties to "Identify the response action alternatives for the Operable Units (OUs), which are appropriate at Longhorn Army Ammunition Plant ('LHAAP' or 'the Site'), prior to the implementation of final remedial action(s) for the site." FFA, Section IV, paragraph B.1. Stipulated penalties were agreed upon as a way to ensure that the response process for each OU and final remedy would proceed at an agreed upon schedule through deadlines for the Primary

Documents that are required to make progress, and then would require implementation of the OU response actions and final remedies by the Army. This is consistent with the intent of DoD and the Army at the time the model FFA was first developed in 1988 and for all FFAs since that time which have included a stipulated penalties section based almost exactly on the model provision. Over the years, EPA has assessed stipulated penalties against the Army only because of a failure to submit a Primary Document on an established deadline and never for any other purpose. EPA now is attempting to reinterpret this clause as allowing the assessment of stipulated penalties any time EPA believes the Army has not carried out any part of any clause of the FFA, including the consideration of EPA policy or internal guidance in the manner of carrying out FFA processes. DoD and the Army never agreed to the assessment of stipulated penalties under such circumstances.

EPA claims that the recent assessment of stipulated penalties on the Navy at the Jackson Park Housing NPL Site established the precedent of assessing penalties for other than failure to meet a deadline for a Primary Document or failure of a remedial action. The Navy objected strenuously to the assessment of penalties in that situation, and reportedly agreed after the issuance of the Regional Administrator's decision to seek authority from Congress to pay them only because the stipulated penalty was for a relatively small amount ($37,000) and because the property was a BRAC parcel with a pending transfer that required EPA agreement to allow the transfer to proceed. This is not precedent setting for the Army, or DoD, or indeed for the meaning of the model FFA stipulated penalties clause. It was an exercise of policy judgment by the Navy that the harm from holding the transfer hostage to the stipulated penalty would be worse than the harm from the relatively low penalty. If DoD and the Military Departments had understood that payment might be construed as creating a precedent, the Army and others would have requested in the strongest way possible that the Navy elevate the issue further for Administration review. Moreover, no Navy official acting under an agreement to which the Army is not a party can establish a precedent that binds or imposes any obligations on the Army.

For the above reasons, the Army has concluded that the EPA attempt to impose financial penalties on the Army because of the disagreement over the language in these three RODs is contrary to the FFA, not otherwise provided by law, is inconsistent with Federal and Administration policy on environmental collaboration and conflict resolution, and is contrary to the best interest of human health and the environment. Furthermore, EPA's assertion that the RODs were so deficient as to be deserving of stipulated penalties is inconsistent with EPA's own Region 6 advisement to the Army that all of its comments on the draft RODs had been satisfactorily addressed. Even if it were to be authorized by law for payment from a future Army environmental restoration account under a DoD Authorization Act, it would divert funds from necessary Army environmental restoration to EPA administrative expenses. A demand for a punitive financial assessment because of a disagreement over ROD language, and in light of the fact that EPA does not apply these as requirements to non-DoD parties conducting CERCLA response actions, is not provided under the FFA and without basis in law or regulation. The EPA assessment of stipulated penalties in this situation should be withdrawn.

CONCLUSION

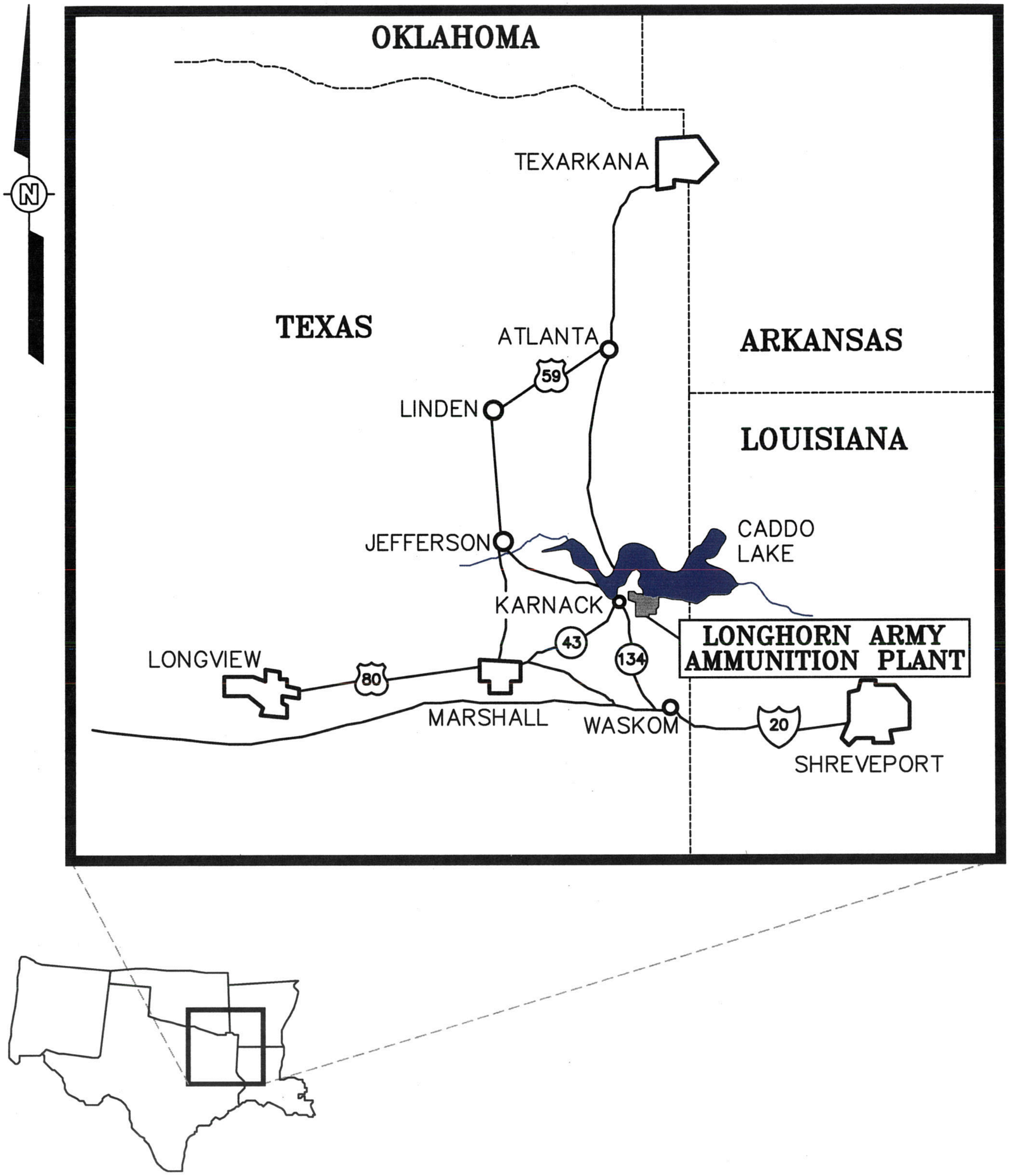
For over twenty years, the Army has worked with EPA and TCEQ to conduct necessary response actions at LHAAP using the cooperative processes of the FFA. For over fifteen years, the three agencies had a common and agreed understanding of the goals for the remedial actions at LHAAP Sites 16 and 17 and the MRS ROD. The Army completed RIs and FSs, presented to the public along with EPA and TCEQ proposed remedial action plans for all these sites, and prepared draft and draft final RODs to put the long agreed remedies in place. EPA HQ then sought to impose new requirements for all three of these RODs through late comments that were not in compliance with the FFA Consultation clause. When the Army objected to these EPA HQ comments and did not incorporate all the changes they sought in their comments, EPA used the stipulated penalties clause to punish the Army for its disagreement, rather than using the dispute resolution process in good faith to allow higher level officials to settle these matters. EPA is now pressing these EPA HQ demands on the Army at many other LHAAP sites with signed RODs and remedies long in place, all without any basis in risk reduction or protectiveness. The EPA Administrator should reject these demands and return the agencies to the agreements for these and other LHAAP remedies that have been carried out by the Army for many years. Proceeding with the agreed remedies will allow the remaining LHAAP land to be transferred to the FWS and for the wildlife conservation uses of the land to be fully implemented to enhance the environment in the region into the future.

Attachments:

Maps and Photos

Supporting Documents with Table of Contents

Maps and Photos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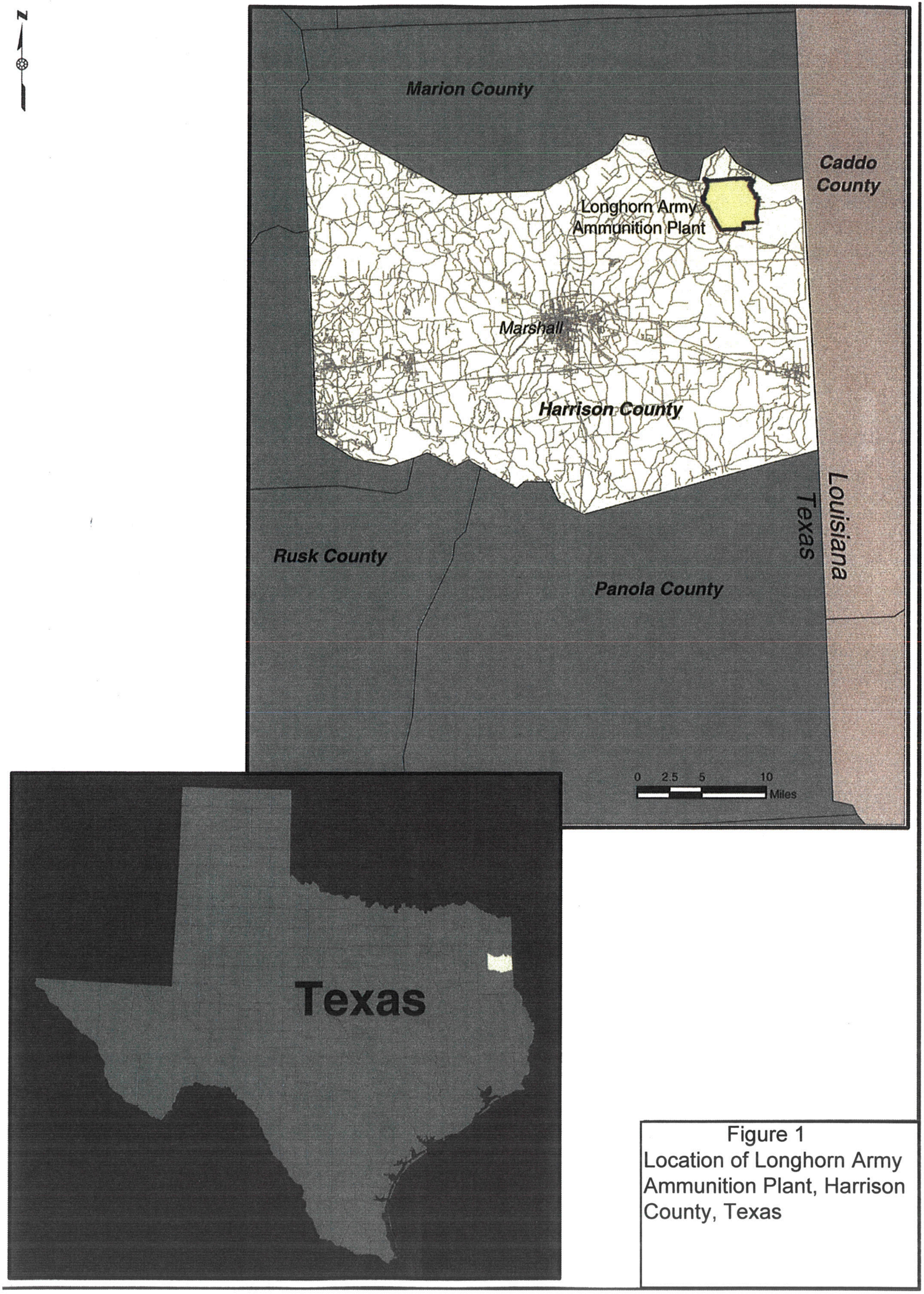
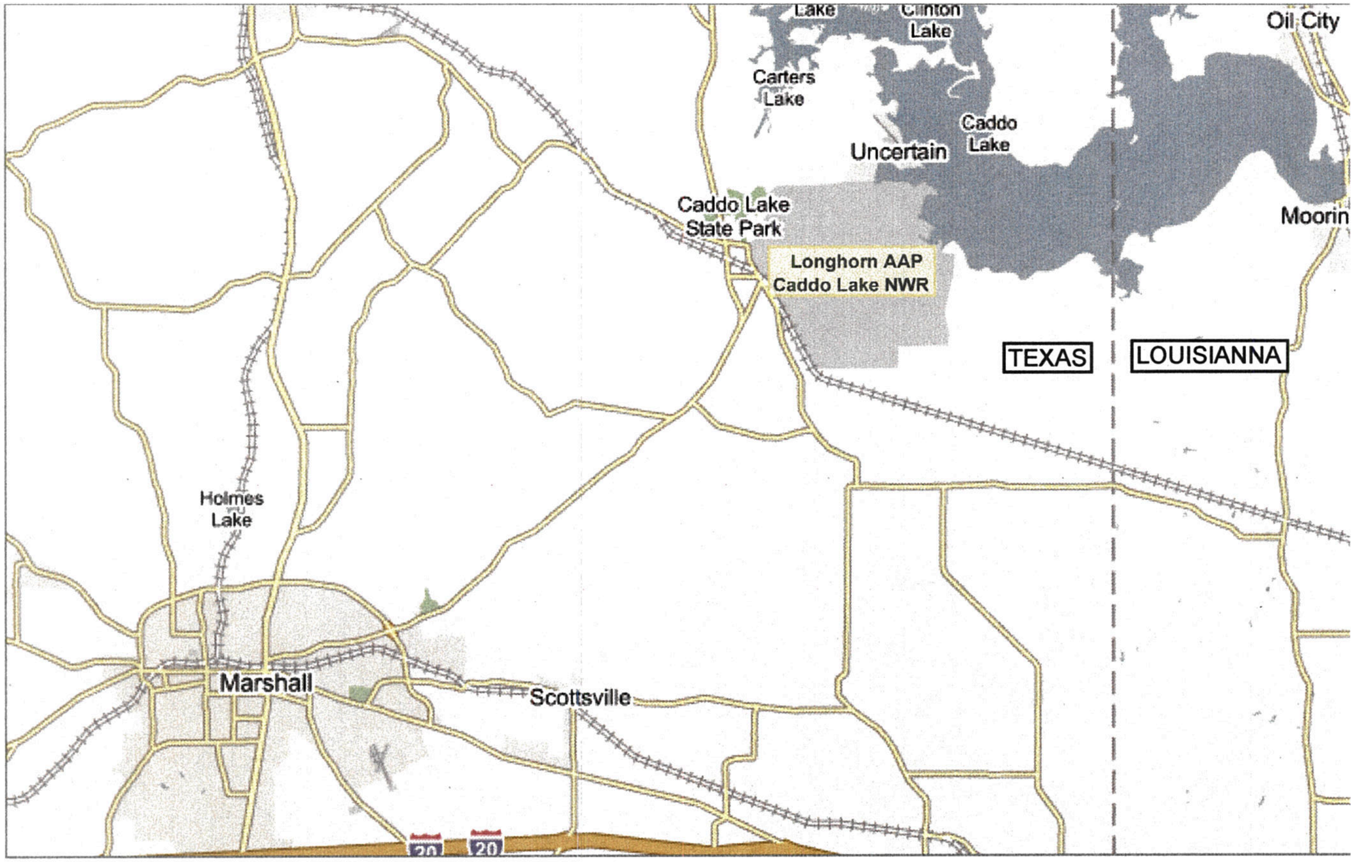


Figure 1
Location of Longhorn Army Ammunition Plant, Harrison County, Texas

Google Maps
karnack, texas



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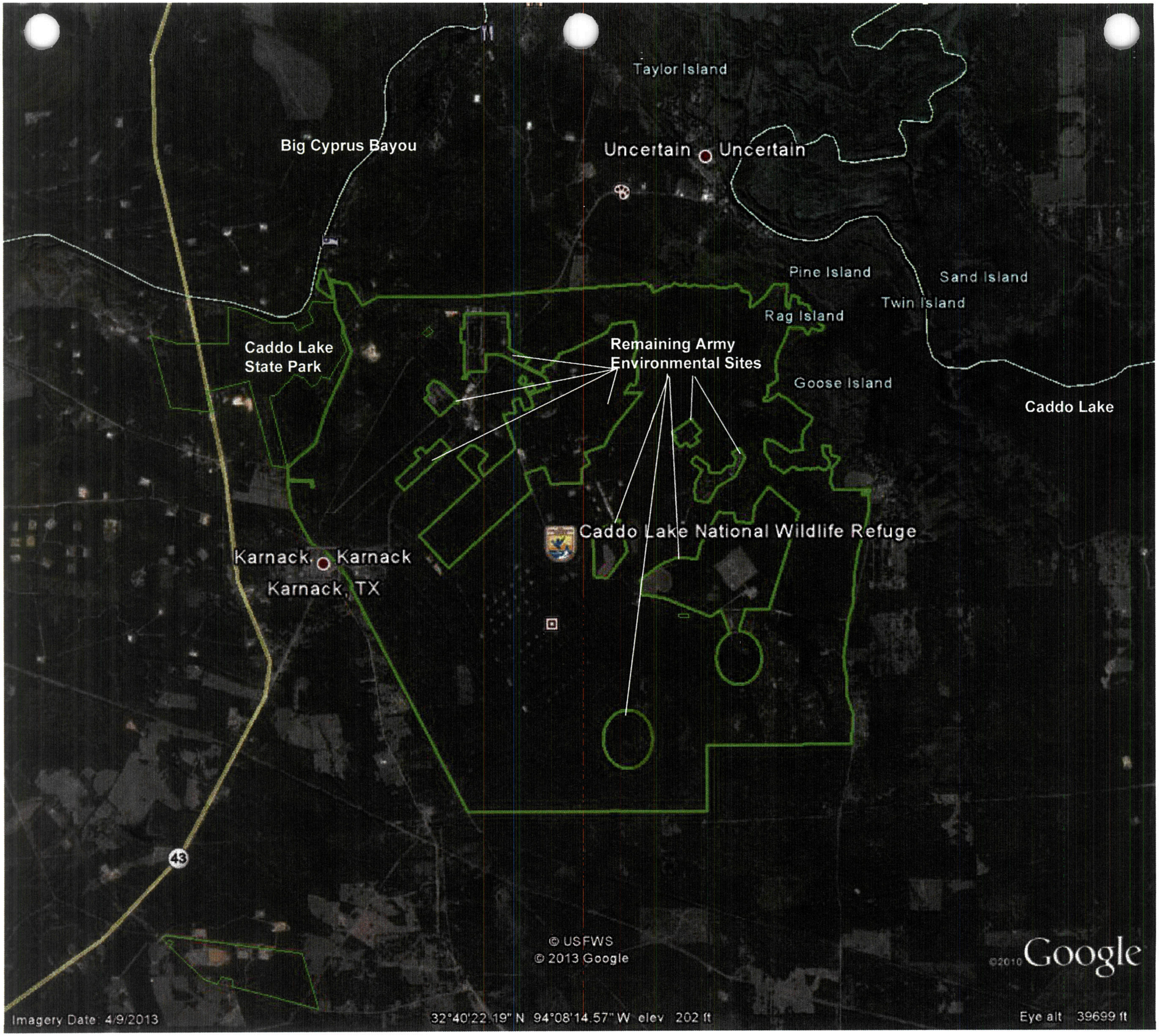

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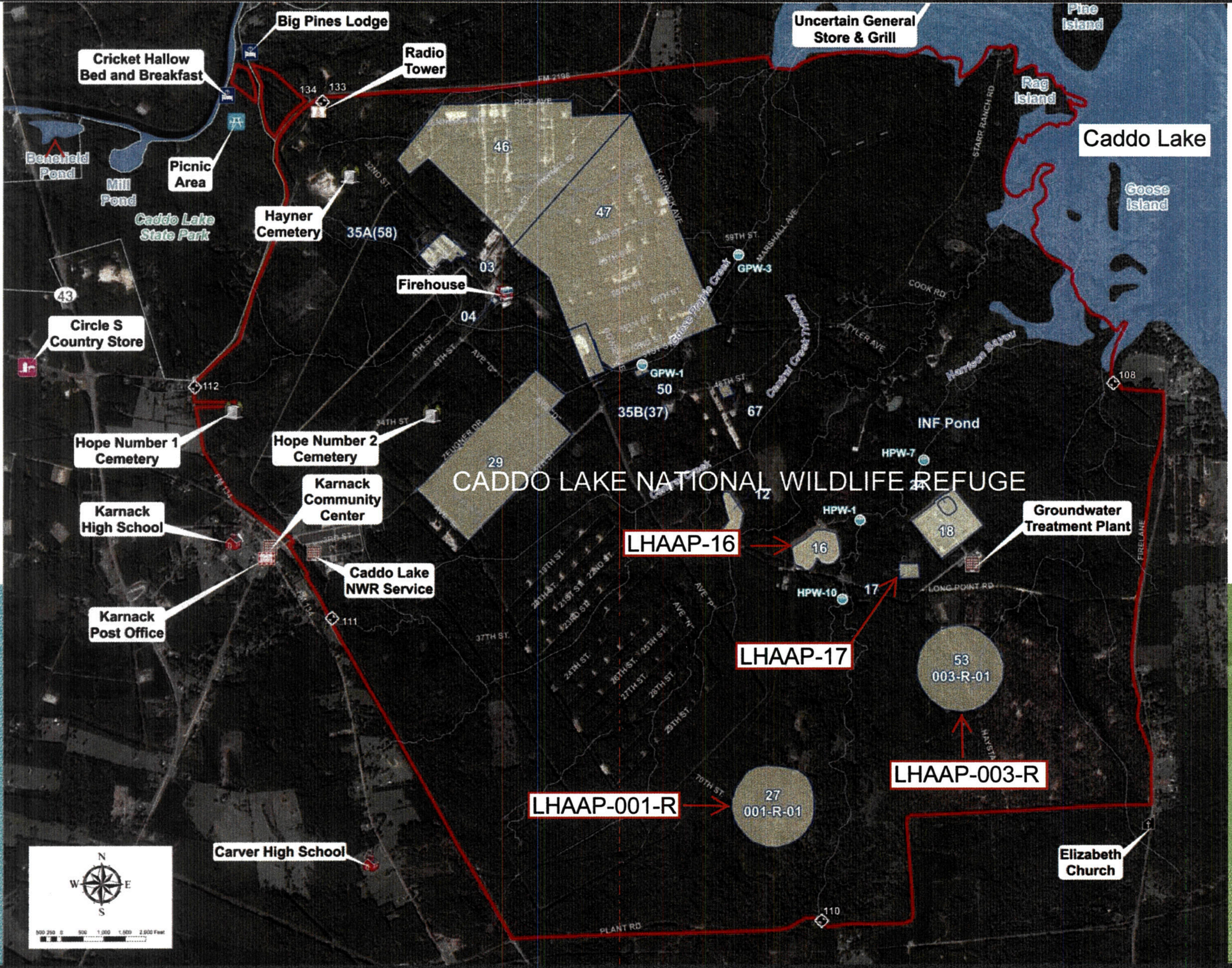
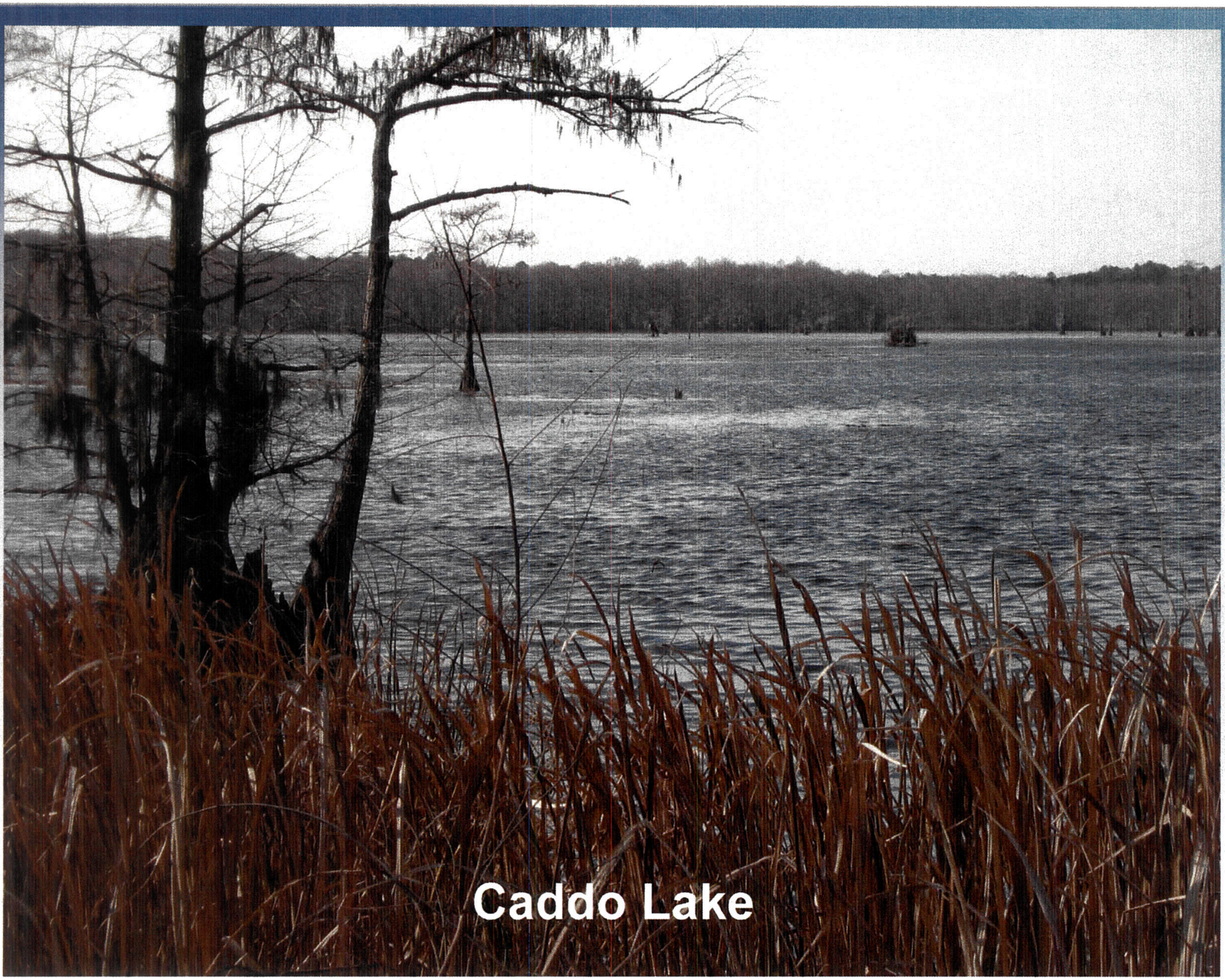
Imagery Date: 4/9/2013 32°40'22.19" N 94°08'14.57" W elev 202 ft Eye alt 39699 ft

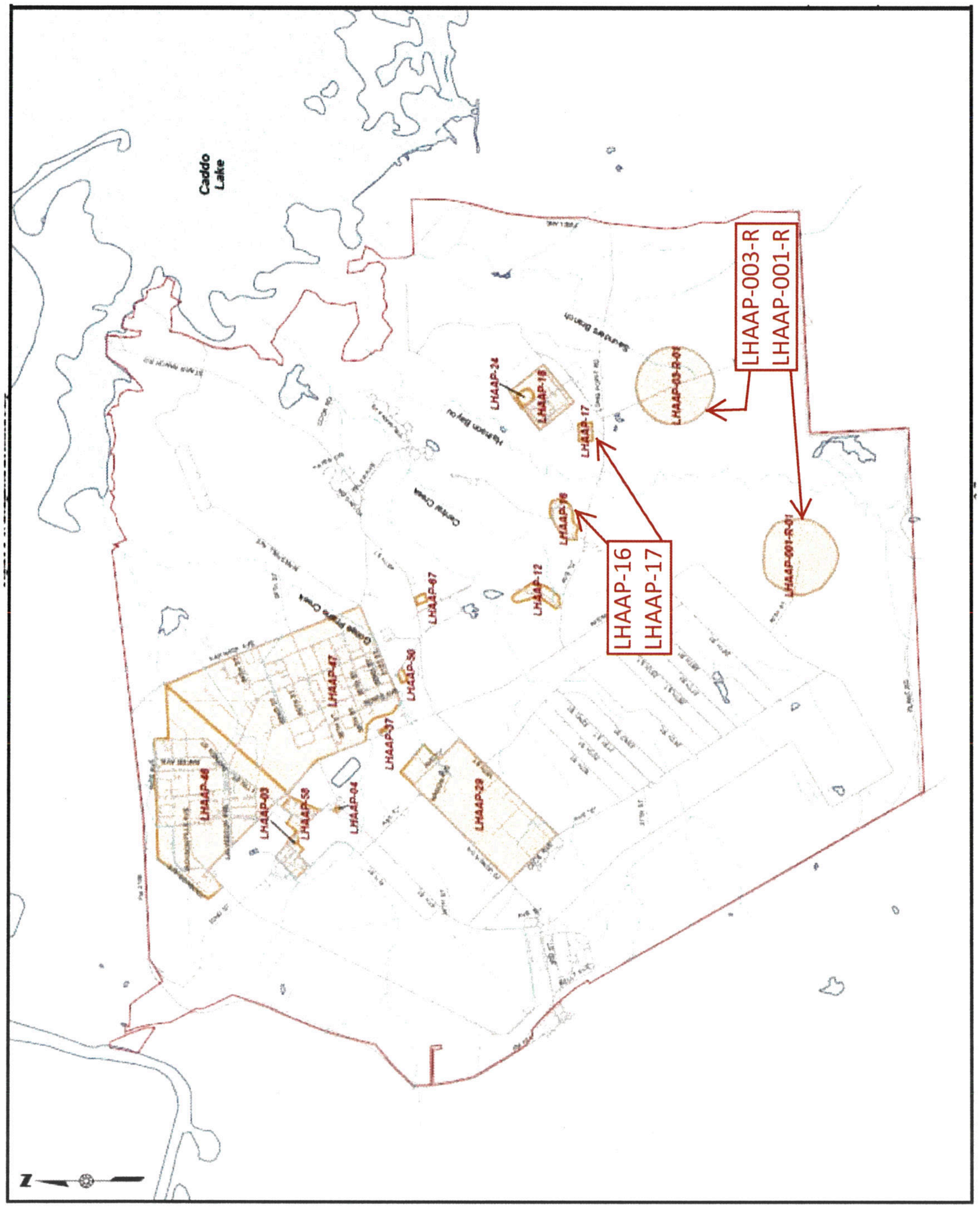
Longhorn Map





Caddo Lake

Longhorn Army Ammunition Plant
Karnack, Texas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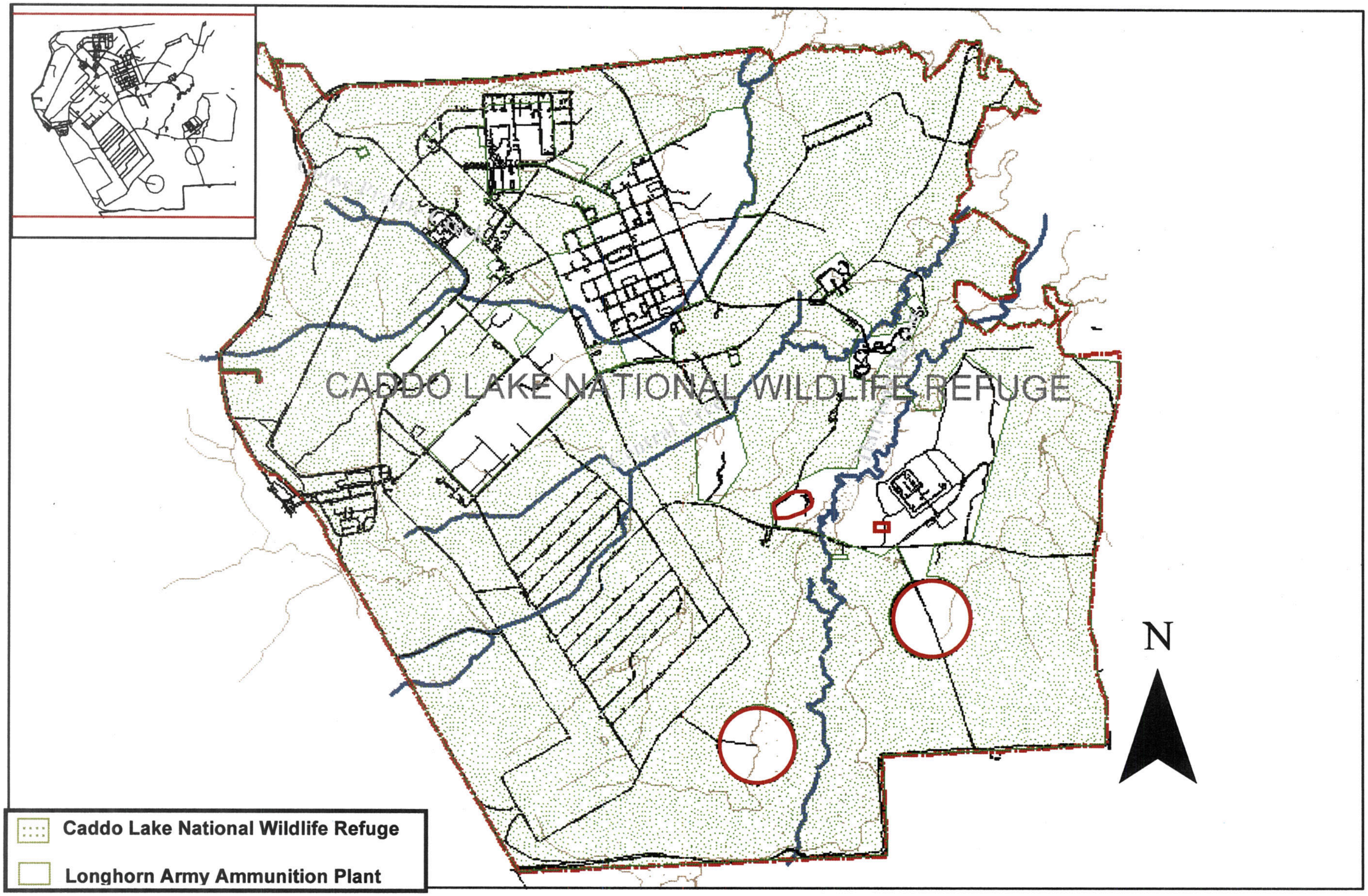
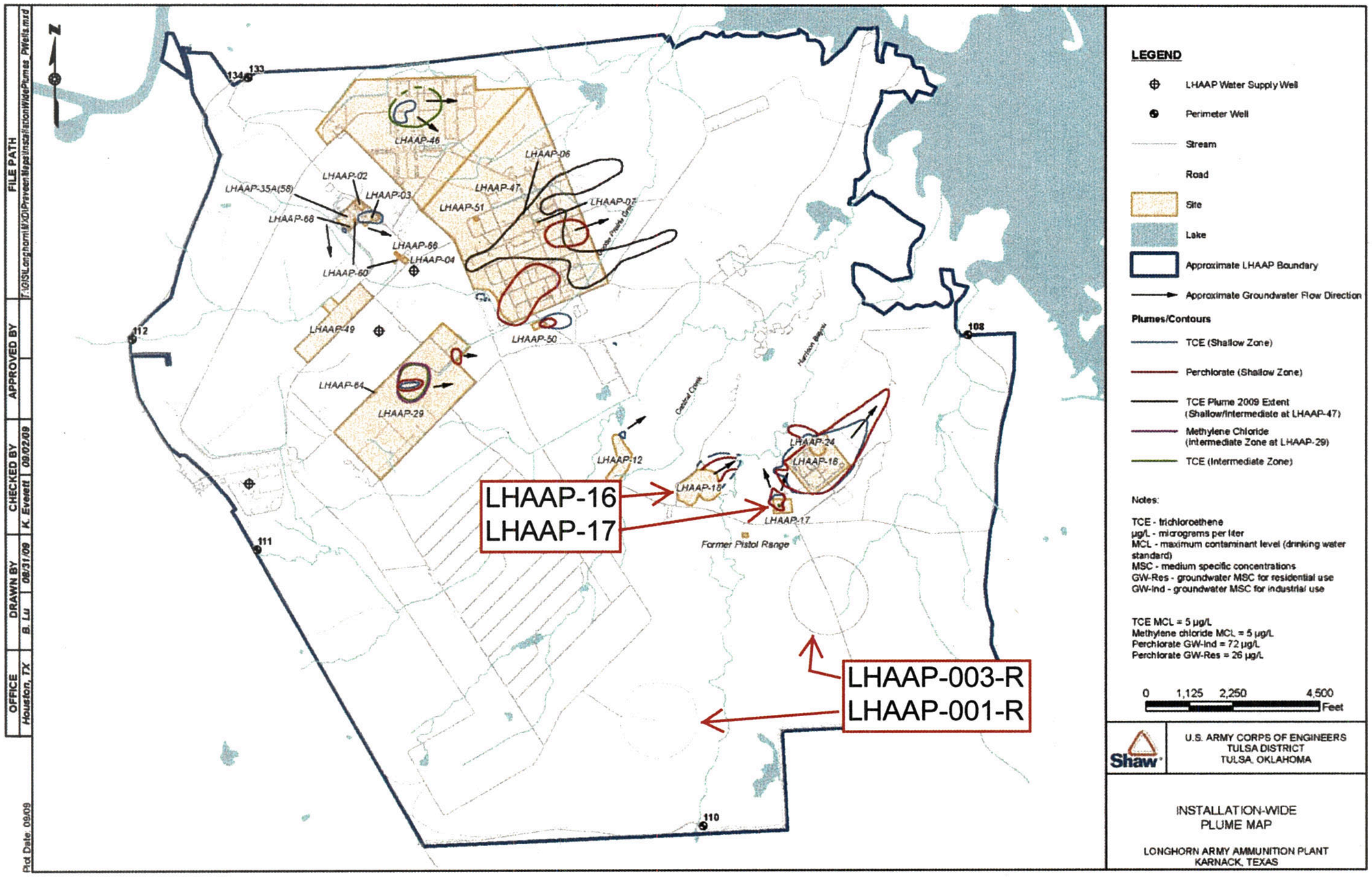


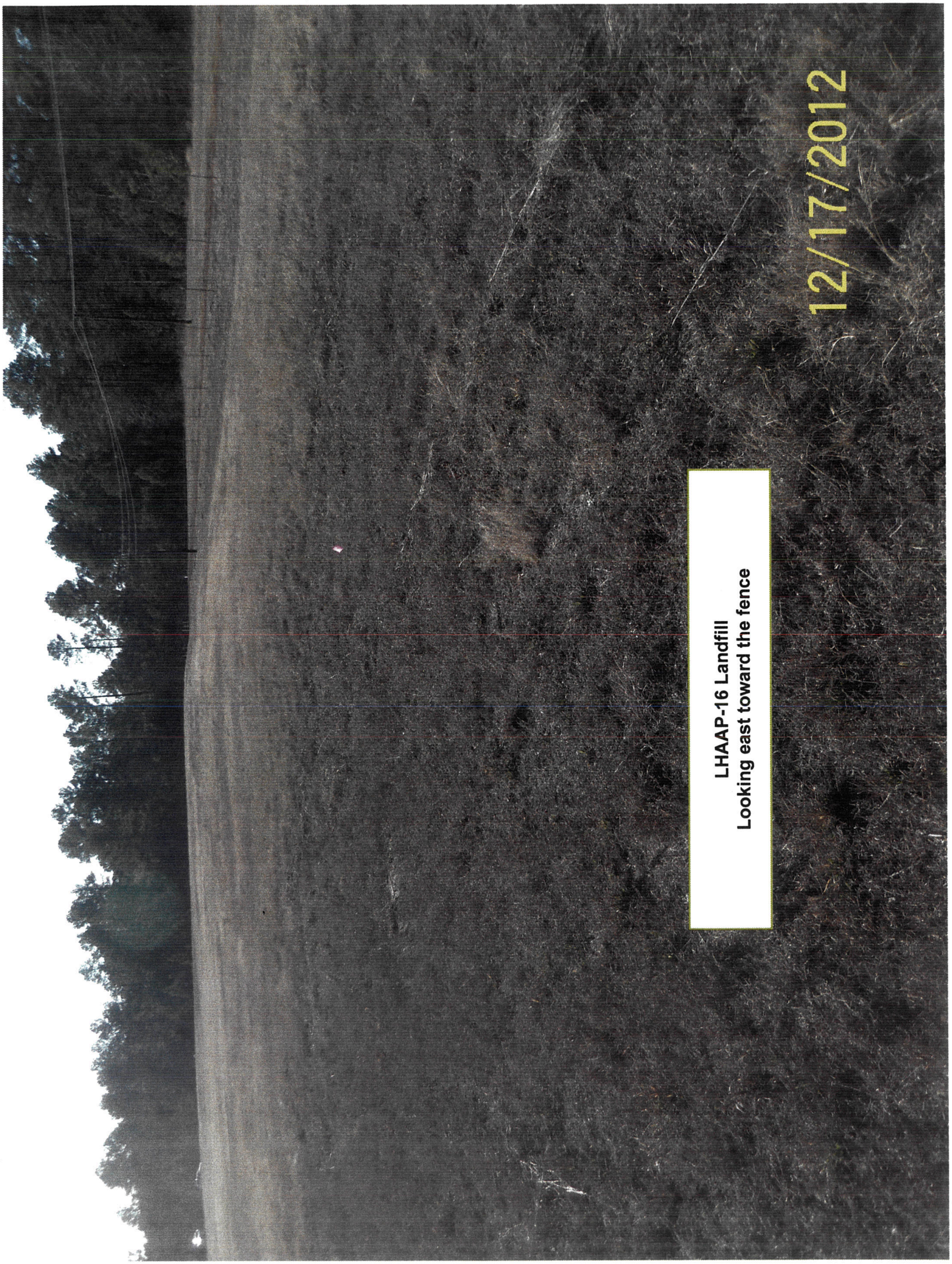
LONGHORN ARMY AMMUNITION PLANT

Longhorn Army Ammunition Plant/Caddo Lake National Wildlife Refuge Properties

25 April 2008

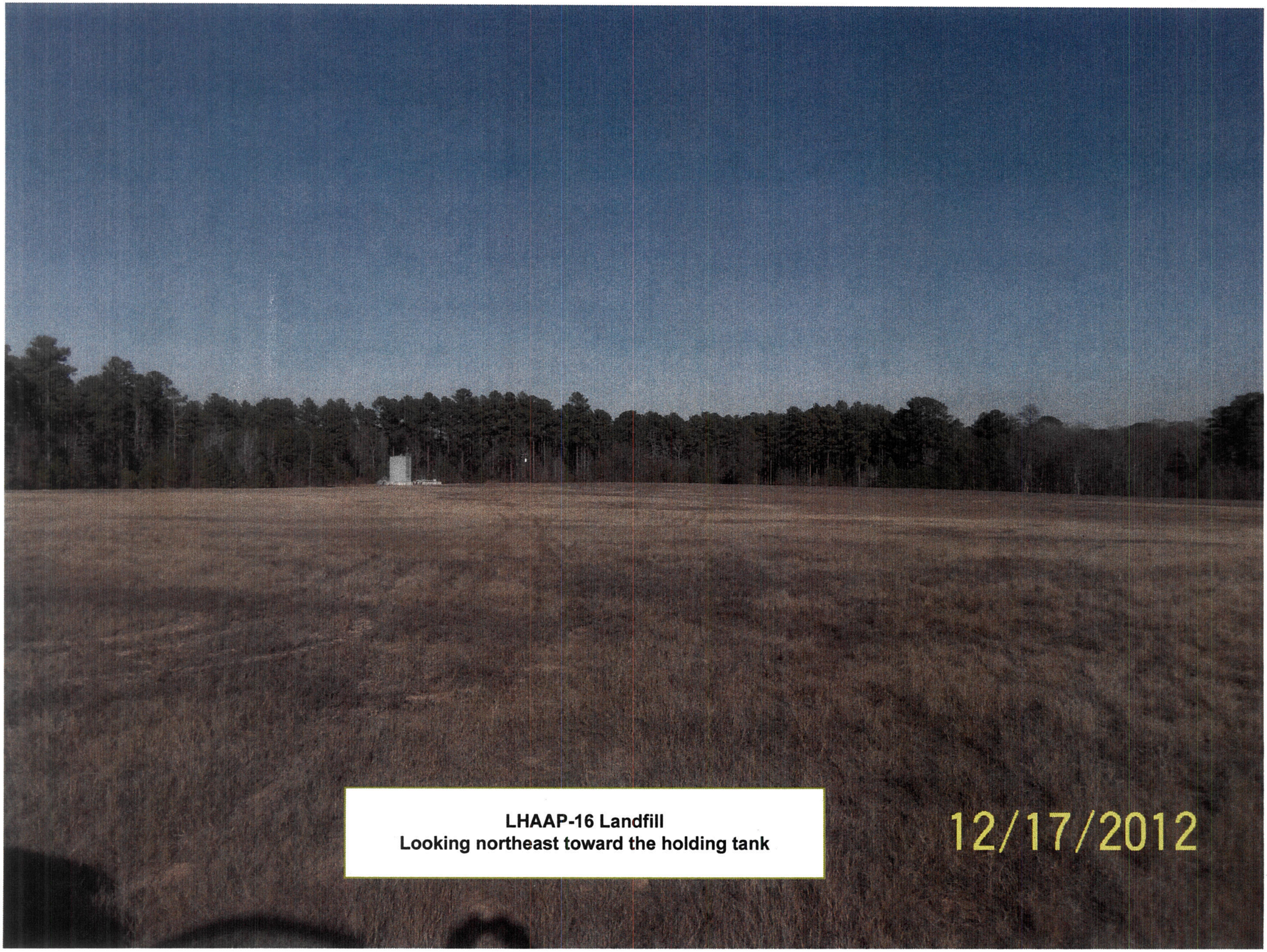
Installation-Wide Plume Map





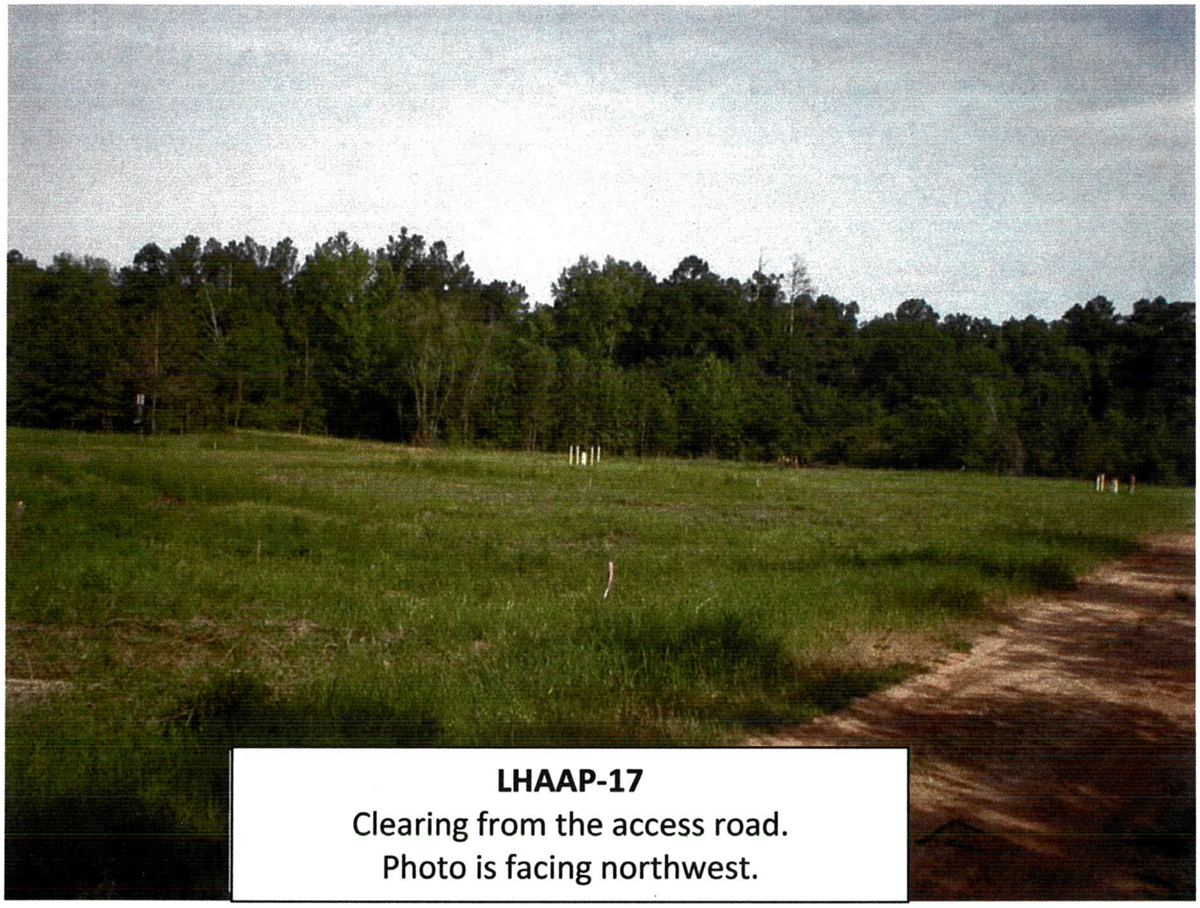
LHAAP-16 Landfill
Looking east toward the fence

12/17/2012

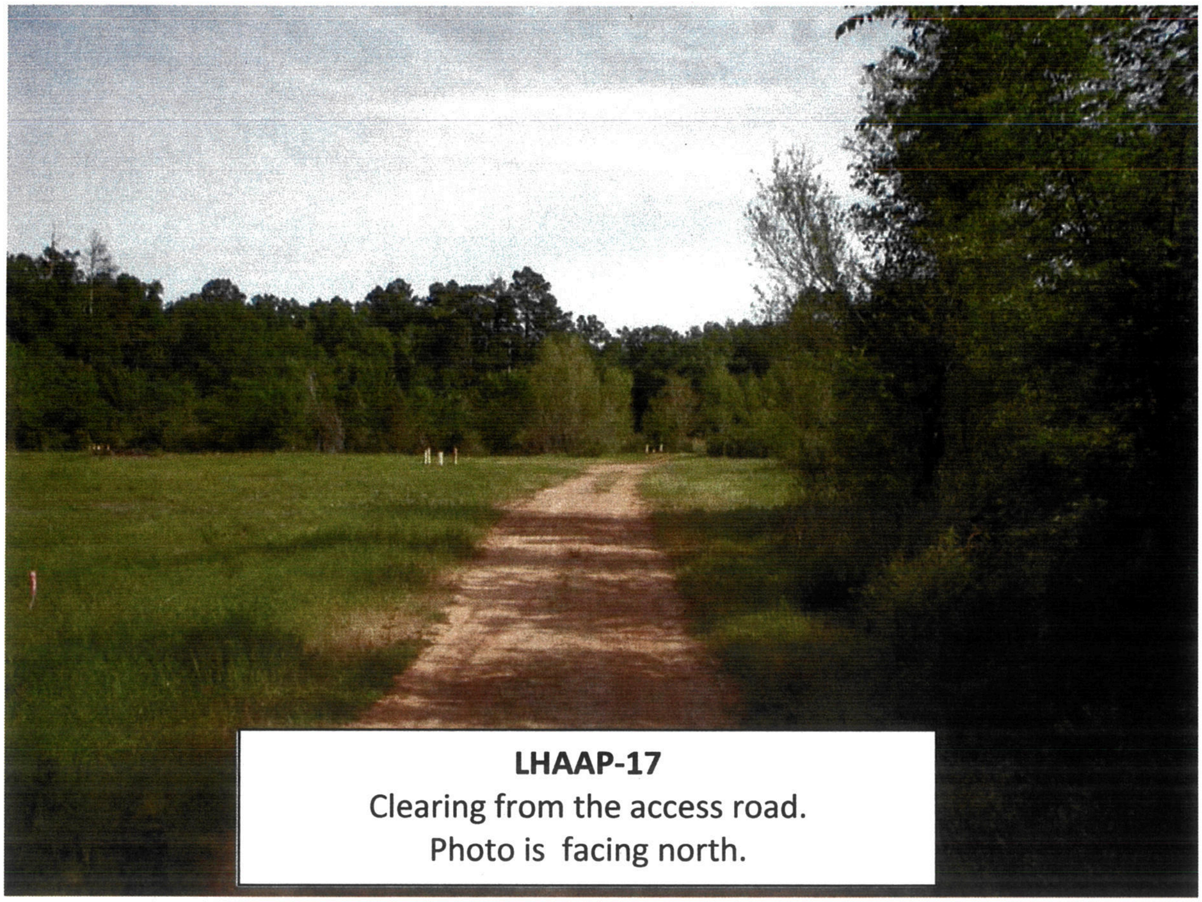


LHAAP-16 Landfill
Looking northeast toward the holding tank

12/17/2012



LHAAP-17
Clearing from the access road.
Photo is facing northwest.



LHAAP-17
Clearing from the access road.
Photo is facing north.

LHAAP-R-001 Signal Test Area
Perimeter road with warning signage

LHAAP-R-001 Signal Test Area
Perimeter road with warning signage

CAPE℠

LHAAP-R-003 South Test/Bomb Test Area
Tree clearing during geophysical
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Robert J. Huston, *Chairman*
R. B. "Ralph" Marquez, *Commissioner*
John M. Baker, *Commissioner*
Jeffrey A. Saitas, *Executive Director*

TEXAS NATURAL RESOURCE CONSERVATION COMMISSION

Protecting Texas by Reducing and Preventing Pollution

August 7, 2000

VIA E-MAIL, FAX, AND CERTIFIED MAIL

Mr. David Tolbert, Commander's Representative
Longhorn/Louisiana Army Ammunition Plant
Attn: SIOLH-CR
P.O. Box 658
Doyline, LA 71023-0658

Re: Texas Risk Reduction Program - Grandfathering under the Risk Reduction Rules

This letter is written in response to the August 6, 2000 Longhorn Army Ammunition Plant's (LHAAP) request to be grandfathered under the Risk Reduction Rules (RRR).

In accordance with section 30 Texas Administrative Code (TAC) 350.2 (m) continued response actions under 30 TAC 335.553 (b) Risk Reduction Standard 3 requires the submittal of a Remedial Investigation (RI) report prior to May 1, 2001. Submittal of an RI report after May 1, 2001 requires that response actions proceed according to 30 TAC 350.

If you have any questions, please call me at (512) 239-2444.

Sincerely,

James S.H. Sher, P.E.,
Project Manager
Superfund Cleanup Section

JS/mmw

cc: Mr. Chris Villareal, EPA Region 6 (6SF-AP)

P.O. Box 13087 • Austin, Texas 78711-3087 • 512/239-1000 • Internet address: www.tnrcc.state.tx.us

Wright, Ann L CIV (US)

m: Zeiler, Rose Ms CIV USA OSA [rose.zeiler@us.army.mil]
t: Tuesday, April 16, 2013 2:40 PM
: Wright, Ann L CIV (US)
Cc: Minvielle, David P CIV (US); Lederle, Thomas E CIV USARMY HQDA ACSIM (US)
Subject: Grandfather documentation for Longhorn
Attachments: Request Grandfathering Pages from 2000-vol. 01 (of 02).pdf

Ann,

Regarding the issue of the grandfathered status of Longhorn with respect to use of the Texas Risk Reduction Rules instead of the TRRP, the letter states that RIs must be submitted prior to May 1, 2001. The Group 2 Sites (12, 17, 18/24, 29 and 32) RI Report was finalized in April 2001. The Site 16 Landfill RI/FS was finalized in October, 2000. The ROD for the IRP equivalents (Sites 27 and 54) of the co-located MMPR sites (Sites R-001 and R-003) was signed in the 1990s.

Rose

Rose M. Zeiler, Ph.D.,
BRAC Field
479-635-0110 0112 - fax

Robert J. Huston, *Chairman*
R. B. "Ralph" Marquez, *Commissioner*
John M. Baker, *Commissioner*
Jeffrey A. Saitas, *Executive Director*

TEXAS NATURAL RESOURCE CONSERVATION COMMISSION

Protecting Texas by Reducing and Preventing Pollution

April 2, 2001

Mr. David Tolbert, Commander's Representative
Longhorn/Louisiana Army Ammunition Plants
Attn.: SIOLH-CR
P.O. Box 658
Doyline, LA 71023

Re: Use of Texas Risk Reduction Rules (TRRR)
Longhorn Army Ammunition Plant (LHAAP)
Karnack, Texas

Dear Mr. Tolbert:

The Texas Natural Resource Conservation Commission's (TNRCC) Texas Risk Reduction Rules (TRRR) were replaced by the Texas Risk Reduction Program (TRRP) Rule (30 TAC 350) on September 23, 1999. When making the change from TRRR to TRRP, the TNRCC took into account that many projects were already underway and allowed for the continuation of the projects through a "grandfathering" provision under 30 TAC §350.2(m)(2). The TNRCC and the Army have had numerous discussions regarding the grandfathering requirements in the past.

The Army submitted the notification of intent to conduct the Group 2 and Group 4 Remedial Investigations (RI) under Risk Reduction Standard 3 prior to May 1, 2000. The TNRCC made it clear through monthly project manager meetings and telephone conversations that the Army's Group 2 and Group 4 RI Reports must meet the deadline of May 1, 2001. The TNRCC also asked the Army to provide the RI report schedule to ensure the May 1, 2001 deadline will be met. It is the understanding of the TNRCC that the Army is aware that the site will be required to be remediated under the residential standards because the installation has been designated as a National Wildlife Refuge, which TNRCC considers to be the same as a park under 30 TAC §350.4(a)(74).

The Army has been aware of the rule changes for more than two years. This has been adequate time for the Army to comply with the rule changes. However, the Army requested for accommodations with regard to the rule. The TNRCC made every attempt to assist the Army by making the following accommodations:

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- The TNRCC stated in the February Monthly Project Manager Meeting that if the Remedial Investigation Report is substantially completed by May 1, 2001, the TNRCC will consider the requirements under 30 TAC §350.2(m)(2) met.
- The TNRCC and EPA agreed to shorten the review time as specified in the Federal Facility Agreement dated December 30, 1991, in order to expedite the process and meet the May 1, 2001 deadline.

Please be advised that the Army, not the TNRCC or EPA, is responsible for meeting the deadline. If the RI report is not deemed substantially complete by the TNRCC by the deadline, the Group will fall under the jurisdiction of the new rules. Should you have any questions, please do not hesitate to contact me at 512-239-2444.

Sincerely,

James S.H. Sher, P.E.
Superfund Cleanup Section

JS/KM/mmw

LONGHORN ARMY AMMUNITION PLANT
IRP STATUS SUMMARY

As of 12 June, 2001

PROJECT NAME	PROJECT PHASE	PROJECT STATUS	NEXT MAJOR MILESTONE(S)
Group # 2 (Sites 12, 17, 18, 24, 29, and 32)	Remedial Investigation/ Feasibility Study	- Quarterly sampling of perimeter wells and Harrison Bayou completed week of 16 April 01. - Final RI to team 23 April 01.	- Risk Assessment – date TBD. - Quarterly sampling scheduled for July 01.
Group # 4 (Wastewater Sumps And Sites 50 & 60)	Remedial Investigation/ Feasibility Study	- Quarterly Goose Prairie Creek sampling completed week of 16 April 01. - Draft Final RI Report sent to team 13 April 01.	- Risk Assessment – date TBD. - Final RI Report to team 28 June 01. - Quarterly sampling scheduled for July 01.
Burn Ground #3 (Sites 18 and 24)	Interim Remedial Action	- Contract option awarded to Complete Environmental on 31 May 00. - Fluidized Bed Reactor results received 30 May indicated that the FBR ran successfully at the design flow rate.	- IRA Five Year Review report.

LONGHORN ARMY AMMUNITION PLANT
IRP STATUS SUMMARY

As of 12 June, 2001

PROJECT NAME	PROJECT PHASE	PROJECT STATUS	NEXT MAJOR MILESTONE(S)
Landfill Site 16 Accelerated RI	RI/FS	- RA Report to team 31 March 00. - Responses to RI comments to team 18 August 00. - Final RI to team 8 November 00. - Draft Final Feasibility Study to team on 1 February 01. - Feasibility Study comments received from EPA and TNRCC 16 February 01. - Final HHRA and Draft Final ERA sent to team on 1 June.	

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SUBCHAPTER S: RISK REDUCTION STANDARDS
§§335.551 - 335.569
Effective September 1, 2003

§335.551. Purpose, Scope and Applicability.

(a) Purpose. This subchapter specifies the information and procedures necessary to demonstrate compliance with the three risk reduction standards of §335.8 of this title (relating to Closure and Remediation).

(b) Scope. The requirements of this subchapter will, when adequately carried out, assure adequate protection of human health and the environment from potential exposure to contaminants associated with releases from solid waste management facilities or other areas. Cleanup levels are specified for different types of contaminated media such as air, surface water, groundwater, and soil, and for cross-media contamination pathways such as soil to groundwater and soil to air. General procedures based on scientific principles are provided or referenced by these regulations so that specific numeric cleanup levels can be generated. The commission will periodically review the general procedures and revise these regulations as necessary.

(c) Applicability. The requirements of this subchapter apply to persons who undertake a closure or remediation in accordance with §335.8 of this title (relating to Closure and Remediation) during the period from June 28, 1993, until May 1, 2000, unless the person qualifies for an extended period of time as specified in §335.8(a) of this title (relating to Applicability) for submission of a final report to be reviewed according to this subchapter. If the executive director denies approval of the final report for reasons of technical inadequacy, the executive director may require the person to comply with the requirements of Chapter 350 of this title (relating to Texas Risk Reduction Program). For closures and remediations initially reported to the executive director on or after May 1, 2000, the person shall use the procedures of Chapter 350 of this title in place of this subchapter.

Adopted September 2, 1999 Effective September 23, 1999

§335.552. Definitions.

The following words and terms when used in this subchapter shall have the following meanings, unless the context clearly indicates otherwise:

(1) **Carcinogen** - Substances which have been classified for human carcinogenic risk based on the United States Environmental Protection Agency's Weight of Evidence System of Carcinogenicity as Group A - Human Carcinogen; Group B - Probable Human Carcinogen; or Group C - Possible Human Carcinogen.

(2) **Carcinogen classification** - The basis by which substances are classified for human carcinogenic risk based on the United States Environmental Protection Agency's Weight of Evidence System for Carcinogenicity: Group A - Human Carcinogen; Group B - Probable Human Carcinogen; Group C - Possible Human Carcinogen; Group D - Not Classifiable as to Human Carcinogenicity; and Group E - Evidence of Non-Carcinogenicity for Humans.

(3) **Long-term effectiveness** - The ability of a remediation or corrective action to maintain over time the required level of protection of human health and the environment.

(4) **Non-residential property** - Any real property or portion of a property not currently being used for human habitation or for other purposes with a similar potential for human exposure, at which activities have been or are being conducted, having the primary Standard Industrial Classification (SIC) major group numbers 01 - 48 inclusive, 49 except 4941, 50 - 67 inclusive, 72 - 79 inclusive, 80 except 8051, 8059, 8062, 8063, 8069, 81 and 82 except 8211, 8221, 8222, 83 except 8351, 8361, 84 - 86 except 8661, 87 - 91 inclusive, 92 except 9223, and 93 - 97 inclusive. Non-residential property includes all of the block(s) and lot(s) controlled by the same owner or operator that are vacant land, or that are used in conjunction with such business. For leased properties, non-residential property includes the leasehold and any external tank, surface impoundment, septic system, or any other structure, vessel, contrivance, or unit that provides, or are utilized, for the management of contaminants to or from the leasehold.

(5) **Permanence/permanent/permanently** - The property of achieving the maximum degree of long-term effectiveness and of enduring indefinitely without posing the threat of any future release that would increase the risk above levels established for the facility or area.

(6) **Point of exposure** - A location where human or environmental receptors can come into contact with contaminants; also, a location which can be arbitrarily determined for purposes of estimating or measuring the concentration of contaminants available for exposure.

(7) **Practical quantitation limit/PQL** - The lowest concentration of an analyte which can be reliably quantified within specified limits of precision and accuracy during routine laboratory operating conditions. The PQL minimizes to the extent possible the effects of instrument and operator variability and the influences of the sample matrix and other contaminants or substances upon the quantitation of the analyte. "Specified limits of precision and accuracy" are the criteria which have been included in applicable regulations or which are listed in the quality control sections of the analytical method. The PQL may be directly obtained or derived from the following sources with preference given to the most recent, scientifically valid method: federal regulations; EPA guidance documents; calculation from interlaboratory studies; and experimentally determined analytical methods not available from other existing sources.

(8) **Residential property** - Any property that does not exclusively meet the definition of non-residential property. Also, a portion of non-residential property that is used in part for residential activities, such as a day care center, is defined as residential.

(9) **Systemic toxicant** - Substances shown either through epidemiological studies or through laboratory studies to cause adverse health effects other than cancer.

§335.553. Required Information.

(a) For Risk Reduction Standard Number 1 or 2, the person shall provide a final report that documents attainment of the risk reduction standard in accordance with §335.554 or §335.555 of this title (relating to Attainment of Risk Reduction Standard Number 1 and Attainment of Risk Reduction Standard Number 2). The report shall include, but is not limited to, descriptions of procedures and conclusions of the investigation to characterize the nature, extent, direction, rate of movement, volume, composition and concentration of contaminants in environmental media; basis for selecting environmental media of concern; documentation supporting selection of exposure factors; descriptions of removal or decontamination procedures performed in closure or remediation; summaries of sampling methodology and analytical results which demonstrate that contaminants have been removed or decontaminated to applicable levels; and a document that the person proposes to use to fulfill the requirements of §335.560(b) of this title (relating to Post-Closure Care and Deed Certification for Risk Reduction Standard Number 2), as applicable.

(b) Risk Reduction Standard Number 3, the person shall conduct the activities set forth in paragraphs (1) - (4) of this subsection. The results of activities required by paragraphs (1) - (3) of this subsection may be combined to address a portion of a facility or one or more facilities of a similar nature or close proximity. The submittal shall be subject to review and approval by the executive director prior to carrying out the closure or remediation. Upon completion of the approved activity, the person shall submit the final report required by paragraph (4) of this subsection.

(1) The person shall prepare a remedial investigation report which contains sufficient documentation such as, but not limited to, descriptions of procedures and conclusions of the investigation to characterize the nature, extent, direction, rate of movement, volume, composition, and concentration of contaminants in environmental media of concern, including summaries of sampling methodology and analytical results. Information obtained from attempts to attain Risk Reduction Standard Number 1 or 2 may be submitted for this purpose.

(2) The person shall prepare a baseline risk assessment report which describes the potential adverse effects under both current and future conditions caused by the release of contaminants in the absence of any actions to control or mitigate the release. The report shall also discuss the degree of uncertainty associated with the baseline risk assessment. Residential land use with on-site exposure shall be assumed to evaluate the future use condition unless the person demonstrates to the satisfaction of the executive director that a different land use assumption such as industrial use is more appropriate. The standard exposure factors set forth in Table 1 (located following paragraph (4) of this subsection) shall be used unless the person documents to the executive director's satisfaction that site-specific exposure data should be used instead.

(3) The person shall evaluate the relative abilities and effectiveness of potential remedies to achieve the requirements for remedies described in §335.561 of this title (relating to Attainment of Risk Reduction Standard Number 3: Closure/Remediation with Controls) when considering the evaluation factors described in §335.562 of this title (relating to Remedy Evaluation Factors for Risk Reduction Standard Number 3). Using this information, the person shall prepare a corrective measure study which recommends the remedy which best achieves the requirements for remedies described in §335.561 of this title. Persons may seek to satisfy the requirements of §335.564 of this title (relating to Post-Closure Care

Not Required for Risk Reduction Standard Number 3) by demonstrating in the corrective measure study using the procedures of §335.563 of this title (relating to Media Cleanup Requirements for Risk Reduction Standard Number 3) that no remedy needs to be performed since the existing conditions of the facility or area conform to the media cleanup requirements without the use of removal, decontamination or control measures. Persons may also seek to satisfy the requirements of §335.564 of this title by demonstrating in the corrective measure study that following completion of their recommended removal and/or decontamination activities the conditions of the facility or area will conform to the media cleanup requirements of §335.563 of this title without the use of control measures. Upon review of the corrective measure study, the executive director may require the person to further evaluate the proposed remedy or to evaluate one or more additional remedies.

(4) The person shall submit to the executive director, for review and acceptance, a final report containing sufficient documentation which demonstrates that the remedy has been completed in accordance with the approved plan and also a document that the person proposes to use to fulfill the requirements of §335.566 of this title (relating to Deed Recordation for Risk Reduction Standard Number 3).

Table 1

Standard Exposure Factors (for use with §335.553(b)(2) and §335.563(e)).

Land Use	Exposure Pathway	Daily Intake Rate	Exposure Frequency	Exposure Duration	Body Weight
Residential	Ingestion of Potable Water	2 liters	350 days/yr	30 years	70 kg
	Ingestion of Soil and Dust+	200 mg-child, age 1-6	350 days/yr	6 years*	15.1 kg*
		100 mg-adult, age 7-31		24 years** (*=child, **=adult)	70 kg**
	+ These factors yield the age-adjusted soil ingestion factor of 114 mg-yr/kg-day				
	Inhalation of Contaminants	20 cu.m.-total 15 cu.m.-indoor	350 days/yr	30 years	70 kg
Commercial/ Industrial	Ingestion of Potable Water	1 liter	250 days/yr	25 years	70 kg
	Ingestion of Soil and Dust	50 mg	250 days/yr	25 years	70 kg
	Inhalation of Volatiles	20 cu.m./workday	250 days/yr	25 years	70 kg
Agricultural	Consumption of Homegrown Produce	42 g-fruit 80 g-vegetables	350 days/yr	30 years	70 kg
	Factors for ingestion of potable water, soil and dust, and inhalation of volatiles: Use the Residential Land Use factors.				
Recreational	Consumption of Locally Caught Fish	10 g-freshwater 15 g-saltwater	350 days/yr	30 years	70 kg

(c) For risk reduction standards Numbers 1, 2, and 3, in order for a treatment process to achieve decontamination in contrast to being a control measure, the person must demonstrate to the satisfaction of the executive director that the treatment process permanently alters all contaminants to levels that will not pose a substantial present or future threat to human health and the environment, and must further demonstrate that any residue remaining in place from the treatment will not pose the threat of any future release that would increase the concentrations of contaminants in environmental media above the cleanup levels determined for that particular risk reduction standard.

(d) For Risk Reduction Standards Numbers 1, 2, and 3, attainment of cleanup levels shall be demonstrated by collection and analysis of samples from the media of concern. Persons shall utilize techniques described in SW 846, Test Methods for Evaluating Solid Waste, EPA, or other available guidance in developing a sampling and analysis plan appropriate for the distribution, composition, and heterogeneity of contaminants and environmental media. A sufficient number of samples shall be collected and analyzed for individual compounds to both accurately assess the risk to human health and the environment posed by the facility or area and to demonstrate the attainment of cleanup levels. Noncompound-specific analytical techniques (e.g., total petroleum hydrocarbons, total organic carbon, etc.) may, where appropriate for the nature of the wastes or contaminants, be used to aid in the determination of the lateral and vertical extent and volume of contaminated media; however, such noncompound-specific analyses will serve only as indicator measures and must be appropriately supported by compound-specific analyses. Comparisons may be based on the following methods:

(1) direct comparison of the results of analysis of discrete samples of the medium of concern with the cleanup level;

(2) for a data set of ten or more samples, statistical comparison of the results of analysis utilizing the 95% confidence limit of the mean concentration of the contaminant as determined by the following expression:

> Cleanup Level $\geq \bar{x}$ + ts/sqrt (n), where $\bar{x}$ is the mean concentration, s is the standard deviation and t is a value from Table 2 (located following paragraph (3) of this subsection) based on the number of samples, and sqrt (n) is the square root of the sample size; or

(3) other statistical methods appropriate for the distribution of the data, subject to prior approval by the executive director.

Table 2

Values for "t" (for use with §335.553(d)).

n	t	n	t	n	t
10	1.812	20	1.725	50	1.676
11	1.796	21	1.721	60	1.671
12	1.782	22	1.717	70	1.667
13	1.771	23	1.714	80	1.664
14	1.761	24	1.711	90	1.662
15	1.753	25	1.708	100	1.661
16	1.746	30	1.697	120	1.658
17	1.740	35	1.690	145	1.656
18	1.734	40	1.684		
19	1.729	45	1.680		

(e) For Risk Reduction Standards Numbers 2 and 3, in determining toxicity information for contaminants (e.g., EPA carcinogen classification, type of toxicant, reference doses, carcinogenic slope factors, etc.), persons shall utilize values from the following sources in the order indicated. For Risk Reduction Standard Number 2, persons may utilize data from these sources that are more current than those used to derive the unadjusted medium-specific concentrations listed in §335.568 of this title (relating to Appendix II), provided that substantiating information is furnished to the executive director in the report required by §335.555(f) of this title (relating to Attainment of Risk Reduction Standard Number 2: Closure/Remediation to Health-Based Standards and Criteria).

(1) Integrated Risk Information System (IRIS);

(2) Health Effects Assessment Summary Table (HEAST);

(3) EPA Criteria Documents;

(4) Agency for Toxic Substances and Disease Registry (ATSDR) Toxicological Profiles; and

(5) other scientifically valid published sources.

(f) For Risk Reduction Standards Numbers 2 and 3, persons determining cleanup levels for contaminated media characterized by noncompound-specific analytical techniques (e.g., total petroleum hydrocarbons, total organic carbon, etc.) and for which individual compounds such as hazardous constituents are not present as contaminants, must at a minimum consider other scientifically valid published numeric criteria to address: adverse impacts on environmental quality; adverse impacts on the public welfare and safety; conditions that present objectionable characteristics (e.g., taste, odor, etc.); or conditions that make a natural resource unfit for use.

(g) All engineering and geoscientific information submitted to the agency shall be prepared by, or under the supervision of, a licensed professional engineer or licensed professional geoscientist, and shall be signed, sealed, and dated by qualified professionals as required by the Texas Engineering Practice Act and the Texas Geoscience Practice Act and the licensing and registration boards under these acts.

Adopted August 6, 2003 Effective September 1, 2003

§335.554. Attainment of Risk Reduction Standard Number 1: Closure/Remediation to Background.

(a) Compliance with this standard is attained when the criteria set forth in subsections (b) - (g) of this section are met.

(b) For closure of hazardous waste management units and response to unauthorized discharges of hazardous waste, all hazardous waste and hazardous waste residues and contaminated design and operating system components such as liners, leachate collection systems and dikes must be removed from the unit or area of the unauthorized discharge. For remediation of media that have become contaminated by releases from a hazardous waste management unit or by other unauthorized discharge of hazardous waste, the contaminated media must be removed or decontaminated to cleanup levels specified in this section.

(c) For closure of non-hazardous industrial solid waste management units, response to unauthorized discharges of non-hazardous industrial solid waste, and the remediation of media that have become contaminated by discharges of non-hazardous industrial solid waste or other contaminants, all waste and waste residues, contaminated design and operating system components such as liners, leachate collection systems and dikes, and contaminated media must be removed or decontaminated to cleanup levels specified in this section.

(d) Background as represented by results of analyses of samples taken from media that are unaffected by waste management or industrial activities shall be used to determine compliance with the requirements of this section. If the Practical Quantitation Limit (PQL) is greater than background, then the PQL rather than background shall be used as the cleanup level provided that the person satisfactorily demonstrates to the executive director that lower levels of quantitation of a contaminant are not possible.

(e) Attainment of cleanup levels shall be demonstrated by collection and analysis of samples from the media of concern using the procedures of §335.553(d) of this title (relating to Required Information).

(f) The person must submit a report to the executive director in accordance with §335.553(a) of this title (relating to Required Information) that documents compliance with the requirements of this section.

(g) Provided that attainment of this risk reduction standard for the facility or area can be demonstrated to the executive director pursuant to this section, the person is released from deed recordation requirements of §335.5 of this title (relating to Deed Recordation of Waste Disposal) and post-closure care responsibilities.

Effective June 28, 1993

§335.555. Attainment of Risk Reduction Standard Number 2: Closure/Remediation to Health-Based Standards and Criteria.

(a) Compliance with this standard is attained when the criteria set forth in subsections (b) - (f) of this section are met.

(b) For closure of hazardous waste management units and response to unauthorized discharges of hazardous waste, all hazardous waste and hazardous waste residues must be removed from the unit or area of the unauthorized discharge. Contaminated design and operating system components such as liners, leachate collection systems and dikes must be removed from the unit or area of the unauthorized discharge. For remediation of media that have become contaminated by releases from a hazardous waste management unit or by other unauthorized discharge of hazardous waste, the contaminated media must be removed or decontaminated to cleanup levels specified in this section or such other lower levels necessary to be in conformance with current hazardous waste regulations.

(c) For closure of non-hazardous industrial solid waste management units, response to unauthorized discharges of non-hazardous industrial solid waste, and the remediation of media that have become contaminated by discharges of non-hazardous industrial solid waste or other contaminants, all waste and waste residues, contaminated design and operating system components such as liners, leachate collection systems and dikes, and contaminated media must be removed or decontaminated to cleanup levels specified in this section.

(d) The concentration of a contaminant in contaminated media of concern such as ground water, surface water, air or soil shall not exceed cleanup levels as defined in §335.556 of this title (relating to Determination of Cleanup Levels for Risk Reduction Standard Number 2).

(1) If the Practical Quantitation Limit (PQL) and/or the background concentration, determined in a manner consistent with §335.554 of this title (relating to Attainment of Risk Reduction Standard Number 1) for a contaminant is greater than the cleanup level, the greater of the PQL or background shall be used for determining compliance with the requirements of this section.

(2) Attainment of cleanup levels shall be demonstrated by collection and analysis of samples from the contaminated media of concern using the procedures of §335.553(d) of this title (relating to Required Information).

(e) The person must prepare a document that he intends to use to fulfill the deed certification requirements of §335.560 of this title (relating to Post Closure Care and Deed Certification for Risk Reduction Standard Number 2) and include this document as part of the report of subsection (f) of this section.

(f) The person must submit a report to the executive director in accordance with §335.553(a) of this title (relating to Required Information) that documents compliance with the requirements of this section. The executive director may require additional information or analysis, such as but not limited to consideration of cumulative health effects and cross-media contamination, prior to accepting a certification of closure or remediation under this performance standard. Upon approval of the report by the executive director, the person shall comply with the requirements of §335.560 of this title (relating to Post Closure Care and Deed Certification for Risk Reduction Standard Number 2).

Effective June 28, 1993

§335.556. Determination of Cleanup Levels for Risk Reduction Standard Number 2.

(a) For purposes of this risk reduction standard, cleanup levels for individual contaminants are represented by Texas or federal promulgated health-based standards, or, when these are not available or do not provide appropriate protection for human health or the environment, persons must develop cleanup levels based on procedures specified or referenced in this section for determining other numeric criteria, referred to as Medium Specific Concentrations (MSCs), and are required to perform any necessary adjustments to these numeric criteria. The MSCs address a single contaminant in a medium and consider one or more exposure pathways, specifically, water ingestion (Water MSC) and soil ingestion with inhalation of volatiles and particulates (Soil MSC). Where a contaminant in one medium has the potential to contaminate another medium, defined as cross-media contamination, additional numeric criteria are developed as cleanup levels (e.g., the soil-to-ground water contaminant pathway). To determine cleanup levels for contaminated media of concern, persons must perform the evaluations of subsections (b) - (e) of this section.

(b) In addition to the exposure pathways defined or referenced in this section, the person must evaluate other exposure pathways at or near the facility (e.g., dermal absorption, ingestion of contaminated fish, etc.) by which human populations (including sensitive subgroups) or environmental receptors (e.g., aquatic organisms, food-chain crops, etc.) are likely to be exposed to contaminants. If such evaluation indicates the need for additional remediation at the facility to adequately protect human health or environmental receptors, then the person shall develop numeric criteria by utilizing available guidance or scientific literature to serve in place of, or in addition to, cleanup levels determined pursuant to this section.

(c) The person must determine the appropriate exposure factors from §335.557 of this title (relating to Criteria for Selection of Non-Residential Soil Requirements for Risk Reduction Standard Number 2); and

(d) The person must calculate MSCs in accordance with §335.558 of this title (relating to Medium Specific Concentrations for Risk Reduction Standard Number 2); and

(e) The person must determine any cross-media requirements and modifications to cleanup levels in accordance with §335.559 of this title (relating to Medium Specific Requirements and Adjustments for Risk Reduction Standard Number 2).

Effective June 28, 1993

§335.557. Criteria for Selection of Non-Residential Soil Requirements for Risk Reduction Standard Number 2.

All facilities or areas shall be subject to the residential soil requirements unless one of the conditions of paragraphs (1) - (3) of this section is satisfied for use of the non-residential soil requirements.

(1) For property located within the jurisdictional area of a zoning authority, persons may provide documentation that the property is zoned for commercial or industrial use.

(2) For property not located within the jurisdictional area of a zoning authority, persons may provide documentation that the activities being conducted on the property satisfy the definition for non-residential property (§335.553 of this title (relating to Definitions)).

(3) For government-owned (local, state or federal) property which does not satisfy either of the conditions of subsections (a) or (b) of this section but does have non-residential activities occurring on all or portions of the property, the person may provide documentation that access will be restricted such that the exposure assumptions remain valid for the duration of government control.

Effective June 28, 1993

§335.558. Medium Specific Concentrations for Risk Reduction Standard Number 2.

(a) Medium specific concentrations (MSCs) for ingestion of surface water and ground water, and soil ingestion along with inhalation of volatiles and particulates are calculated according to the procedures specified in subsections (b) -(d) of this section based on residential exposure factors. MSCs are subject to additional numeric criteria and adjustments of §335.559 of this title (relating to Medium Specific Requirements and Adjustments for Risk Reduction Standard Number 2). The derivation of all equations is presented in §335.567 of this title (relating to Appendix I).

(b) For a contaminant which is a carcinogen, the MSC is the concentration which represents an excess upper bound lifetime cancer Target Risk (TR) of 0.000001 (also expressed as one (1) in one million (1,000,000)) for Class A and B carcinogens, or 0.00001 (also expressed as one (1) in one hundred thousand (100,000)) for Class C carcinogens due to continuous lifetime exposure as calculated using the equations and factors listed in paragraghs (1) and (2) of this subsection.

(1) Water MSC for Ingestion, in units of milligrams per liter (mg/L):

$$\text{MSC} = \frac{85.16\ (\text{TR})}{\text{Sf}_o} \qquad \text{Equation 1}$$

where

Sf_o is the chemical-specific oral cancer slope factor.

(2) Soil MSC for Ingestion with Inhalation of volatiles and particulates, in units of milligram per kilogram (mg/kg):

$$\text{MSC} = \frac{5110\ (\text{TR})}{[((7.98 \text{ x } 10^{-3}) \text{ x } \text{SF}_o) + (\text{SF}_i \text{ x } [(450/\text{VF}) + (9.72 \text{ x } 10^{-8})])]} \qquad \text{Equation 2}$$

where

VF is the chemical-specific soil-to-air volatilization factor.

(c) For a contaminant which is a systemic toxicant, the MSC is the concentration to which human populations (including sensitive subgroups) could be exposed by direct ingestion or inhalation on a daily basis without appreciable risk of deleterious effects during a lifetime. The MSC is calculated using the equations and factors listed in paragraphs (1) and (2) of this subsection.

(1) Water MSC for Ingestion in units of milligram per liter (mg/L):

$$\text{MSC} = 36.5\ \text{RfD}_o\ \text{mg/L} \qquad \text{Equation 3}$$

where

RfD_o is the chemical-specific oral reference dose.

(2) Soil MSC for Ingestion with Inhalation of volatiles and particulates, in units of milligram per kilogram (mg/kg):

$$\text{MSC} = \frac{2190}{[(7.98 \text{ x } 10^{-3}/\text{RfD}_o) + ((1/\text{RfD}_i) \text{ x } [(450/\text{VF}) + (9.72 \text{ x } 10^{-8})])]}\ \text{mg/kg} \qquad \text{Equation 4}$$

where

VF is the chemical-specific soil-to-air volatilization factor.

(d) Examples of unadjusted MSCs, standards and criteria are listed in §335.568 of this title (relating to Appendix II: "Examples of Medium Specific Concentrations, Standards and Criteria for Health-Based Closure/Remediation (31 TAC §335.558)". The commission will revise Appendix II on an annual basis to reflect newly promulgated standards and MSCs based on current toxicological data.

Effective June 28, 1993

§335.559. Medium Specific Requirements and Adjustments for Risk Reduction Standard Number 2.

(a) Numeric cleanup levels. The subsections (b) - (h) of this section specify requirements that can define or modify numeric cleanup levels such as MSCs or require non-health based criteria to be addressed.

(b) Surface water. In determining the necessity for remediation at the facility, persons shall utilize Chapter 307 of this title (relating to Texas Surface Water Quality Standards) or, if those values are not available, Maximum Contaminant Levels (MCLs) promulgated under the Safe Drinking Water Act, or if MCLs are not available or appropriate, MSCs based upon human ingestion of the water. Any discharge or release into or adjacent to surface water, including storm water runoff, occurring during or after attainment of Risk Reduction Standard Number 2, shall be compliant with the Texas Surface Water Quality Standards of Chapter 307 of this title and may be subject to the permitting requirements of Chapter 305 of this title (relating to Consolidated Permits) or other authorization from the commission.

(c) Air. In determining the necessity for remediation at the facility, persons shall observe limitations established by the National Ambient Air Quality Standards (NAAQS) and the National Emission Standards for Hazardous Air Pollutants (NESHAPS) as found in the 40 Code of Federal Regulations (CFR) Parts 50 and 61, respectively, and other applicable federal standards and guidelines of the EPA. Also, limitations established by the commission under the Texas Clean Air Act, the state implementation plan or other federal requirements must be observed. Permit requirements, limitations established by standard exemptions, or other requirements of the commission relative to atmospheric emissions and/or air quality may also apply.

(d) Groundwater. The groundwater cleanup levels shall be determined by a consideration of the following.

(1) For residential exposure, the concentration of a contaminant dissolved in groundwater must not exceed the MCL, if promulgated pursuant the Federal Safe Drinking Water Act, §141, otherwise the water MSC for ingestion determined pursuant to §335.556 of this title (relating to Determination of Cleanup Levels for Risk Reduction Standard Number 2). Phase-separated non-aqueous liquids released from the unit that is undergoing closure or remediation must be removed or decontaminated.

(2) For nonresidential exposure, the concentration of a contaminant dissolved in groundwater must not exceed the MCL if promulgated pursuant to the Federal Safe Drinking Water

Act, §141. If no MCL has been promulgated, the groundwater concentration shall not exceed the water MSC for ingestion determined pursuant to §335.556 of this title, which has been multiplied by a factor of 3.36 for carcinogens or 2.8 for systemic toxicants to account for lower ingestion rates associated with nonresidential worker exposure. Persons must be able to demonstrate that the quality of groundwater at the facility property boundary will be protective for residential exposure. Phase-separated non-aqueous liquids released from the unit that is undergoing closure or remediation must be removed or decontaminated to the extent practicable.

(3) For residential and non-residential exposure, if the groundwater at the facility or area has a naturally occurring background total dissolved solids concentration greater than 10,000 milligrams per liter, the cleanup level for a contaminant dissolved in this groundwater determined pursuant to paragraph (1) or (2) of this subsection, as appropriate, may be adjusted by multiplying by 100. The resulting value becomes the maximum concentration for groundwater for residential and non-residential exposure, respectively.

(4) The executive director may require the evaluation of additional exposure pathways or environmental receptors as part of the adjustment of paragraph (3) of this subsection.

(e) Soil. For all situations, concentrations of contaminants in soils must be protective of surface water, air, and groundwater as specified in subsections (b) - (d) of this section. No soil remaining in place shall exhibit the hazardous waste characteristics of ignitability, corrosivity, or reactivity as defined in 40 CFR Part 261, Subpart C. The sum of concentrations of the volatile organic compounds in vapor phase in soil shall not exceed 1,000 parts per million by weight or volume, as measured by EPA Test Method 8015 or calculated by using soil concentrations and Henry's Law constants.

(f) Residential soil requirements. In addition to the requirements of subsection (e) of this section, the concentration of a contaminant throughout the soil column (i.e., surface and subsurface soils) shall not exceed the lower of the soil MSC, based upon residential human ingestion of soil and inhalation of particulates and volatiles (as defined in the preceeding section), and the residential soil-to-groundwater cross-media protection concentration, a numeric value which is determined as follows:

(1) a value which is 100 times the residential groundwater cleanup level determined by the procedures of subsection (d)(1) of this section. Examples of such values are listed in Appendix II; or

(2) a concentration in soil that does not produce a leachate in excess of MCLs or MSCs for groundwater when subjected to the Synthetic Precipitation Leaching Procedure, Method 1312 of SW 846, Test Methods for Evaluating Solid Waste, United States Environmental Protection Agency. Other test methods that more accurately simulate conditions at the facility may be used in the demonstration in place of this method, subject to prior approval of the executive director.

(g) Nonresidential soil requirements. Nonresidential soils shall conform to the requirements of subsection (e) of this section. The concentration of a contaminant in near-surface soils (i.e., within two feet of the land surface) shall not exceed the lower of the nonresidential soil MSC defined in paragraph

(1) of this subsection, based upon worker ingestion of soil and inhalation of particulates and volatiles, and the nonresidential soil-to-groundwater cross-media protection concentration defined in paragraph (2) of this subsection. In no event shall compliance be achieved with the surface soil criteria by applying two feet of clean soil onto the surface of a facility or area without prior approval from the executive director. The concentration of a contaminant in subsurface soils (i.e., greater than two feet in depth from the land surface) shall not exceed the nonresidential soil-to-groundwater cross-media protection concentration.

(1) Nonresidential soil MSC. The MSC is calculated using the equations and factors listed in subparagraphs (A) and (B) of this paragraph. The chemical-specific factors SF_o, SF_i, RfD_o, RfD_i, and VF are the same as for the soil MSCs of the preceding section. The derivation of all equations is presented in Appendix I.

(A) Carcinogenic effects equation, in units of milligram per kilogram (mg/kg):

$$\mathrm{MSC} = \frac{286.16\ (\mathrm{TR})\ \mathrm{mg/kg}}{[((5 \times 10^{-5}) \times SF_o) + (SF_i \times [(20/VF) + (4.3 \times 10^{-9})])]} \qquad \text{Equation 5}$$

(B) Systemic toxicant effects equation, in units of milligram per kilogram (mg/kg):

$$\mathrm{MSC} = \frac{102.2\ \mathrm{mg/kg}}{[(5 \times 10^{-5}/RfD_o) + ((1/RfD_i) \times [(20/VF) + (4.3 \times 10^{-9})])]} \qquad \text{Equation 6}$$

(2) Non-residential soil-to-ground water cross-media protection concentration. Persons must demonstrate that a contaminant in soil does not pose the potential for a future release of leachate in excess of the groundwater concentration considered to be protective for nonresidential worker exposure. Persons may make this demonstration by showing that a contaminant occurs in soil at less than the concentration described in either subparagraph (A) or (B) of this paragraph:

(A) a concentration which is 100 times the nonresidential groundwater cleanup level determined by the procedures of subsection(d)(2) or (3), as applicable, of this section.

(B) a concentration in soil that does not produce a leachate in excess of the groundwater concentration of this paragraph when subjected to the Synthetic Precipitation Leaching Procedure, Method 1312 of SW 846, Test Methods for Evaluating Solid Waste, U. S. Environmental Protection Agency. Other test methods that more accurately simulate conditions at the facility may be used in the demonstration in place of this method, subject to prior approval by the executive director.

(h) Other criteria. For contaminants that do not exceed standards or criteria protective of human health and environmental receptors as determined by the procedures of this section but otherwise adversely impact environmental quality, or the public welfare and safety, or present objectionable characteristics (e.g., taste, odor, etc.), or make a natural resource unfit for use, other scientifically valid published criteria may be utilized such as but not limited to threshold limit values for air and secondary maximum contaminant levels for water.

§335.560. Post Closure Care and Deed Certification for Risk Reduction Standard Number 2.

(a) Provided that attainment of this risk reduction standard for the facility can be demonstrated to the executive director pursuant to §335.555 of this title (relating to Attainment of Risk Reduction Standard Number 2), the conditions of subsections (b) and (c) of this section apply.

(b) The person is required to place in the county deed records of the county or counties in which such activities take place the information specified in paragraphs (1) - (4) of this subsection. The statements should be worded such that a lay person can easily understand them. An example format is provided in §335.569 of this title (relating to Appendix III). Proof of deed certification of the required information shall be provided to the executive director in writing no later than 90 days after acceptance of the report required by §335.555(f) of this title (relating to Attainment of Risk Reduction Standard Number 2).

(1) A certification signed by the person, showing the person's full name and title, and stating that closure or remediation of the facility or area was carried out in accordance with a plan designed to meet §335.555 of this title (relating to Risk Reduction Standard Number 2), which mandates that the remedy be designed to eliminate substantial present and future risk, such that no post-closure care or engineering or institutional control measures are required to protect human health and the environment.

(2) A metes and bounds description of the portion or portions of the tract of land on which closure or remediation of industrial solid waste, municipal hazardous waste or contaminants was achieved.

(3) For a facility that satisfies the conditions of §335.557 of this title (relating to Criteria for Selection of Non-Residential Soil Requirements for Risk Reduction Standard Number 2) for use of non-residential soil requirements, a statement that current or future owners of the facility must undertake actions as necessary to protect human health and the environment in accordance with the rules of the commission.

(4) A statement that information and documents concerning the closure or remediation of the facility or area are available for inspection upon request at the Texas Water Commission. The statement shall further describe the jurisdiction of the Texas Water Commission to review the establishment of the final cleanup criteria.

(c) The person is released from post-closure care responsi-bilities upon acceptance by the executive director of the proof of deed certification required by subsection (b) of this section.

Effective June 28, 1993

§335.561. Attainment of Risk Reduction Standard Number 3: Closure/Remediation With Controls.

(a) Compliance with this standard is attained when, in the evaluation of the executive director, the person recommends the remedy which best achieves the requirements of subsections (b) - (d) of this section taking into consideration the evaluation factors of §335.562 of this title (relating to Remedy Evaluation Factors) and then following approval subsequently completes the remedy, submits the final report required by §335.553(b)(4) of this title (relating to Required Information), initiates any post-closure care required by §335.565 of this title (relating to Post closure care required for Risk Reduction Standard Number 3) and completes the deed recordation requirements of §335.566 of this title (relating to Deed Recordation for Risk Reduction Standard Number 3).

(b) A remedy must be permanent or, if that is not practicable, achieve the highest degree of long-term effectiveness possible;

(c) A remedy must be cost-effective in that it achieves the best balance between long-term effectiveness and cost for alternative remedies which meet the cleanup objectives for a facility; and

(d) A remedy must achieve media cleanup requirements as specified pursuant to §335.563 of this title (relating to Media Cleanup Requirements for Risk Reduction Standard Number 3).

Effective June 28, 1993

§335.562. Remedy Evaluation Factors for Risk Reduction Standard Number 3.

(a) General. For closure/remediation in accordance with Risk Reduction Standard Number 3, persons shall consider the evaluation factors set forth in subsections (b) - (g) of this section when evaluating the relative abilities and effectiveness of potential remedies to achieve the requirements for remedies described in §335.561 of this title (relating to Attainment of Risk Reduction Standard Number 3). A description of the evaluation for these factors for the proposed remedy shall be included in the corrective measure study prepared pursuant to §335.553 (b) (3) of this title (relating to Required Information). Persons performing these evaluations shall submit to the executive director upon request such additional information as may reasonably be required to enable the executive director to determine whether such evaluation has been conducted in a manner compliant with this section.

(b) Compliance with other laws and regulations. Remedies shall be evaluated to determine attainment of cleanup requirements for other Texas or federal environmental laws which are either legally applicable to the facility or that address problems or situations that are sufficiently similar to those encountered at the facility that their use is well suited to the facility.

(c) Long-term effectiveness and permanence. Remedies shall be evaluated for long-term effectiveness. Factors that shall be considered in this evaluation include:

(1) Magnitude of risks remaining after completion of the closure or remedial action;

(2) The type, degree and duration of post-closure care required including but not limited to operation and maintenance, monitoring, inspections and reports and their frequencies, or other activities which will be necessary to protect human health and the environment;

(3) Potential for exposure of humans and environmental receptors to contaminants remaining at the facility;

(4) Long-term reliability of any engineering and voluntary institutional controls; and

(5) Potential need for replacement of components of the remedy.

(d) Reduction of toxicity, mobility, or volume. Remedies shall be evaluated to determine the degree to which treatment could be used to significantly and irreversibly reduce the toxicity, mobility or volume of contaminants. Factors to be considered in this evaluation include:

(1) The amount of contaminants that will be treated or destroyed;

(2) The degree of expected reduction in toxicity, mobility, or volume;

(3) The type, quantity, toxicity, and mobility of contaminants remaining after treatment; and

(4) The degree to which the treatment is irreversible.

(e) Short-term effectiveness. The short-term effects of remedies shall be evaluated considering the following:

(1) Short-term risks that might be posed to the community, workers, or the environment during implementation of the remedy and the effectiveness and reliability of protective measures; and

(2) Time until protection is achieved.

(f) Implementability. The ease or difficulty of implementing the remedies shall be evaluated by considering the following types of factors:

(1) Degree of difficulty associated with constructing the remedy;

(2) Expected operational reliability of the remedy;

(3) Availability of necessary equipment and specialists;

(4) Available capacity and location of needed treatment, storage, and disposal services.

(g) Cost. The types of costs that shall be evaluated include the following:

(1) Capital costs;

(2) Operation and maintenance costs; and

(3) Net present value of capital and operation and maintenance costs.

Effective June 28, 1993

§335.563. Media Cleanup Requirements for Risk Reduction Standard Number 3.

(a) General. For closure/remediation in accordance with Risk Reduction Standard Number 3, persons shall propose media cleanup levels in accordance with the conditions set forth in subsections (b) - (j) of this section.

(b) Carcinogens. For known or suspected carcinogens, media cleanup levels shall be established at concentrations which represent an excess upperbound lifetime risk of between one in 10,000 and one in one million. The executive director will use one in one million as a goal in establishing such concentration limits. The cumulative excess risk to exposed populations (including sensitive subgroups) shall not be greater than one in 10,000.

(c) Systemic toxicants. For systemic toxicants, media cleanup levels shall represent concentrations to which the human population (including sensitive subgroups) could be exposed on a daily basis without appreciable risk of deleterious effect during a lifetime or part of a lifetime and where:

(1) the hazard quotient, which is the ratio of a single systemic toxicant exposure level for a specified time period to a reference dose for that systemic toxicant derived from the same time period, shall not exceed one; and

(2) the hazard index shall not exceed one. The hazard index is the sum of the hazard quotients for a single or multiple systemic toxicants which affect the same target organ or act by the same method of toxicity and act through a single or multiple media exposure pathways.

(d) Additional considerations. In establishing media cleanup levels pursuant to subsections (b) and (c) of this section, the executive director may consider and may direct persons who submit plans or reports in accordance with §335.553(b) of this title (relating to Required Information) to address the following:

(1) multiple contaminants in a medium;

(2) exposure to multiple contaminated media;

(3) reasonable expected future exposure conditions at the facility; and

(4) the technical limitations, effectiveness, practicability, or other relevant features of available remedies.

(e) Standard exposure factors. In determining media cleanup levels pursuant to subsections (b) and (c) of this section, persons shall use the standard exposure factors for residential use of the facility as set forward in Table 1 (located in §335.553 of this title) unless the person documents to the satisfaction of the executive director that:

(1) site-specific data warrant deviation from the standard exposure factors; or

(2) a land use other than residential is more appropriate based on:

(A) historical, current, and probable future land use; and

(B) effectiveness of institutional or legal controls placed on the future use of the land.

(f) Air. Media cleanup levels for air will be established to meet the lowest of the values determined by the requirements of paragraphs (1) - (3) of this subsection.

(1) Concentrations of contaminants in air that emanate from a facility, area of soil contamination, or plume of contaminated groundwater shall not exceed:

(A) National Ambient Air Quality Standards (NAAQS), National Emission Standards for Hazardous Air Pollutants (NESHPAS) (as found in 40 Code of Federal Regulation Parts 50 and 61 respectively) and other applicable federal standards and guidelines of the Environmental Protection Agency; and

(B) concentrations established by the commission under the Texas Clean Air Act, the state implementation plan, or other federal requirements. Permit requirements, limitations established by standard exemptions, or other requirements relative to atmospheric emissions and/or air quality may also apply.

(2) For residential exposure conditions, concentrations of contaminants in air that emanate from a facility, area of soil contamination, or plume of contaminated ground water shall not exceed concentrations that satisfy subsections (b) - (e) of this section at exposure points located both within the contaminated area and at the property boundary.

(3) For nonresidential exposure conditions, concentrations of contaminants in air that emanate from a facility, area of soil contamination, or plume of contaminated groundwater shall not exceed either OSHA permissible exposure limits, threshold limit values or other criteria applicable to an industrial exposure setting within the facility boundaries or concentrations that satisfy subsections (b) - (e) of this section at the property boundary.

(g) Surface water. In determining the necessity for remediation at the facility, persons shall utilize Chapter 307 of this title (relating to Texas Surface Water Quality Standards) or, if those values are not available, maximum contaminant levels (MCLs) promulgated under the Safe Drinking Water Act or, if MCLs are not available or appropriate, values calculated pursuant to subsections (b) - (e) of this section based upon human ingestion of the water or other site-specific exposure pathway. Any discharge or release into or adjacent to surface water, including storm water runoff, occurring during or after attainment of Risk Reduction Standard Number 3, shall be compliant with Chapter 307 of this title and may be subject to the permitting requirements of Chapter 305 of this title (relating to Consolidated Permits) or other authorization from the commission.

(h) Groundwater. Media cleanup levels for groundwater that is a current or potential source of drinking water as defined in paragraph (1) of this subsection shall not exceed MCLs promulgated under the Safe Drinking Water Act or, if MCLs are not available, values calculated according to subsections (b) - (e) of this section based upon human ingestion of the water. Cleanup levels for groundwater may be subject to the modifications of paragraphs (2) - (4) of this subsection.

(1) Groundwater that has a background total dissolved solids (TDS) content less than or equal to 10,000 milligrams per liter (mg/L) and that occurs within a geologic zone that is sufficiently permeable to transmit water to a pumping well in usable quantities shall be considered a current or potential source of drinking water for the purpose of determining cleanup levels.

(2) The cleanup levels shall be achieved throughout the plume of contaminated groundwater, with the exception of the circumstances described in subparagraphs (A) - (C) of this paragraph:

(A) when alternate concentration limits of §335.160(b) of this title (relating to Alternate Concentration Limits) have been approved in a permit issued by the commission for a hazardous waste management facility;

(B) when the selected remedy calls for waste to be left in place and when appropriate control measures are installed or operated, the executive director may authorize the zone underlying the area encompassing the original source(s) of release to be excluded from this requirement;

(C) when the person documents to the executive director's satisfaction pursuant to subsection (e) of this section that a future land use other than residential is appropriate for the facility or area and further demonstrates that institutional or legal controls will effectively prevent use of the contaminated groundwater, the extent of plume remediation may be determined in a manner consistent with §335.160(b) of this title.

(3) The executive director may determine that remediation of groundwater to the extent required in paragraphs (1) or (2) of this subsection is not necessary if the person demonstrates to the executive director's satisfaction that:

(A) the contaminant is present in groundwater that is not a current or potential source of drinking water and the contaminated groundwater is not hydraulically connected with and is not likely to migrate to either surface water or to groundwater that is a current or potential source of drinking water; or

(B) restoration of the groundwater to these levels is technically impracticable.

(4) If a determination is made pursuant to paragraph (3) of this subsection, the executive director may require any alternative measures or cleanup levels that are necessary to protect human health and the environment. At a minimum, for all cases described in this subsection, phase-separated non-aqueous liquids shall be removed from groundwater zones to the extent practicable.

(i) Soil. Concentrations of contaminants in soil shall not exceed the following values:

(1) the values calculated pursuant to subsections (b) - (d) of this section based upon human ingestion of the soils at all points where direct contact exposure to the soils may occur; and

(2) values which will allow the air, surface water, and groundwater cleanup levels specified in subsections (f) - (h) of this section, respectively, to be maintained over time taking into account the effects of engineering controls.

(A) Such determinations shall be based on sound scientific principles including fate and transport evaluation of contaminant migration. Procedures and conclusions shall be documented to the satisfaction of the executive director.

(B) The executive director may require the evaluation of additional migration pathways beyond those listed in this section if determined necessary. Such additional pathways may include but are not limited to, food chain contamination, impairment of soil for agricultural purposes, phytotoxicity, accumulations of contaminants in sediment of surface water bodies, or other impairments of natural resources, land, or water use.

(j) Other adjustments. Cleanup levels may be adjusted according to paragraphs (1) - (3) of this subsection.

(1) If the practical quantitation limit (PQL) or the background concentration (represented by results of analyses of samples taken from media that are not affected by waste management or industrial activities) for a contaminant is greater than the cleanup level determined by procedures of this section, then the greater of the PQL or background shall become the cleanup level.

(2) Other scientifically valid published criteria, such as, but not limited to threshold limit values for air and secondary maximum contaminant levels for water, shall be utilized as cleanup levels for contaminants for which the procedures of this section are not appropriate (e.g., mixtures or substances that do not have toxicological data) or that do not exceed standards or criteria protective of human health as determined by the procedures of this section but otherwise adversely impact environmental quality, or the public welfare and safety, or present objectionable characteristics (e.g., taste, odor, etc.), or make a natural resource unfit for use.

(3) More stringent cleanup levels may be established for a facility than are specified in this section if, by utilizing available guidance or scientific literature, the executive director determines that it is necessary to protect environmental receptors.

§335.564. Post Closure Care not required for Risk Reduction Standard Number 3.

In cases under Risk Reduction Standard Number 3 where the executive director determines that neither engineering nor institutional control measures are required to protect human health and the environment, the person is released from post closure care responsibilities but is required to deed record the facility in accordance with §335.566 of this title (relating to Deed Recordation for Risk Reduction Standard Number 3).

Effective June 28, 1993

§335.565. Post closure care required for Risk Reduction Standard Number 3.

In cases under Risk Reduction Standard Number 3 where the executive director determines that either engineering or institutional control measures are required to protect human health and the environment, the person shall comply with the requirements of paragraphs (1) and (2) below, as applicable, and deed record the facility in accordance with §335.566 of this title (relating to Deed Recordation for Risk Reduction Standard Number 3).

(1) Carry out the post-closure requirements as evaluated and approved by the remedy evaluation process described in §335.562 of this title (relating to Remedy Evaluation Factors).

(2) For hazardous waste storage, processing or disposal facilities, the person must also satisfy the applicable requirements of Subchapters E and F of this chapter (relating to Interim Standards for Hazardous Waste Storage, Processing, or Disposal Facilities; and Permitting Standards for Owners and Operators of Hazardous Waste Storage, Processing, or Disposal Facilities, respectively).

Effective June 28, 1993

§335.566. Deed Recordation for Risk Reduction Standard Number 3.

(a) Within 90 days after acceptance by the executive director of the final report referenced in §335.561(a) of this title (relating to Attainment of Risk Reduction Standard Number 3), the person must record in the county deed records of the county or counties in which such activities take place the information specified in subsections (b) - (e) of this section and submit written proof of such recordation to the executive director. The statements should be worded such that a lay person can easily understand them. An example format is provided in §335.569 of this title (relating to Appendix III).

(b) A certification, signed by the person, showing the person's full name and title, and stating: that remediation of the facility or area was carried out in accordance with a plan designed to meet §335.561 of this title (relating to Risk Reduction Standard Number 3), which mandates that the remedy be designed to eliminate or reduce to the maximum extent practicable, substantial present and future risk; and whether continued post-closure care or engineering or institutional control measures ("Post-Closure Measures") are required to protect human health and the environment together with a description of any required Post-Closure Measures;

(c) A description of any institutional or legal controls placed by the person on the future use of the property. The notice shall indicate that the current or future owner must undertake actions as necessary to protect human health and the environment in accordance with the rules of the commission.

(d) A metes and bounds description of the portion or portions of the tract of land on which closure or remediation of industrial solid waste, municipal hazardous waste or contaminants was achieved; and

(e) A statement that information and documents concerning the closure or remediation of the facility or area are available for inspection upon request at the Texas Water Commission. The statement shall further describe the jurisdiction of the Texas Water Commission to review the establishment of the final cleanup criteria.

Effective June 28, 1993

§335.567. Appendix I.

Derivation of Reduced Equations for Calculation of Medium Specific Concentrations of Risk Reduction Standard Number 2.

Equation 1 - MSC for Ingestion of Water; Carcinogenic Effects:

$$\text{MSC} = \frac{85.16\ \text{TR}}{\text{Sf}_o}$$

is derived from the following expression:

$$\text{MSC} = \frac{\text{TR x BW x AT}_c \text{ x 365 days/yr}}{\text{Sf}_o \text{ x IR}_w \text{ x EF x ED x A}}$$

Equation 2 - MSC for Ingestion of Soils and Inhalation of Volatiles
and Particulates; Residential Scenario; Carcinogenic Effects:

$$\text{MSC} = \frac{5110\ \text{TR}}{[((7.98 \text{ x } 10^{-3}) \text{ x SF}_o) + (\text{SF}_i \text{ x } [(450/\text{VF}) + (9.72 \text{ x } 10^{-8})])]}$$

is derived from the following expression:

$$\text{MSC} = \frac{\text{TR x BW x AT}_c \text{ x 365 days/yr}}{\text{EF } [(\text{BW x SF}_o \text{ x } 10^{-6} \text{ Kg/mg x IF}_{soil/adj}) + (\text{SF}_i \text{ x ED x IR}_{air} \text{ x } [1/\text{VF} + 1/\text{PEF}])]}$$

Equation 3 - MSC for Ingestion of Water; Systemic Toxicant Effects:

$$\text{MSC} = 36.5\ \text{RfD}_o$$

is derived from the following expression:

$$\text{MSC} = \frac{\text{THI x RfD}_o \text{ x BW x AT}_s \text{ x 365 days/yr}}{\text{Ir}_w \text{ x EF x ED x A}}$$

Equation 4 - MSC for Ingestion of Soils and Inhalation of Volatiles and Particulates; Residential Scenario; Systemic Toxicant Effects:

$$\text{MSC} = \frac{2190}{[(7.98 \text{ x } 10^{-3}/\text{RfD}_o) + ((1/\text{RfD}_i) \text{ x } [(450/\text{VF}) + (9.72 \text{ x } 10^{-8})])]}$$

is derived from the following expression:

$$\text{MSC} = \frac{\text{THI x BW x AT}_s \text{ x 365 days/yr}}{\text{EF } [((1/\text{RfD}_o) \text{ x BW x } 10^{-6} \text{ Kg/mg x IF}_{soil/adj}) + ((1/\text{RfD}_i) \text{ x ED x IR}_{air} [1/\text{VF} + 1/\text{PEF}])]}$$

Equation 5 - MSC for Worker Ingestion of Soils and Inhalation of Volatiles and Particulates; Carcinogenic Effects:

$$\text{MSC} = \frac{286.16\ \text{TR}}{[((5 \text{ x } 10^{-5}) \text{ x SF}_o) + (\text{SF}_i \text{ x } [(20/\text{VF}) + (4.3 \text{ x } 10^{-9})])]}$$

is derived from the following expression:

$$\text{MSC} = \frac{\text{TR x BW x AT}_c \text{ x 365 days/yr}}{\text{EF x ED x } [(\text{SF}_o \text{ x } 10^{-6} \text{ Kg/mg x IR}_{soil}) + (\text{SF}_i \text{ x IR}_{air} \text{ x } [1/\text{VF} + 1/\text{PEF}])]}$$

Equation 6 - MSC for Worker Ingestion of Soils and Inhalation of Volatiles and Particulates; Systemic Toxicant Effects:

$$\text{MSC} = \underline{102.2}$$

$$[(5 \times 10^{-5}/RfD_o) + ((1/RfD_i) \times [(20/VF) + (4.3 \times 10^{-9})]])]$$

is derived from the following expression:

$$MSC = \frac{\text{THI} \times \text{BW} \times \text{AT}_c \times 365 \text{ days/yr}}{\text{EF} \times \text{ED} \times [((1/RfD_o) \times 10^{-6} \text{ Kg/mg} \times IR_{soil}) + ((1/RfD_i) \times IR_{air} \times (1/VF + 1/PEF))]}$$

VF: Parameters, Definitions and Values for the Soil to
Air Volatilization Factor

$$VF(m^3/kg) = \frac{(LS \text{ X } V \text{ X } DH)}{A} \quad \text{X} \quad \frac{(3.14 \text{ X } \square \text{ X } T)^{1/2}}{(2 \text{ X } D_{ei} \text{ X } E \text{ X } K_{as} \text{ X } 10^{-3} \text{ kg/g})}$$

SITE DATA/DEFAULT FACTORS:

LS	Length of contaminated area (m)	=	45
E	true soil porosity (unitless)	=	0.35
V	wind speed in mixing zone (m/s)	=	2.25
ps	true soil density (g/cm^3)	=	2.65
DH	diffusion height (m)	=	2
T	exposure interval (s)	=	7.90e+08
A	area of contamination (cm^2)	=	2.03e+07
OC	organic carbon content, soil fraction (unitless)	=	0.02

CHEMICAL SPECIFIC DATA:

D_i	Molecular Diffusivity (cm^2/s).
H	Henry's Law Constant (atm-m^3/mol).
K_{oc}	Organic Carbon Partition Coefficient (cm^3/g).
D_{ei}	Effective Diffusivity (cm^2/sec), calculated from Di X $E^{0.33}$.
Kd	Soil-water partition coefficient (cm^3/g), calculated from Koc X OC.

☐ $$\text{Alpha, (cm}^2\text{/s)} = \frac{(\text{Dei X E})}{\text{E} + (p_s)(1-\text{E})/K_{as}}$$

K_{as} Soil/air partition coefficient (g soil/cm^3 air). Calculated from $K_{as} = (H/Kd) \times 41$.

Parameters, Definitions and Values used in Equations 1 - 6 are displayed in the following table:

Parameters	Definitions (Units)	Values
MSC	Medium Specific Concentration (mg/Kg)	chemical-specific
TR	Target excess individual lifetime cancer risk (unitless)	10^{-6} for Class A and B carcinogens; 10^{-5} for Class C carcinogens
THI	Target hazard index (unitless)	1
SF_o	Oral cancer slope factor ((mg/Kg-day)$^{-1}$)	chemical-specific
SF_i	Inhalation cancer slope factor ((mg/Kg-day)$^{-1}$)	chemical-specific
RfD_o	Oral chronic reference dose (mg/Kg-day)	chemical-specific
RfD_i	Inhalation chronic reference dose (mg/Kg-day)	chemical-specific
BW	Adult body weight (Kg)	70 Kg
AT_c	Averaging time for carcinogens (yr)	70 yr
AT_s	Averaging time for systemic toxicants (yr)	30 yr residential 25 yr worker
EF	Exposure frequency (days/yr)	350 residential 250 worker
ED	Exposure duration (yr)	30 yr residential 25 yr worker
IR_w	Daily water ingestion rate (liter/day)	2 l/day residential 1 l/day worker
IR_{soil}	Workday soil ingestion rate (mg/day)	50 mg/day
$IF_{soil/adj}$	Age-adjusted ingestion factor (mg-yr/Kg-day)	114 mg-yr/Kg-day
IR_{air}	Daily indoor inhalation rate (m^3/day)	15 m^3/day residential 20 m^3/8 hr day worker
PEF	Particulate emission factor (m^3/Kg)	4.63 x 10^9 m^3/Kg
VF	Soil-to-air volatilization factor	chemical-specific
A	Absorption factor	1

Reference: U.S. EPA, OSWER Directive 9285.7-01B, Dec. 13, 1991, Human Health Evaluation Manual, Part B: "Development of Risk-based Preliminary Remediation Goals"

Effective June 28, 1993

§335.568. Appendix II.

Examples of Medium-Specific Concentrations, Standards and Criteria for Health-Based Closure/Remediation (See §335.558 of this title (relating to Medium Specific Consentration of Risk Reduction Standards Number 2.))

CAS # = Chemical Abstracts Service Number for the Specific Compound.

GW = Ground Water. Maximum Concentration in Ground Water (mg/L) for residential exposure conditions.

GWP-Res = Ground-Water Protection Standard for Residential Use. Concentration in Residential Soil Assumed Protective of Ground Water Considering Cross-media Contamination of Ground Water from Contaminated Soil (mg/kg).

GWP-Ind = Ground-Water Protection Standard for Industrial Use. Concentration in Industrial Soil Assumed Protective of Ground Water Considering Cross-media Contamination of Ground Water from Contaminated Soil (mg/kg).

SAI-Res = Soil/Air and Ingestion Standard for Residential Use. Maximum Concentration in Residential Soil Considering Cross-media Contamination of Air and the Human Ingestion and Inhalation Pathways (mg/kg).

SAI-Ind = Soil/Air and Ingestion Standard for Industrial Use. Maximum Concentration in Industrial Soil Considering Cross-media Contamination of Air and the Human Ingestion and Inhalation Pathways (mg/kg).

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CONSTITUENT	CAS #	GW (1-4)	GWP-Res (1,5)	GWP-Ind (1,6)	SAI-Res (1,7,10,11)	SAI-Ind (1,8,10,11)
Acenaphthene	83-32-9	2.19e+00	2.19e+02	6.13e+02	1.34e+04 (13)	4.43e+04 (13)
Acetone	67-64-1	3.65e+00	3.65e+02	1.02e+03	3.82e+03 (13)	4.16e+03 (13)
Acetonitrile	75-05-8	2.19e-01	2.19e+01	6.13e+01	1.65e+03	1.23e+04
Acetophenone	98-86-2	3.65e+00	3.65e+02	1.02e+03	2.26e+04	8.15e+04
Acrolein	107-02-8	7.30e-01 (12)	7.30e+01	2.04e+02	1.56e+03 (12)	2.04e+04 (12)
Acrylamide	79-06-1	1.89e-05	1.89e-03	6.36e-03	1.42e-01	1.27e+00
Acrylonitrile	107-13-1	1.58e-04	1.58e-02	5.30e-02	1.15e-01 (13)	1.44e-01 (13)
Alachlor	15972-60-8	2.00e-03 (9)	2.00e-01	2.00e-01	7.95e+00	7.10e+01
Aldicarb	116-06-3	3.00e-03 (9)	3.00e-01	3.00e-01	5.49e+01	4.09e+02
Aldicarb Sulfone	1646-88-4	2.00e-03 (9)	2.00e-01	2.00e-01	8.23e+01	6.13e+02
Aldicarb Sulfoxide	1646-88-3	4.00e-03 (9)	4.00e-01	4.00e-01	5.49e+01	4.09e+02

CONSTITUENT	CAS #	GW (1-4)	GWP-Res (1,5)	GWP-Ind (1,6)	SAI-Res (1,7,10,11)	SAI-Ind (1,8,10,11)
Aldrin	309-00-2	5.01e-06	5.01e-04	1.68e-03	3.77e-02	3.36e-01
Aluminum Phosphide	20859-73-8	1.46e-02	1.46e+00	4.09e+00	1.10e+02	8.18e+02
Aniline	62-53-3	1.49e-02	1.49e+00	5.02e+00	4.18e-02 (13)	4.80e-02 (13)
Anthracene	120-12-7	1.10e+01	1.10e+03	3.07e+03	5.91e+04 (13)	1.51e+05 (13)
Antimony	7440-36-0	6.00e-03 (9)	6.00e-01	6.00e-01	1.10e+02	8.18e+02
Arsenic	7440-38-2	5.00e-02 (9)	5.00e+00	5.00e+00	3.66e-01	3.27e+00
Atrazine	1912-24-9	3.00e-03 (9)	3.00e-01	3.00e-01	2.88e+01	2.58e+02
Barium (ionic)	7440-39-3	2.00e+00 (9)	2.00e+02	2.00e+02	1.91e+04	1.37e+05
Benzene	71-43-2	5.00e-03 (9)	5.00e-01	5.00e-01	1.33e+00 (13)	1.62e+00 (13)
Benzidine	92-87-5	3.70e-07	3.70e-05	1.24e-04	2.78e-03	2.49e-02
Beryllium	7440-41-7	4.00e-03 (9)	4.00e-01	4.00e-01	1.49e-01	1.33e+00

CONSTITUENT	CAS #	GW (1-4)	GWP-Res (1,5)	GWP-Ind (1,6)	SAI-Res (1,7,10,11)	SAI-Ind (1,8,10,11)
Biphenyl	92-52-4	1.83e+00	1.83e+02	5.11e+02	6.68e+03 (13)	1.11e+04 (13)
Bis (2-chloro-ethyl) ether	111-44-4	7.74e-05	7.74e-03	2.60e-02	2.20e-01 (13)	3.77e-01 (13)
Bis (2-chloroisopropyl) ether	39638-32-9	1.22e-02	1.22e+00	4.09e+00	4.50e+01 (13)	9.05e+01 (13)
Bis (2-ethyl-hexyl) phthalate	117-81-7	6.08e-03	6.08e-01	2.04e+00	4.57e+01	4.09e+02
Bromodichloromethane	75-27-4	1.00e-01 (9)	1.00e+01	1.00e+01	7.19e-01 (13)	9.46e-01 (13)
Bromoform	75-25-2	1.00e-01 (9)	1.00e+01	1.00e+01	8.11e+01	7.24e+02
Bromomethane	74-83-9	5.11e-02	5.11e+00	1.43e+01	2.44e+01 (13)	2.47e+01 (13)
Butyl-4,6-dinitrophenol, 2-sec-	88-85-7	3.65e-02	3.65e+00	1.02e+01	2.74e+02	2.04e+03
Cadmium	7440-43-9	5.00e-03 (9)	5.00e-01	5.00e-01	1.37e+02	1.02e+03
Carbofuran	1563-66-2	4.00e-02 (9)	4.00e+00	4.00e+00	1.37e+03	1.02e+04

CONSTITUENT	CAS #	GW (1-4)	GWP-Res (1,5)	GWP-Ind (1,6)	SAI-Res (1,7,10,11)	SAI-Ind (1,8,10,11)
Carbon Disulfide	75-15-0	3.65e+00	3.65e+02	1.02e+03	2.45e+01 (13)	2.34e+01 (13)
CarbonTetrachloride	56-23-5	5.00e-03 (9)	5.00e-01	5.00e-01	4.14e-01 (13)	5.13e-01 (13)
Chlordane	57-74-9	2.00e-03 (9)	2.00e-01	2.00e-01	4.93e-01	4.40e+00
Chloroanaline, p-	106-47-8	1.46e-01	1.46e+01	4.09e+01	1.10e+03	8.18e+03
Chlorobenzene	108-90-7	1.00e-01 (9)	1.00e+01	1.00e+01	2.56e+02 (13)	2.56e+02 (13)
Chlorobenzilate	510-15-6	7.30e-01	7.30e+01	2.04e+02	5.49e+03	4.09e+04
Chloroethane (Ethylchloride)	75-00-3	7.30e-01	7.30e+01	2.04e+02	4.99e+03 (13)	2.30e+04 (13)
Chloroform	67-66-3	1.00e-01 (9)	1.00e+01	1.00e+01	4.37e-01 (13)	5.04e-01 (13)
Chloronaphthalene, 2-	91-58-7	2.92e+00	2.92e+02	8.18e+02	2.20e+04	1.64e+05
2-chlorophenol	95-57-8	1.83e-01	1.83e+01	5.11e+01	1.37e+03	1.02e+04
Chromium (total)	7440-47-3	1.00e-01 (9)	1.00e+01	1.00e+01	3.91e+02 (12)	5.11e+03 (12)

CONSTITUENT	CAS #	GW (1-4)	GWP-Res (1,5)	GWP-Ind (1,6)	SAI-Res (1,7,10,11)	SAI-Ind (1,8,10,11)
Chromium (VI)	7440-47-3	1.00e-01 (9)	1.00e+01	1.00e+01	3.91e+02 (12)	5.11e+03 (12)
Cresol, m-	108-39-4	1.83e+00 (12)	1.83e+02	5.11e+02	3.91e+03 (12)	5.11e+04 (12)
Cresol, o-	95-48-7	1.83e+00 (12)	1.83e+02	5.11e+02	3.91e+03 (12)	5.11e+04 (12)
Cresol, p-	106-44-5	1.83e+00 (12)	1.83e+02	5.11e+02	3.91e+03 (12)	5.11e+04 (12)
Cyanide	57-12-5	2.00e-01 (9)	2.00e+01	2.00e+01	5.49e+03	4.09e+04
DDD	72-54-8	3.55e-04	3.55e-02	1.19e-01	2.67e+00	2.38e+01
DDE	72-55-9	2.50e-04	2.50e-02	8.41e-02	1.88e+00	1.68e+01
DDT	50-29-3	2.50e-04	2.50e-02	8.41e-02	1.88e+00	1.68e+01
Di-n-butyl phthalate	84-74-2	3.65e+00	3.65e+02	1.02e+03	2.74e+04	2.04e+05
Di-n-octyl phthalate	117-81-7	7.30e-01	7.30e+01	2.04e+02	5.49e+03	4.09e+04
Dibromo-3-chloropropane, 1,2-	96-12-8	2.00e-04 (9)	2.00e-02	2.00e-02	4.57e-01	4.09e+00

CONSTITUENT	CAS #	GW (1-4)	GWP-Res (1,5)	GWP-Ind (1,6)	SAI-Res (1,7,10,11)	SAI-Ind (1,8,10,11)
Dibromochloromethane	124-48-1	1.00e-01 (9)	1.00e+01	1.00e+01	7.62e+01	6.81e+02
Dichlorobenzene (1,2)	95-50-1	6.00e-01 (9)	6.00e+01	6.00e+01	6.69e+03 (13)	8.39e+03 (13)
Dichlorobenzene (1,3)	541-73-1	6.00e-01 (9)	6.00e+01	6.00e+01	7.61e+03 (13)	9.99e+03 (13)
Dichlorobenzene (1,4)	106-46-7	7.50e-02 (9)	7.50e+00	7.50e+00	8.64e+01 (13)	1.38e+02 (13)
Dichlorodifluoromethane	75-71-8	7.30e+00	7.30e+02	2.04e+03	5.00e+01 (13)	4.79e+01 (13)
Dichloroethane (1,1)	75-34-3	3.65e+00	3.65e+02	1.02e+03	7.30e+03 (13)	2.04e+04 (13)
Dichloroethane (1,2)	107-06-2	5.00e-03 (9)	5.00e-01	5.00e-01	4.17e-01 (13)	5.05e-01 (13)
Dichloroethylene (1,1)	75-35-4	7.00e-03 (9)	7.00e-01	7.00e-01	7.15e-01 (13)	8.72e-01 (13)
Dichloroethylene, cis-(1,2)	156-59-2	7.00e-02 (9)	7.00e+00	7.00e+00	1.08e+02 (13)	1.08e+02 (13)
Dichloroethylene, trans-(1,2)	156-60-5	1.00e-01 (9)	1.00e+01	1.00e+01	2.56e+02 (13)	2.56e+02 (13)
Dichlorophenol, 2,4-	120-83-2	1.10e-01	1.10e+01	3.07e+01	8.23e+02	6.13e+03

CONSTITUENT	CAS #	GW (1-4)	GWP-Res (1,5)	GWP-Ind (1,6)	SAI-Res (1,7,10,11)	SAI-Ind (1,8,10,11)
Dichlorophenoxyacetic acid, 2,4-	94-75-7	7.00e-02 (9)	7.00e+00	7.00e+00	2.74e+03	2.04e+04
Dichloropropane (1,2)	78-87-5	5.00e-03 (9)	5.00e-01	5.00e-01	6.88e-01 (13)	8.43e-01 (13)
Dieldrin	60-57-1	5.32e-06	5.32e-04	1.79e-03	4.00e-02	3.57e-01
Diethyl phthalate	84-66-2	2.92e+01	2.92e+03	8.18e+03	2.20e+05	NHHB (16)
Diethylhexyl adipate	103-23-1	5.00e-01 (9)	5.00e+01	5.00e+01	5.34e+03	4.77e+04
Dimethoate	60-51-5	7.30e-03	7.30e-01	2.04e+00	5.49e+01	4.09e+02
Dimethyl phenol, 2,4-	105-67-9	7.30e-01	7.30e+01	2.04e+02	5.49e+03	4.09e+04
Dinitrobenzene, 1,3-	99-65-0	3.65e-03	3.65e-01	1.02e+00	2.74e+01	2.04e+02
Dinitrophenol, 2,4-	51-28-5	7.30e-02	7.30e+00	2.04e+01	5.49e+02	4.09e+03
Dioxane (1,4)	123-91-1	7.74e-03	7.74e-01	2.60e+00	1.55e+01 (13)	2.31e+01 (13)
Diphenylamine	122-39-4	9.13e-01	9.13e+01	2.56e+02	6.86e+03	5.11e+04

CONSTITUENT	CAS #	GW (1-4)	GWP-Res (1,5)	GWP-Ind (1,6)	SAI-Res (1,7,10,11)	SAI-Ind (1,8,10,11)
Diphenylhydrizine, 1,2-	122-66-7	1.06e-04	1.06e-02	3.58e-02	8.00e-01	7.15e+00
Disulfoton	298-04-4	1.46e-03	1.46e-01	4.09e-01	1.10e+01	8.18e+01
Endosulfan	115-29-7	1.83e-03	1.83e-01	5.11e-01	1.37e+01	1.02e+02
Endothall	145-73-3	1.00e-01 (9)	1.00e+01	1.00e+01	5.49e+03	4.09e+04
Endrin	72-20-8	2.00e-03 (9)	2.00e-01	2.00e-01	8.23e+01	6.13e+02
Ethoxy ethanol, 2-	110-80-5	1.46e+01	1.46e+03	4.09e+03	1.10e+05	8.17e+05
Ethoxyethanol acetate, 2-	111-15-9	1.10e+01	1.10e+03	3.07e+03	8.23e+04	6.13e+05
Ethyl benzene	100-41-4	7.00e-01 (9)	7.00e+01	7.00e+01	1.14e+04 (13)	1.70e+04 (13)
Ethylene dibromide	106-93-4	5.00e-05 (9)	5.00e-03	5.00e-03	7.09e-03 (13)	4.53e-02 (13)
Ethylene glycol	107-21-1	7.30e+01	7.30e+03	2.04e+04	5.49e+05	NHHB (16)
Ethylene oxide	75-21-8	8.35e-05	8.35e-03	2.80e-02	1.11e-01 (13)	1.51e-01 (13)

CONSTITUENT	CAS #	GW (1-4)	GWP-Res (1,5)	GWP-Ind (1,6)	SAI-Res (1,7,10,11)	SAI-Ind (1,8,10,11)
Fluoranthene	206-44-0	1.46e+00	1.46e+02	4.09e+02	1.10e+04	8.18e+04
Fluorene	86-73-7	1.46e+00	1.46e+02	4.09e+02	9.60e+03 (13)	3.87e+04 (13)
Fluorides	7782-41-4	4.00e+00 (9)	4.00e+02	4.00e+02	1.65e+04	1.23e+05
Formaldehyde	50-00-0	7.30e+00 (12)	7.30e+02	2.04e+03	1.56e+04 (12)	2.04e+05 (12)
Heptachlor	76-44-8	4.00e-04 (9)	4.00e-02	4.00e-02	1.42e-01	1.27e+00
Heptachlor epoxide	1024-57-3	2.00e-04 (9)	2.00e-02	2.00e-02	7.04e-02	6.29e-01
Hexachlorobenzene	118-74-1	1.00e-03 (9)	1.00e-01	1.00e-01	4.00e-01	3.57e+00
Hexachlorobutadiene	87-68-3	1.09e-02	1.09e+00	3.67e+00	8.21e+01	7.33e+02
Hexachlorocyclohexane, alpha	319-84-6	1.35e-05	1.35e-03	4.54e-03	1.02e-01	9.08e-01
Hexachlorocyclohexane, beta	319-85-7	4.73e-04	4.73e-02	1.59e-01	3.56e+00	3.18e+01
Hexachlorocyclohexane, gama	58-89-9	2.00e-04 (9)	2.00e-02	2.00e-02	8.23e+01	6.13e+02

CONSTITUENT	CAS #	GW (1-4)	GWP-Res (1,5)	GWP-Ind (1,6)	SAI-Res (1,7,10,11)	SAI-Ind (1,8,10,11)
Hexachloroethane	67-72-1	6.08e-02	6.08e+00	2.04e+01	4.57e+02	4.09e+03
Isobutyl alcohol	78-83-13	1.10e+01	1.10e+03	3.07e+03	8.23e+04	6.13e+05
Lead (inorganic)	7439-92-1	1.50e-02 (9)	1.50e+00	1.50e+00	5.00e+02 (14)	1.00e+03 (14)
Mercury	7439-97-6	2.00e-03 (9)	2.00e-01	2.00e-01	8.23e+01	6.13e+02
Methomyl	16752-77-5	9.13e-01	9.13e+01	2.56e+02	6.86e+03	5.11e+04
Methoxy ethanol	109-86-4	1.46e-01	1.46e+01	4.09e+01	1.10e+03	8.18e+03
Methoxychlor	72-43-5	4.00e-02 (9)	4.00e+00	4.00e+00	1.37e+03	1.02e+04
Methoxyethanol acetate	110-49-6	7.30e-02	7.30e+00	2.04e+01	5.49e+02	4.09e+03
Methyl Ethyl Ketone	78-93-3	1.83e+00	1.83e+02	5.11e+02	7.58e+03 (13)	1.40e+04 (13)
Methyl isobutyl ketone	108-10-1	1.83e+00	1.83e+02	5.11e+02	1.37e+04	1.02e+05
Methyl methacrylate	80-62-6	2.92e+00	2.92e+02	8.18e+02	6.74e+02 (13)	6.63e+02 (13)

CONSTITUENT	CAS #	GW (1-4)	GWP-Res (1,5)	GWP-Ind (1,6)	SAI-Res (1,7,10,11)	SAI-Ind (1,8,10,11)
Methylene Chloride	75-09-2	5.00e-03 (9)	5.00e-01	5.00e-01	1.07e+01 (13)	1.38e+01 (13)
Naphthalene	91-20-3	1.46e+00	1.46e+02	4.09e+02	4.91e+03 (13)	7.72e+03 (13)
Nickel	7440-02-0	1.00e-01 (9)	1.00e+01	1.00e+01	1.56e+03 (12)	2.04e+04 (12)
Nitrate	14797-55-8	1.00e+01 (9)	1.00e+03	1.00e+03	4.39e+05	NHHB (16)
Nitrite	14797-65-0	1.00e+00 (9)	1.00e+02	1.00e+02	2.74e+04	2.04e+05
Nitrobenzene	98-95-3	1.83e-02	1.83e+00	5.11e+00	6.48e+01 (13)	1.06e+02 (13)
Nitroso-methyl-ethyl-amine, n-	10595-95-6	3.87e-06	3.87e-04	1.30e-03	2.91e-02	2.60e-01
Nitrosodi-n-propylamine, n-	621-64-7	1.22e-05	1.22e-03	4.09e-03	9.15e-02	8.17e-01
Nitrosodiethylamine, n-	55-18-5	5.68e-07	5.68e-05	1.91e-04	4.27e-03	3.81e-02
Nitrosodimethylamine, n-	62-75-9	1.67e-06	1.67e-04	5.61e-04	1.26e-02	1.12e-01
Nitrosopryyolidine, n-	930-55-2	4.06e-05	4.06e-03	1.36e-02	3.05e-01	2.72e+00

CONSTITUENT	CAS #	GW (1-4)	GWP-Res (1,5)	GWP-Ind (1,6)	SAI-Res (1,7,10,11)	SAI-Ind (1,8,10,11)
Pentachloronitrobenzene	82-68-8	3.28e-03	3.28e-01	1.10e+00	2.46e+01	2.20e+02
Pentachlorophenol	87-86-5	1.00e-03 (9)	1.00e-01	1.00e-01	5.34e+00	4.77e+01
Phenol	108-95-2	2.19e+01	2.19e+03	6.13e+03	1.65e+05	NHHB (16)
Phthalic anhydride	85-44-9	7.30e+01	7.30e+03	2.04e+04	5.49e+05	NHHB (16)
Polychlorinated biphenyls	1336-36-3	5.00e-04 (9)	5.00e-02	5.00e-02	1.00e+01 (15)	2.50e+01 (15)
Pronamide	23950-58-5	2.74e+00	2.74e+02	7.67e+02	2.06e+04	1.53e+05
Pyrene	129-00-0	1.10e+00	1.10e+02	3.10e+02	8.20e+03	6.10e+04
Pyridine	110-86-1	3.65e-02	3.65e+00	1.02e+01	2.74e+02	2.04e+03
Selenium	7782-49-2	5.00e-02 (9)	5.00e+00	5.00e+00	1.37e+03	1.02e+04
Silver	7440-22-4	1.83e-01	1.83e+01	5.11e+01	1.37e+03	1.02e+04
Strychnine	57-24-9	1.10e-02	1.10e+00	3.07e+00	8.23e+01	6.13e+02

CONSTITUENT	CAS #	GW (1-4)	GWP-Res (1,5)	GWP-Ind (1,6)	SAI-Res (1,7,10,11)	SAI-Ind (1,8,10,11)
Styrene	100-42-5	1.00e-01 (9)	1.00e+01	1.00e+01	2.13e+01	1.91e+02
Tetrachlorobenzene, 1,2,4,5-	95-94-3	1.10e-02	1.10e+00	3.07e+00	8.23e+01	6.13e+02
Tetrachloroethane (1,1,1,2)	630-20-6	3.28e-02	3.28e+00	1.10e+01	4.59e+01 (13)	6.29e+01 (13)
Tetrachloroethane (1,1,2,2)	79-34-5	4.26e-03	4.26e-01	1.43e+00	8.00e+00 (13)	1.17e+01 (13)
Tetrachloroethylene	127-18-4	5.00e-03 (9)	5.00e-01	5.00e-01	7.93e+01 (13)	2.07e+02 (13)
Tetrachlorophenol, 2,3,4,6-	58-90-2	1.10e+00	1.10e+02	3.07e+02	8.23e+03	6.13e+04
Tetraethyl dithiopyrophosphate	3689-24-5	1.83e-02	1.83e+00	5.11e+00	1.37e+02	1.02e+03
Toluene	108-88-3	1.00e+00 (9)	1.00e+02	1.00e+02	3.58e+03 (13)	3.63e+03 (13)
Toxaphene	8001-35-2	3.00e-03 (9)	3.00e-01	3.00e-01	5.82e-01	5.20e+00
TP Silvex, 2,4,5-	93-72-1	5.00e-02 (9)	5.00e+00	5.00e+00	2.20e+03	1.64e+04
Trichlorobenzene (1,2,4)	120-82-1	7.00e-02 (9)	7.00e+00	7.00e+00	6.78e+02 (13)	8.28e+02 (13)

CONSTITUENT	CAS #	GW (1-4)	GWP-Res (1,5)	GWP-Ind (1,6)	SAI-Res (1,7,10,11)	SAI-Ind (1,8,10,11)
Trichloroethane (1,1,1)	71-55-6	2.00e-01 (9)	2.00e+01	2.00e+01	9.63e+03 (13)	1.40e+04 (13)
Trichloroethane (1,1,2)	79-00-5	5.00e-03 (9)	5.00e-01	5.00e-01	1.27e+01 (13)	1.62e+01 (13)
Trichloroethylene	79-01-6	5.00e-03 (9)	5.00e-01	5.00e-01	2.40e+00 (13)	2.85e+00 (13)
Trichlorofluoromethane	75-69-4	1.10e+01	1.10e+03	3.07e+03	8.73e+00 (13)	8.36e+00 (13)
Trichlorophenol (2,4,5)	95-95-4	3.65e+00	3.65e+02	1.02e+03	8.08e+03 (13)	1.04e+04 (13)
Trichlorophenol, 2,4,6-	88-06-2	7.74e-03	7.74e-01	2.60e+00	5.82e+01	5.20e+02
Trichlorophenoxyacetic acid, 2,4,5-	93-76-5	3.65e-01	3.65e+01	1.02e+02	2.74e+03	2.04e+04
Trichloropropane, 1,1,2-	598-77-6	1.83e-01	1.83e+01	5.11e+01	1.37e+03	1.02e+04
Trichloropropane, 1,2,3-	96-18-4	2.19e-01	2.19e+01	6.13e+01	1.65e+03	1.23e+04
Trinitrobenzene, 1,3,5-	99-35-4	1.83e-03	1.83e-01	5.11e-01	1.37e+01	1.02e+02
Vinyl acetate	108-05-4	3.65e+01	3.65e+03	1.02e+04	2.74e+05	2.04e+06

CONSTITUENT	CAS #	GW (1-4)	GWP-Res (1,5)	GWP-Ind (1,6)	SAI-Res (1,7,10,11)	SAI-Ind (1,8,10,11)
Vinyl Chloride	75-01-4	2.00e-03 (9)	2.00e-01	2.00e-01	1.99e-02 (13)	2.41e-02 (13)
Xylene	1330-20-7	1.00e+01 (9)	1.00e+03	1.00e+03	5.47e+03 (13)	5.80e+03 (13)

(1) Concentrations for constituents are expressed in scientific notation. Examples 2.20E-00 = 2.2; 2.20E+02 = 220; and 2.20E-01 = 0.22.

(2) The development of final cleanup levels may involve other factors as described in this subchapter, such as cumulative health effects, that are not considered in this chapter.

(3) Ground-water concentrations are based on Maximum Contaminant Levels (MCLs) or the formula and parameters for residential use of ground water which are contained in 31 TAC §335.567 (relating to Appendix I). For non-residential exposure conditions, the ground water concentrations are calculated using the procedures of §335.559(d)(2) or (3).

(4) For some constituents, the Practical Quantitation Limit (PQL) may be the appropriate Ground Water MSC as described in 31 TAC 335.555(d)(1) of this rule. See 40 Code of Federal Regulations Part 264 (Appendix IX) for a list of ground-water PQLs.

(5) Residential soil ground-water protection concentrations are based on a multiplication factor of 100 times the ground-water MSC.

(6) Industrial soil ground-water protection concentrations are based on a multiplication factor of 100 times the MCL or, when an MCL is not available, a factor of 100 times the ground-water concentration calculated using the formula and parameters which are contained in 31 TAC §335.559(d)(2) or (3) of this title.

(7) Residential soil concentrations (maximum) are calculated using the formula and parameters for residential land use which are contained in §335.567 of this title (relating to Appendix I). The person must also demonstrate that ground water is protected and that no nuisance conditions exist (31 TAC §335.559(a)-(h) of this title).

(8) Industrial soil concentrations (maximum) are calculated using the formula and parameters for industrial land use which are contained in 31 TAC §335.567 of this title (relating to Appendix I). The person must also demonstrate that ground water is protected and that no nuisance conditions exist (31 TAC §335.559(a)-(h) of this title).

(9) The final, proposed or listed Maximum Contaminant Level (MCL), from Section 141 of the Federal Safe Drinking Water Act. For lead, the Action Level for lead in drinking water is used as the MSC.

(10) All concentrations were calculated using data from the Integrated Risk Information System (IRIS) Chemical Files, or data from the Health Effects Assessment Summary Tables (HEAST), developed by the United States Environmental Protection Agency, Office of Research and Development and Office of Health and Environmental Assessment, Washington, D.C. 20460. The toxicity information, and the MSCs, will be updated as new information becomes available.

(11) In some cases, an oral Reference Dose (RFD) or an oral Slope Factor (SF) was substituted for the inhalation RFD or inhalation SF in calculating MSC. This MSC will be updated when this information becomes available.

(12) The MSCs calculated for this compound are based on noncarcinogenic effects. The following formula was used for calculating the soil MSCs: MSC = [(oral RFD)(Body Weight)(ED)(365 days/yr)]/[(EF)(ED)(IR)(CF)]. For residential soils, the following exposure factors were used: BW = 15 Kg; ED = 5 years; EF = 350 days/year; IR = 200 mg/day. For industrial soils, the following exposure factors were used: BW = 70 Kg; ED = 25 years; EF = 250 days/year; IR = 100 mg/day. In both cases, the CF is 0.000001 kg/mg. When oral slope factors become available, these MSCs will be revised.

(13) As described in 31 TAC §335.559(e) of this title, the sum of concentrations of the volatile organic compounds in vapor phase in soil shall not exceed 1,000 ppm by weight or volume.

(14) The MSC for lead in soil is based on values calculated by the United States EPA using the Lead Uptake/Biokinetic Model, Version 0.4, which has been developed by the United States EPA Office of Health & Environmental Assessment.

(15) Soil MSCs for polychlorinated biphenyls are based upon the 4/2/87 TSCA regulations, 40 Code of Federal Regulation 761.125 (see 52 FR 10688).

(16) NHHB = Not Human Health Based. The SAI-Ind MSC for this compound exceeds 10e+6 ppm, which means it is not toxic to humans when exposed to soils under these assumptions. Persons must consider other criteria of 31 TAC §335.559 of this title (relating to Medium Specific Requirements and Admustments for Risk Reduction Standards Number 2.) to develop numeric cleanup values.

§335.569. Appendix III.

For the purposes of this subchapter, the following is the model deed certification language.

MODEL DEED CERTIFICATION LANGUAGE

STATE OF TEXAS
(   ) COUNTY

INDUSTRIAL SOLID WASTE
CERTIFICATION OF REMEDIATION

KNOW ALL MEN BY THESE PRESENTS THAT:

Pursuant to the Rules of the Texas Natural Resource Conservation Commission pertaining to Industrial Solid Waste Management, this document is hereby filed in the Deed Records of County, Texas in compliance with the recordation requirements of said rules:

I

(Company Name) has performed a remediation of the land described herein. A copy of the Notice of Registration (No.), including a description of the facility, is attached hereto and is made part of this filing. A list of the known waste constituents, including known concentrations (i.e., soil and ground water, if applicable), which have been left in place is attached hereto and is made part of this filing. Further information concerning this matter may be found by an examination of company records or in the Notice of Registration (No.) files, which are available for inspection upon request at the central office of the Texas Natural Resource Conservation Commission in Austin, Texas.

The Texas Natural Resource Conservation Commission derives its authority to review the remediation of this tract of land from Texas Health and Safety Code, §361.002, which enables the Texas Natural Resource Conservation Commission to promulgate closure and remediation standards to safeguard the health, welfare and physical property of the people of the State and to protect the environment by controlling the management of solid waste. In addition, pursuant to the Texas Water Code, §5.012 and §5.013, Texas Water Code, Annotated, Chapter 5, the Texas Natural Resource Conservation Commission is given primary responsibility for implementing the laws of the State of Texas relating to water and shall adopt any rules necessary to carry out its powers and duties under the Texas Water Code. In accordance with this authority, the Texas Natural Resource Conservation Commission requires certain persons to provide certification and/or recordation in the real property records to notify the public of the conditions of the land and/or the occurrence of remediation. This deed certification is not a representation or warranty by the Texas Natural Resource Conservation Commission of the suitability of this land for any purpose, nor does it constitute any guarantee by the Texas Natural Resource Conservation Commission that the remediation standards specified in this certification have been met by (Company name).

II

Being a acre tract, more or less, out of the (Company Name)'s acre tract in the (Name) League (No.), Abstract (No.), recorded in Volume (No.), Page (No.) of the Deed of Records County, Texas, said acre tract being more particularly described as follows:

(Insert metes and bounds description here)

For Standard 2 cleanups: (Contaminants/contaminants and waste) deposited hereon have been remediated (to meet residential soil criteria/ to meet non-residential (i.e., industrial/commercial) soil criteria)), in accordance with a plan designed to meet the Texas Natural Resource Conservation Commission's requirements in 30 Texas Administrative Code, §335.555), which mandates that the remedy be designed to eliminate substantial present and future risk such that no post-closure care or engineering or institutional control measures are required to protect human health and the environment. Future land use is considered suitable for (residential, non-residential (i.e.,industrial/commercial)) purposes in accordance with risk reduction standards applicable at the time of this filing. Future land use is intended to be (residential, non-residential).

For Standard 3 cleanups: (Contaminants/contaminants and waste) deposited hereon have been remediated (to meet residential soil criteria/to meet non-residential (i.e., industrial/commercial) soil criteria) in accordance with a plan designed to meet the requirements of 30 Texas Administrative Code, §335.561 (Risk Reduction Standard Number 3), which mandates that the remedy be designed to eliminate or reduce to the maximum extent practicable, substantial present or future risk. The remediation plan (does/ does not) require continued post-closure care or engineering or institutional control measures. Future use of the property is considered appropriate for (describe) in accordance with risk reduction standards applicable at the time of this filing. Institutional or legal controls placed on the property to ensure appropriate future use include (describe).

For both Standard 2 and 3 cleanups where the remedy is based upon non-residential soil criteria: The current or future owner must undertake actions as necessary to protect human health or the environment in accordance with the rules of the Texas Natural Resource Conservation Commission.

III

The owner of the site is (Company Name), a Texas corporation, and its address is (P.O. Box or Street), (City), Texas (Zip Code), where more specific information may be obtained from the (plant manager, owner).

EXECUTED this the day of , 20 .

(Company Name)
a Texas corporation

(Name)
Plant Manager

STATE OF TEXAS
(   ) COUNTY

BEFORE ME, on this the   day of   , personally appeared (Name), (Plant Manager, Owner) of (Company Name), a Texas corporation, known to me to be the person and agent of said corporation whose name is subscribed to the foregoing instrument, and he acknowledged to me that he executed the same for the purposes and in the capacity therein expressed.

GIVEN UNDER MY HAND AND SEAL OF OFFICE, this the   day of   , 20__.

Notary Public in and
for the State of Texas,
County of

3

<<Prev Rule Next Rule>>

Texas Administrative Code

TITLE 30 ENVIRONMENTAL QUALITY
PART 1 TEXAS COMMISSION ON ENVIRONMENTAL QUALITY
CHAPTER 350 TEXAS RISK REDUCTION PROGRAM
SUBCHAPTER A GENERAL INFORMATION
RULE §350.2 **Applicability**

(a) General applicability. On May 1, 2000, persons shall comply with the requirements of this chapter to the extent not modified by the provisions of this section. Before May 1, 2000, the person may use this chapter upon the effective date of the chapter. The rules in this chapter specify objectives for response actions for affected properties and further specify the mechanism to evaluate such response actions once an obligation is established to take a response action via other applicable rules, orders, permits or statutes. All actions undertaken and demonstrations required by this chapter must be performed and documented to the reasonable satisfaction of the executive director. Additionally, no person shall submit information to the executive director or to parties who are required to be provided information under this chapter which they know or reasonably should have known to be false or intentionally misleading, or fail to submit available information which is critical to the understanding of the matter at hand or to the basis of critical decisions which reasonably would have been influenced by that information. This chapter does not establish requirements for reporting releases to program areas. The regulations in this chapter address releases of chemicals of concern (COCs) as defined by various programs subject to this chapter as specified in subsections (b) - (m) of this section. However, the regulations in this chapter do not eliminate the need for the person to meet any more stringent or additional requirements found in the particular rules for the covered program areas or applicable federal requirements.

(b) Property where a release of COCs occurs that is regulated under Chapter 327 of this title (relating to Spill Prevention and Control), as amended. The person shall first complete notification for releases under §327.3 of this title (relating to Notification Requirements), as amended, and then conduct response actions under §327.5 of this title (relating to Actions Required), as amended. The person shall utilize this chapter to conduct response actions when either the conditions of paragraphs (1) or (2) of this subsection apply.

(1) The person chooses to respond under this chapter to a release of COCs within the first six months after the release is reported to the executive director.

(2) The person determines that the response action to the release of COCs cannot be completed to the satisfaction of the executive director within the first six months following notification to the executive director.

(c) Property regulated under Chapter 330 of this title (relating to Municipal Solid Waste). Persons shall comply with the requirements of this chapter for those municipal solid waste properties except when subject to the requirements of 40 Code of Federal Regulations Parts 257 and/or 258, as amended. However, for those municipal solid waste properties subject to the requirements of 40 Code of Federal Regulations Parts 257 and/or 258, as amended, the executive director may establish an alternative health-based groundwater protection standard for a COC in accordance with §330.409 of this title (relating to Assessment Monitoring Program), as amended. Determination of such an alternative standard shall be made using the procedures of Subchapter D of this chapter (relating to Development of Protective Concentration Levels).

(d) Property regulated under Chapter 331 of this title (relating to Underground Injection Control). The person shall address unauthorized releases of COCs from associated tankage and equipment utilizing the procedures of this chapter. Excursions of injected mining solutions at in-situ mining properties or injection of waste which is confined below all underground sources of drinking water as defined in §331.2 of this title (relating to Definitions), as amended, are not subject to the requirements of this chapter.

(e) Property regulated under Chapter 332 of this title (relating to Composting). The person shall comply with the requirements of this chapter to conduct assessments, response actions, and post-response action care for releases of COCs in environmental media at a compost facility, mulching facility or land application property authorized under Chapter 332 of this title, as amended.

(f) Property regulated under Chapter 333 of this title (relating to Brownfields Initiatives). The person entering the Voluntary Cleanup Program (VCP) shall comply with all requirements found in the Texas Health and Safety Code, Chapter 361, Subchapter S, as amended, concerning the Voluntary Cleanup Program; Subchapter A of Chapter 333 of this title (relating to Voluntary Cleanup Program Section), as amended; and the requirements of this chapter. Where there is a conflict between the requirements of this chapter and the requirements in the Texas Health and Safety Code, Chapter 361, Subchapter S, as amended, and Chapter 333, Subchapter A of this title, as amended, the requirements of the Texas Health and Safety Code, Chapter 361, Subchapter S, as amended, and Chapter 333, Subchapter A of this title, as amended, shall apply.

(g) Property regulated under Chapter 334 of this title (relating to Underground and Aboveground Storage Tanks). The person shall comply with the requirements of Chapter 334 of this title and not this chapter for the assessment, response actions, and post-response action care for releases of regulated substances from underground storage tanks (USTs) and aboveground storage tanks (ASTs).

(h) Property regulated under Chapter 335 of this title (relating to Industrial Solid Waste and Municipal Hazardous Waste). The person shall comply with the requirements of this chapter when undertaking the remediation of affected property at facilities used for the storage, processing or disposal of industrial solid waste or municipal hazardous waste, or for the remediation of environmental media containing COCs resulting from releases from waste management facility components (e.g., tank, container storage area, surface impoundment, etc.), either as part of closure or at any time before or after closure. The person shall close a waste management facility component in a manner that minimizes or eliminates the need for further maintenance and controls. The manner of closure shall also minimize or eliminate, to the extent necessary to protect human health and the environment, the post-closure escape of waste, contaminants, leachate, run-off, or decomposition products to the surrounding environmental media. Waste management facility components undergoing closure for which the person can demonstrate that no release of COCs to surrounding environmental media has occurred are subject to this chapter only with regard to this closure performance standard and the removal, decontamination or control requirements for waste as specified in Subchapter B of this chapter (relating to Remedy Standards). In the event a release of COCs to surrounding environmental media has occurred, then the person shall comply with this chapter for response to the release. The person shall comply with §335.118(b) of this title (relating to Closure Plan; Submission and Approval of Plan), as amended, or applicable permit provisions regarding requirements for public participation in the corrective action process for permitted hazardous waste facilities. The person shall also comply with the requirements of paragraphs (1) - (3) of this subsection, as applicable.

(1) Any person who stores, processes, or disposes of industrial solid waste or municipal hazardous waste at a facility permitted under §335.2(a) of this title (relating to Permit Required), as amended, shall, unless specifically modified by other order of the commission, close the facility in accordance with the closing provisions of the permit.

(2) Any person who stores, processes, or disposes of hazardous waste is also subject to the applicable provisions relating to closure and post-closure in Chapter 335, Subchapters E and F of this title (relating to Interim Standards for Owners and Operators of Hazardous Waste Treatment, Storage, or Disposal Facilities; and Permitting Standards for Owners and Operators of Hazardous Waste Treatment, Storage, or Disposal Facilities, respectively), as amended.

(3) The person may utilize this chapter to determine if COCs, specifically listed hazardous waste or hazardous constituents, exceed concentrations protective of human health and the environment when making "contained-in" determinations for environmental media being managed as wastes (e.g., excavated soils, investigation derived wastes such as monitor well purge water, etc.) for purposes of treatment or disposal in a different location. In such cases, the person must still perform a waste classification in response to Chapter 335, Subchapters A and R of this title (relating to Industrial Solid Waste and Municipal Hazardous Waste Management in General; and Waste Classification, respectively), as amended.

(4) The person may propose a facility operations area (FOA) to address multiple sources of COCs within an active facility that is required to perform corrective action for releases pursuant to a permit or commission corrective action order. The requirements for establishing a FOA are specified in Subchapter G of this chapter (relating to Establishing a Facility Operations Area).

(i) Affected property regulated under Chapter 335, Subchapter K of this title (relating to Hazardous Substance Facilities Assessment and Remediation). The person shall comply with all requirements found in the Texas Health and Safety Code, Chapter 361, Subchapter F, as amended; Chapter 335, Subchapter K of this title, as amended; and the requirements of this chapter for any release or threatened release of hazardous substances into the environment that may constitute an imminent and substantial endangerment to public health and safety or the environment. Where there is a conflict between the requirements in this chapter and the requirements of Texas Health and Safety Code, Chapter 361, Subchapter F, as amended, and Chapter 335, Subchapter K of this title, as amended, the requirements of Texas Health and Safety Code, Chapter 361, Subchapter F and Chapter 335, Subchapter K of this title shall apply.

(j) Property regulated under Chapter 336 of this title (relating to Radioactive Substance Rules). The person shall comply with the requirements of Chapter 336 of this title, as amended, regarding contamination limits for radioactive material in environmental media. In instances involving remediation of releases in media containing both radioactive material and other COCs, the person shall use the contamination limits determined in accordance with Chapter 336 of this title, as amended, for radioactive material and PCLs determined by the procedures of this chapter for other COCs.

(k) Property regulated under Chapter 312 of this title (relating to Sludge Use, Disposal, and Transportation). The executive director may reference this chapter in permits subject to Chapter 312 of this title, as amended, when specifying closure provisions to address releases of COCs from facility components at municipal wastewater treatment plants.

(l) Other releases. The executive director may require the use of this chapter to address other releases of COCs subject to Texas Water Code, Chapter 26, as amended.

(m) Use of this chapter on or after May 1, 2000. The person who started a response action under Chapter 335, Subchapters A and S of this title (relating to Industrial Solid Waste and Municipal Hazardous Waste in General; Risk Reduction Standards, respectively), as amended, may qualify to continue under those previous commission rules subject to the limitations specified in paragraphs (1) - (4) of this subsection. Any person desiring to remain under Chapter 335 of this title may not use any of the provisions of this chapter. If a person elects to proceed under this chapter, then they shall not be allowed to return to Chapter 335 of this title. Also, the person shall respond as described in §350.35 of this title (relating to Substantial Change in Circumstances) in the event a substantial change in circumstance occurs which results in an unacceptable threat to human health or the environment.

(1) The person who has submitted an initial notification of intent to conduct a Risk Reduction Standard 1 or 2 response action (i.e., §335.8(c)(1) and (2) of this title (relating to Closure and Remediation), as amended) prior to May 1, 2000, and has submitted a final report within five years after that date may request that the response action be reviewed according to the regulations in effect at the time of initial notification. Persons will automatically qualify for this grandfathering provision if they have previously received a letter from the agency acknowledging receipt of the initial notification, or submit other forms of documentation by May 1, 2001, that proper and timely notification had been made.

(2) The person who has submitted a remedial investigation report that fully complies with §335.553(b)(1) of this title (relating to Required Information), as amended, prior to May 1, 2001, may elect to either continue under those rules or to proceed under this chapter.

(3) Any closure plans approved as part of a permit issued prior to May 1, 2000, but not implemented at the time of permit renewal are subject to review for compliance with this chapter as part of the permit renewal process.

(4) The person may resubmit plans or reports that the person has revised voluntarily to conform with the requirements of this chapter, unless such resubmittal would result in noncompliance with a previously approved or imposed schedule of compliance.

Source Note: The provisions of this §350.2 adopted to be effective September 23, 1999, 24 TexReg 7436; amended to be effective March 19, 2007, 32 TexReg 1526; amended to be effective March 19, 2009, 34 TexReg 1866

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4

-----Original Message-----
From: Tzhone.Stephen@epamail.epa.gov [mailto:Tzhone.Stephen@epamail.epa.gov]
Sent: Wednesday, August 17, 2011 10:42 PM
To: Zeiler, Rose Ms CIV USA OSA; Lambert, John R SWT; Williams, Aaron K SWT; Srivastav, Praveen; Watson, Susan; Duffield, Robert; Jones, Greg N
Cc: Fay Duke; Dale Vodak; Burton.Terry@epamail.epa.gov; Forsythe.Barry@epamail.epa.gov; kdbecher@usgs.gov
Subject: Longhorn: additional EPA comments on LHAAP-16 ROD

Hi Rose,

Here are the additional EPA comments on LHAAP-16 ROD:

Thanks,

Stephen L. Tzhone
Superfund Remedial Project Manager
USEPA Region 6 (6SF-RA)
214.665.8409
tzhone.stephen@epa.gov

From: "Zeiler, Rose Ms CIV USA OSA" <rose.zeiler@us.army.mil>
To: Stephen Tzhone/R6/USEPA/US@EPA
Date: 08/16/2011 06:02 AM
Subject: Anything from George on Site 16 ROD?

Rose M. Zeiler, Ph.D.,
Site Manager
Longhorn Army Ammunition Plant
479-635-0110 (0112 - fax)

From: Stephen Tzhone/R6/USEPA/US
To: "Zeiler, Rose Ms CIV USA OSA" <rose.zeiler@us.army.mil>
Cc: "Wililams, Aaron" <aaron.k.williams@usace.army.mil>, Fay Duke <fay.duke@tceq.texas.gov>, "Lambert, John R SWT" <John.R.Lambert@SWT03.usace.army.mil>
Date: 08/03/2011 03:07 PM
Subject: Re: Site 16 ROD RTCs

Hi Rose,

The responses to the current RTCs are agreeable to EPA, but there will be additional comments forthcoming on the LHAAP-16 ROD (mainly on ARARs and more uniform acknowledgement of surface water pathway). George is finishing them up and I will send to you

Thanks,

Stephen L. Tzhone
Superfund Remedial Project Manager
USEPA Region 6 (6SF-RA)
214.665.8409
tzhone.stephen@epa.gov

From: "Zeiler, Rose Ms CIV USA OSA" <rose.zeiler@us.army.mil>
To: Stephen Tzhone/R6/USEPA/US@EPA
Cc: Fay Duke <fay.duke@tceq.texas.gov>, "Lambert, John R SWT" <John.R.Lambert@SWT03.usace.army.mil>, "Wililams, Aaron" <aaron.k.williams@usace.army.mil>
Date: 08/03/2011 02:36 PM
Subject: Site 16 ROD RTCs

Hi Steve - Any idea when we might get feedback on the RTCs?
Thanks,
Rose

Rose M. Zeiler, Ph.D.,
Site Manager
Longhorn Army Ammunition Plant
479-635-0110 (0112 - fax)

Classification: UNCLASSIFIED
Caveats: NONE

1. Section 1.4, Page 1-2, Description of the Selected Remedy, 3rd Bullet - This bullet should be revised to read, "Installation of a biobarrier in the downgradient portion of the contaminant plume to prevent contaminated groundwater from discharging into Harrison Bayou, which flows into Caddo Lake, at concentrations that would cause surface waters to exceed Texas Surface Water Quality standards, the SDWA MCLs, and Texas Media-Specific Concentration (MSC) levels. A second biobarrier will be installed at the edge of the landfill to control potential migration of volatile organic compounds (VOCs) from the landfill. The purpose of the biobarriers in conjunction with natural attenuation will be to reduce groundwater contaminant and by-product contaminant concentrations to levels that will prevent surface waters from exceeding surface water cleanup levels, to reduce groundwater contaminant and by-product contaminant concentrations to levels that attain groundwater cleanup standards, to reduce the potential migration of contaminants and by-product contaminants from the landfill, and to reduce groundwater contaminant and by-product contaminant mass."

General Comment - Delete the word, "passive" whenever it is used before the word "biobarrier," as the use of biobarriers constitute "treatment" in accordance with CERCLA's statutory preference for treatment.

The word "passive" is used many times in this section and should be deleted.

Other areas to delete the word "passive" can be found on pp. 2-22, 2-23,2-25, 2-27, 2-30, 2-36, 2-38, 2-40, 2-42, 2-43, 2-45, 2-46, 2-47, 2-48, 2-50, 2-51, 2-53, 2-55, 2-57, 2-58.

2. Section 1.4, Page 1-3, Description of the Selected Remedy, 4th Bullet on p. 1-3 - Replace the first sentence of this bullet to read, "Surface water monitoring will also be conducted to confirm that surface water standards are not exceeded in Harrison Bayou, which flows in Caddo Lake.

3. Section 1.4, Page 1-3, Description of the Selected Remedy, 5th Bullet on p. 1-3 - Replace this bullet with the following, "LUCs to prevent human exposure to landfill waste and contaminated groundwater. The LUCs will remain in place as long as the landfill waste remains at the Site. In addition, LUCs restricting the use of groundwater to environmental monitoring and testing only, will remain in place until the contaminated groundwater attains groundwater cleanup levels in order to prevent human exposure to the contaminated groundwater. The above LUCs will remain in place until the contaminated soil, subsurface soil and groundwater attain cleanup standards/levels to allow for unlimited use and unrestricted exposure."

4. Section 1.4, Page 1-4 - Description of the Selected Remedy, 2nd Paragraph - This paragraph should be modified to show that there will be "LUCs" and not just LUC.

As such, throughout this section as well as the remainder of the ROD, LUC should be modified to read "LUCs."

5. Section 1.4, Page 1 - 5, Statutory Determinations - This section should be modified by deleting all references in the section that refers to MNA as "passive treatment." MNA is a passive remedial action - not treatment.

In addition, delete the word "passive" every time it is used before the word "biobarrier." See comment # 1.

6. Section 2.2.1, Page 2-2, History of Site Activities, 4th Para. - After the phrase, "Harrison Bayou," include the following: ", which flows into Caddo Lake."

7. Section 2.4, Page 2-6 - Scope and Role of Response Action, Second Paragraph - Delete the existing language and modify the second paragraph to read, "The selected remedial action will treat the contaminated groundwater plume to prevent the migration of groundwater contaminants to Harrison Bayou, which flows into Caddo Lake, a major source of drinking water. In addition, the selected remedial action will include groundwater monitoring to demonstrate that the contaminants and by-product contaminants are not migrating into Harrison Bayou, which flows into Caddo Lake, at or above surface water standards. For purposes of this ROD, surface water standards (i.e., cleanup levels) include the Texas Surface Water Quality Standards found at 30 TAC 307, or if those standards are not available, the SDWA MCLs, or if MCLs are not available, the Texas MSCs for GW-Res as authorized under 30 TAC 335.559(b).

Please note that the ARARs table 2-10 and table 2-7 will have to be modified to include the above ARARs and standards.

Same Section, Page 2-7, Second Para. on the page - Modify the second paragraph on page 2-7, beginning with sentence 5 and through the end of the paragraph with, "Installation of biobarriers will control the potential migration of contaminants and by-product contaminants from the landfill, and will reduce the groundwater contamination mass, thus providing additional protection to Harrison Bayou and Caddo Lake. Natural attenuation will further reduce groundwater contaminants and by-product contaminants respective concentrations. The LUCs to be implemented include groundwater use restrictions and land use restrictions to protect and maintain the integrity of the existing landfill cover system. The LUCs will continue to remain in place until the contaminated soil, subsurface soil and groundwater attain cleanup standards/levels to allow for unlimited use and unrestricted exposure. Without the selected remedial action, the potential for the contaminated groundwater to seep into Harrison Bayou, which flows into Caddo Lake, at levels that equal or exceed surface water standards constitutes an unacceptable risk to human health and the environment. Caddo Lake is a major source of drinking water, also used for fish consumption and recreation."

Delete the existing language for the above paragraph, starting at sentence 5.

8. Section 2.5.1, Page 2-8, Conceptual Site Model, Last Para. of the Section - Delete the last paragraph of this section and modify/replace with, "The contaminants in the shallow groundwater migrate toward and discharge by seepage into Harrison Bayou, which flows into Caddo Lake, a major source of drinking water. The discharge of contaminated groundwater into Harrison Bayou, which flows into Caddo Lake, represents a groundwater to surface water pathway of exposure that is identified and addressed by the selected remedial action."

***it appears that there is a groundwater to surface water pathway of exposure. Are there risks related to wildlife, plant-life and aquatic life due to contaminated groundwater discharging into Harrison Bayou? If so, were those risks documented to be acceptable or unacceptable risks?**

9. Section 2.6.2, Page 2-11, Current and Future Surface Water Uses - The first paragraph of this section should be modified to reflect that the surface water discussed here is Harrison Bayou. As such, delete the existing language and replace with,

"Harrison Bayou, which is located on and adjacent to LHAAP, currently supports wildlife and aquatic life and flows into Caddo Lake. Humans have limited access to parts of Harrison Bayou during animal hunts, but there is no routine use of Harrison Bayou located at the LHAAP Site. Harrison Bayou does not carry adequate numbers and size of fish to support either sport or subsistence fishing. During the dry summer months, Harrison Bayou ceases to flow and dries up. The eastern portion of the LHAAP-16 landfill Site is located within Harrison Bayou's 100-year flood-plain. When flowing, Harrison Bayou discharges into

Caddo Lake, a large recreational lake covering 51 square miles with a mean depth of 6 feet. The watershed of the lake encompasses approximately 2,700 square miles. Caddo Lake is used extensively for fishing and boating, and is a major drinking water supply for multiple cities in Louisiana including Vivian, Oil City, Mooringsport, South Shore, Blanchard, Shreveport, and Bossier City."

10. Section 2.7.1.4, Page 2-15, Risk Characterization, Last Para. - At the end of the last paragraph in this Section, add the following sentence. Five-Year Reviews will be conducted at the Site in a manner consistent with the 1991 FFA, CERCLA Section 121(c), the NCP, and EPA's Five-Year Review Guidance per CERCLA Section 120(a).

11. Section 2.7.3, Summary of Ecological Risk Assessment, Pages 2-18 - 2-19 – ***This section seems to only address ecological risks pertaining to soils. Are there risks related to wildlife, plant-life and aquatic life due to contaminated groundwater discharging into Harrison Bayou? If so, were those risks documented to be acceptable or unacceptable risks?**

12. Section 2.7.4, Page 2-19, Basis of Action, Second Paragraph - Delete the second paragraph of this Section and modify/replace with, "As it concerns the contaminated groundwater at LHAAP-16, a SDWA MCL has been identified for each COC with the exception of perchlorate, manganese and nickel. For those COCs and by-product (i.e., daughter) contaminants that have an MCL, the MCL constitutes the groundwater cleanup level to be attained. If no MCL exists for a COC or by-product contaminant found in the contaminated groundwater, the MSCs for GW-Ind as authorized under 30 TAC 335.559(d), constitutes the groundwater cleanup standard to be attained. With respect to the surface waters impacted by contaminated groundwater discharging into Harrison Bayou, which flows into Caddo Lake (a drinking water source), the Texas Surface Water Quality Standards found at 30 TAC 307, or if those standards are not available, the SDWA MCLs, or if MCLs are not available the Texas MSCs for GW-Res as authorized under 30 TAC 335.559(b), constitute the surface water cleanup levels/standards to be attained at the Site."

13. Section 2.9.1, Page 2-20, Description of Remedy Components, Alternative 1 - This Section discusses how the existing landfill cap would be maintained, which is okay. But, because this alternative is part of the selected remedial action (alternative 7), the ARARs section and the ARARs table 2-10 will have to be modified to reflect that there are certain requirements concerning the closure and post-closure care for landfills. 40 C.F.R. §§ 264.111 and 264.300 - 310 are relevant and appropriate requirements here, and the standards will have to be met.

14. Section 2.9.1, Page 2-22, Alternative 4 - The title for this alternative is misleading, and the word "passive" should be deleted. A more descriptive title for the groundwater portion of this title should simply read, "In Situ Permeable Reactive Barrier." I recommend the above change be made throughout this document.

The above comment also applies to the titles for Alternative 5a and 5b on page 2-23.

15. Section 2.9.1, Page 2-23, Alternative 5(b), Bullet one - The contingency action language under the first bullet addresses the possibility of excavating, handling and disposal of hazardous landfill waste is simply incorrect. The removal and management of such waste as a hazardous waste under this alternative is simply an ARAR under 40 C.F.R. §§ 264.110 - 120 and 264.300-310. In addition, the hazardous waste analysis, treatment and disposal requirements are ARARs under 40 C.F.R. Parts 262 and 268, for this particular alternative.

16. Section 2.9.1, Page 2-23, Alternative 7, Bullet six - Delete the first paragraph of this bullet and replace/modify with the following, "MNA of the shallow and intermediate groundwater zones to further reduce the concentrations of contaminants and by-product contaminants in the groundwater so that the

contaminated groundwater attains groundwater cleanup levels/standards, and the surface water (i.e., Harrison Bayou which flows into Caddo Lake) impacted by the contaminated groundwater attains surface water cleanup levels/standards."

17. Section 2.9.2, Page 2-26, Common Elements of Alternatives 1 through 7, LUCs, First Para., Fourth Sentence - Modify this sentence to read, "The LUCs would prevent human exposure to landfill contents and residual groundwater contamination that may present an unacceptable risk to human health and the environment, and would preclude .... ."

18. Section 2.9.2, Page 2-27, Common Elements of Alternatives 1 through 7, MNA, First Para., the Sentence just before the Last Sentence of the Para. - Modify this sentence to read, "MNA would take over within the areas of the selected remedial action employing biobarriers, so long as the monitoring and sampling data indicate that MNA would serve as an appropriate remedy in lieu of the biobarriers."

19. Section 2.9.2, Page 2-27, Common Elements of Alternatives 1 through 7, Inspection/Long-Term Groundwater Monitoring, Third Sentence - Modify the third sentence to read, "Further groundwater and surface water monitoring would be used to evaluate contaminant and by-product contaminant migration, confirm that the COCs and by-product contaminants in the groundwater plumes degrade in a manner to achieve attainment of groundwater cleanup standards/levels, and to verify that contaminant levels in Harrison Bayou, which flows into Caddo Lake, are below the surface water cleanup standards/levels."

20. Section 2.9.2, Page 2-29, Distinguishing Features of the Alternatives, Performance Monitoring, Second Para., Second Sentence - Modify/Replace this sentence to read, "The groundwater extraction system would need to operate until the contaminated groundwater at LHAAP-16 has attained the SDWA MCLs and Texas MSCs for GW-Ind. For those COCs and by-product (i.e., daughter) contaminants that have an MCL, the MCL constitutes the groundwater cleanup level to be attained. If no MCL exists for any COC found in the contaminated groundwater, the Texas MSCs for GW-Ind, as authorized under 30 TAC 335.559(d) constitutes the groundwater cleanup standard/level to be attained. With respect to the surface waters impacted by contaminated groundwater discharging into Harrison Bayou, which flows into Caddo Lake (a drinking water source), the Texas Surface Water Quality Standards found at 30 TAC 307, or if those standards are not available, the SDWA MCLs, or if MCLs are not available the Texas MSCs for GW-Res, as authorized under 30 TAC 335.559(b), constitute the surface water cleanup levels/standards to be attained at the Site."

21. Section 2.9.2, Page 2-30, Distinguishing Features of the Alternatives, Passive Groundwater Treatment - Modify/Replace this heading to read, "In Situ Permeable Reactive Barrier."

Also delete all use of the word "passive" as it relates to barrier system used in this section.

Fist Para. of this Section - The second to the last sentence of the first paragraph ends with "Harrison Bayou." Modify the sentence to end with, ... "Harrison Bayou, which flows into Caddo Lake."

22. Section 2.9.2, Page 2-32, Distinguishing Features of the Alternatives, Permeable Reactive Barrier - Modify/Replace this heading to read, "In Situ Permeable Reactive Barrier."

Also delete all use of the word "passive" as it relates to barrier system used in this section.

First Para. of this Section, Page 2-33 - Modify the first sentence of the first paragraph. After the words, "Harrison Bayou" include the following, " , which flows into Caddo Lake."

Same Section, Second Para., Page 2-33 - After the third sentence of this paragraph, include the following sentence, "Note however, these soils would be subject to the waste analysis and land disposal restriction requirements found in 40 C.F.R. §§ 262.11 and 268.7.

23. Section 2.9.2, Page 2-36, Distinguishing Features of the Alternatives, Passive Biobarrier - Modify/Replace this heading to read, "Biobarriers."

Also delete all use of the word "passive" as it relates to the biobarriers used in this section.

Fist Para. of this Section - Modify the first sentence of this section to read, "A biobarrier would be installed in the downgradient portion of the groundwater plume to prevent the contaminated groundwater from discharging into Harrison Bayou, which flows into Caddo Lake, at concentrations that fail to attain the Texas Surface Water Quality Standards found at 30 TAC 307, or if those standards are not available, the SDWA MCLs, or if MCLs are not available the Texas MSCs for GW-Res, as authorized under 30 TAC 335.559(b)."

24. Section 2.9.3, Pages 2-36 - 2-37, Expected Outcomes of Each Alternative - Modify this section to read, "Alternative 1 would allow the site to remain a hazard to human health due to the potential ingestion of contaminated groundwater; and the environment, because no remedial activities would be conducted and there would be no LUCs except for cap maintenance. Note however, the landfill cap maintenance would comply with RCRA landfill closure and post-closure care regulations. Alternatives 2 through 7 all provide engineering controls, treatment, containment, or removal and disposal of the waste material to levels protective of human receptors and the environment, including the groundwater at the Site, and Harrison Bayou, which flows into Caddo Lake. The six remedial action alternatives have very similar outcomes of preventing exposure to landfill wastes and contaminated groundwater by utilizing the landfill cap and LUCs. Alternatives 2, 3, 4, 6, and 7 would maintain the surface water standards of Harrison Bayou, which flows into Caddo Lake, through a variety of treatment processes. Alternative 2 takes advantage of the existing groundwater treatment plant. Alternatives 3b, 4, 5a, 5 and 7 would achieve groundwater and surface water cleanup levels/standards in less time through utilization of active treatment. The similar outcomes include restoration of the contaminated groundwater by attainment of the SDWA MCL for those COCs and by-product (i.e., daughter) contaminants that have a MCL, to the extent practicable, and consistent with 40 C.F.R. § 300.430(e)(2)(i)(B & C). Because no SDWA MCL exists for some COCs including perchlorate, manganese and nickel, the MSCs (GW-Ind) as authorized under 30 TAC 335.559(d) constitutes the groundwater cleanup standard to be attained. Similar outcomes also include the attainment of surface water standards in surface waters impacted by the contaminated groundwater discharges at LHAAP. As such, the Texas Surface Water Quality Standards found at 30 TAC 307, or if those standards are not available, the SDWA MCLs, or if MCLs are not available the Texas MSCs (GW-Res) as authorized under 30 TAC 335.559(b), constitute the surface water cleanup levels/standards to be attained at Harrison Bayou, which flows into Caddo Lake (a drinking water source). In addition, the groundwater and surface water monitoring activities associated with Alternatives 2 through 7 would confirm the protection of human health and the environment by documenting the return of groundwater to its potential beneficial use as a drinking water supply, by documenting the reduction of contaminant mass, and protection of the surface water through containment of the plume. The LUCs will remain in place until the contaminated soil, subsurface soil and groundwater attain cleanup levels to allow for unlimited use and unrestricted exposure. Without these remedial action alternatives, the potential risk for seepage of contaminated groundwater into Harrison Bayou, which flows into Caddo Lake, at levels that equal or exceed surface water standards constitutes an unacceptable risk to human health and the environment. Caddo Lake is a major source of drinking water."

Same Section - The phrase, "Summary of Comparative Analysis of Alternatives" should have been a heading for a new section or subsection.

25. Section 2.9.4, Page 2-38, Overall Protection of Human Health and the Environment - In the first paragraph on p. 2-38, modify the second sentence as follows, "Alternative 2 maintains the current actions of capping and groundwater extraction to contain the contaminated groundwater plume and prevent it from further impacting Harrison Bayou, which flows into Caddo Lake, a drinking water source."

Also delete all use of the word "passive" as it relates to the biobarriers used in this section.

26. Section 2.9.5, Pages 2-38 - 2-39, Compliance with ARARs - Modify/Replace the Second paragraph with the following, " Because contaminated groundwater has discharged into Harrison Bayou, which flows into Caddo Lake (a drinking water supply), chemical-specific ARARs for surface water consumption are applicable, relevant and appropriate. Specifically, Texas Surface Water Quality Standards as set forth in 30 TAC 307.6(d)(1) for TCE (5ug/L), 1,2-DCA (5 ug/L), 1,1-DCE (7 ug/L), 1,1,2-TCA (5 ug/L), vinyl chloride (2 ug/L), arsenic (10 ug/L), and thallium (2 ug/L) will be attained at the Site. The Texas Surface Water Quality standards are equivalent to the SDWA MCLs. When the Texas Surface Water Quality standards are not available, the SDWA MCLs constitute the cleanup standards/levels to be attained per 30 TAC 335.559(b). The MCLs for cis-1,2-DCE (70 ug/L), methylene chloride (5 ug/L), and chromium (100 ug/L) will be attained at the Site. When no SDWA MCLs are available the Texas MSC (GW-Res) is the standard used for surface waters such as Harrison Bayou, which flow into a major drinking water source, Caddo Lake. The MSC (GW-Res) for nickel (730 ug/L), perchlorate (26 ug/L) and manganese (7,820 ug/L) will be attained at the Site.

27. Section 2.9.6, Page 2-40, Long-term Effectiveness and Permanence - Second Paragraph - Modify/Replace the first sentence of this paragraph with, " The permeable reactive barriers used in Alternatives 5a and 5b to avoid the potential risk that the contaminated groundwater seeping into surface water could cause Harrison Bayou, which flows into Caddo Lake, to exceed surface water standards, may be effective and relatively reliable with long-term maintenance and monitoring."

Also delete all use of the word "passive" as it relates to the biobarriers and treatment used in this section.

Also replace the phrase "drain passively" and replace with "drain by use of gravity."

Same Section, Page 2-41 - Is it necessary to include "(if they can be found)" in the language in this section discussing the location of hot spots? If not, delete the language, as it seems that Army does not either have the money or fortitude to locate the hot spots in question.

28. Section 2.9.7, Page 2-42, Reduction of Toxicity, Mobility, or Volume through Treatment, Last Paragraph, Last Sentence - Replace the last sentence with, "If the excavated material is RCRA-characteristic, treatment of such materials to meet the LDRs would satisfy the CERCLA Section 121(b), statutory preference for treatment.

Also delete all use of the word "passive" as it relates to the biobarriers used in this section.

28. Section 2.9.8, Page 2-43, Short-term Effectiveness, Last Paragraph - Modify the 3rd sentence in the last paragraph for this section to read, "However, the shallow groundwater zone plume is still migrating along the groundwater flow direction toward Harrison Bayou, which flows into the drinking water source, Caddo Lake."

Also delete all use of the word "passive" as it relates to the biobarriers used in this section; do the same on p. 2-45 (Implementability Section); do the same as it relates to treatment components on p. 2-46 (Cost Section).

29. Section 2.10, Page 2-47, Principle Threat Wastes, First Para. - Modify/Replace the first paragraph to read, "LHAAP-16 was used primarily as a solid and industrial waste landfill. Placement of the landfill cap prevents rainfall from further infiltrating and leaching contaminants from principle threat wastes and source material disposed in the landfill. However, contaminated groundwater beneath the landfill area continues to migrate. A groundwater extraction and treatment system was voluntarily installed in 1996 to prevent the groundwater plume with elevated levels of contaminants, from migrating to Harrison Bayou, which flows into Caddo Lake."

30. Section 2.11.1, Page 2-47, Summary of Rationale for the Selected Remedy -

Capping comment - This comment serves as a reminder concerning a previous comment (i.e., #13) made with respect to capping requirements. Note that the ARARs section and the ARARs table 2-10 will have to be modified to reflect that there are certain requirements concerning the closure and post-closure care for landfills. 40 C.F.R. §§ 264.111 and 264.300 - 310 are relevant and appropriate requirements here, and the standards must be attained.

Same Section, Second Bullet - Modify/Replace with, "Treatment of the groundwater by in situ bioremediation in the more contaminated areas and installation of biobarriers will reduce contaminant mass and control contaminated groundwater from migrating into Harrison Bayou, which flows into Caddo Lake. The above selected remedial actions employing treatment along with MNA, will ultimately restore the groundwater to attain groundwater cleanup standards/levels.

Same Section, Page 2-48, Third Bullet - Modify/Replace with, "MNA for areas inside and outside the influence of the selected remedies employing treatment will assure protection of human health and environment by documenting that further reductive dechlorination is occurring within the groundwater plume and that contaminant and by-product contaminant concentrations are being reduced to attain surface water and groundwater standards/levels."

Same Section, Page 2-48, Last Two Bullets - Modify/Replace with, " LUCs will remain in place as long as the landfill waste remains at the Site. In addition, LUCs restricting the use of groundwater to environmental monitoring and testing only, will remain in place until the contaminated groundwater attains groundwater cleanup standards/levels in order to prevent human exposure to the contaminated groundwater. The above LUCs will remain in place until the contaminated soil, subsurface soil and groundwater attain cleanup standards/levels to allow for unlimited use and unrestricted exposure."

Same Section, Page 2-48, First Paragraph on p. 2-48 - Modify/Replace with, "Groundwater and surface water monitoring will be conducted to confirm that COCs and by-product contaminants concentrations in the groundwater plume are declining through treatment and natural processes, and that Harrison Bayou, which flows into Caddo Lake, is protected from groundwater discharges that fail to attain surface water and groundwater cleanup standards/levels. In situ bioremediation and biobarriers constitute treatment measures designed to reduce the COCs and by-products contaminant mass, and protect Harrison Bayou and Caddo Lake from contaminant and by-product contaminant discharges above cleanup standards/levels." Monitoring will continue until it is demonstrated that there is no further release or threat of releases of contaminated groundwater into the surface water, and the groundwater supports unlimited use and unrestricted exposure."

Same Section, Page 2-48, Second Paragraph, First Sentence on p. 2-48 - Modify/Replace with, "The selected remedies employing treatment will significantly reduce contaminant concentrations. The remedies employing treatment, along with MNA, will ultimately restore the groundwater to attain groundwater cleanup standards/levels."

Same Section - Delete the word, "passive" in this section when it is connected to the use of biobarriers.

31. Section 2.11.2, Page 2-49, Description of the Selected Remedy -

Bullet One, Cap maintenance - This comment serves as a reminder concerning a previous comment (i.e., #13) made with respect to capping requirements. Note that this section, the ARARs section and the ARARs table 2-10 will have to be modified to reflect that there are certain requirements concerning the closure and post-closure care for landfills. 40 C.F.R. §§ 264.111 and 264.300 - 310 are relevant and appropriate requirements here, and the standards must be met.

Bullet Two - Modify/Replace with, "The LUCs will restrict access to contaminated groundwater for environmental monitoring and testing only, will preserve the integrity of the landfill cap, and restrict intrusive activities (e.g., digging) that would degrade or alter the cap. The LUCs will remain in place as long as the landfill waste remains at the Site. LUCs restricting the use of groundwater to environmental monitoring and testing only, will remain in place until the contaminated groundwater attains groundwater cleanup levels in order to prevent human exposure to the contaminated groundwater. LUCs will remain in place until the contaminated soil, subsurface soil and groundwater attain cleanup standards/levels that support unlimited use and unrestricted exposure. Without the selected remedial action, including the LUCs, the potential for the contaminated groundwater located beneath the landfill to seep into Harrison Bayou, which flows into Caddo Lake, at levels that equal or exceed surface water standards, constitutes an unacceptable risk to human health and the environment. Caddo Lake is a major source of drinking water, and is also used for fish consumption and recreation. LUC implementation details will be included in the RD. Within 90 days of the signing of the ROD, the U.S. Army will prepare and submit the RD to EPA consistent with the scheduling requirements found in the 1991 FFA. The recordation notification for the Site which will be filed with Harrison County will include a description of the LUCs. The boundary of the LUCs will enclose the Site boundaries and the groundwater plume boundaries shown in Figure 2-3."

Same Section, Page 2-49, Second Paragraph - Replace the phrase, "The Army would be responsible" with "The Army will be responsible ..."

Also, in item number (5) in this paragraph, replace the language with "(5) ensuring that the LUC objectives are met to protect the integrity of the selected remedy."

Same Section, Page 2-49, Second Paragraph - At the end of the paragraph add, "The Army shall retain the ultimate responsibility for remedy integrity as provided in the 1991 FFA and CERCLA Section 120."

Same Section, Page 2-50, First Paragraph - This paragraph should be modified to address the duration of the LUCs as provided in my previous comments under this item (i.e., # 31). The LUCs will remain in place as long as the landfill and the cap are in place at the Site, and until the contaminated soil, subsurface soil and groundwater attain cleanup standards/levels that support unlimited use and unrestricted exposure.

Same Section, Page 2-50, Fourth Paragraph - Modify/Replace the fourth paragraph, first sentence, with "The need for continued groundwater and surface water monitoring will be evaluated very five years during the reviews required under CERCLA Section 121(c)."

Same Section - delete the word, "passive" when it is used in connection with the word "biobarrier."

Same Section, Page 2-51, First Paragraph - Modify/Replace the phrase, "TCE daughter products" with "TCE daughter by-products ..."

Same Section, Page 2-51, Passive Biobarriers Sub-heading - Delete the word, "passive" when it is used in connection with the word "biobarrier." Also, delete the word, "passive" when it is used in connection with the word "biobarrier" on the remainder of the page.

Same Section, Page 2-51, Passive Biobarriers Sub-heading, Second Sentence - Modify/Replace the second sentence to read, "A biobarrier will be installed in the downgradient portion of the contaminant plume to prevent contaminated groundwater from discharging into Harrison Bayou and Caddo Lake at concentrations that would cause surface water to exceed Texas Surface Water Quality Standards, SDWA MCL standards, and Texas MSC for GW-Res standards..

Also in the same Sub-heading, include the phrase "COC and by-product concentrations ..." in the beginning of the second to last sentence of this sub-heading. In the last sentence of the sub-heading, include the phrase "COCs and by-products downgradient ..."

Same Section, Page 2-51, MNA to return groundwater to its potential beneficial use, wherever practicable Sub-heading, Sixth Sentence - Modify/Replace the sixth sentence with, "Therefore, MNA is proposed for LHAAP-16 in conjunction with in situ bioremediation to enhance reductive dechlorination within the groundwater plume. Biobarriers will prevent the discharge of contaminants and by-product contaminants into the surface water (i.e., Harrison Bayou, which flows into Caddo Lake)."

Same Section, Page 2-52, Third Circle - Modify the phrase "daughter products" to read "contaminants and daughter by-product contaminants."

Same Section, Pages 2-52 - 2-53, Groundwater and Surface Water Monitoring Sub-heading - In the first sentence, modify the language concerning the protection of Harrison Bayou to read, "... and to protect surface water in Harrison Bayou, which flows into Caddo Lake, from not attaining Texas Surface Water Quality Standards, SDWA MCLs and the Texas MSC for GW-Res standards."

Same Section, Page 2-53, Long-Term Operations Sub-heading, Last Three Sentences - Modify/Replace the last three sentences with, "Groundwater use restrictions will remain in place until groundwater COC and by-product contaminants concentrations drop to levels below the SDWA MCLs and Texas MSCs for GW-Ind, and support unrestricted use of the groundwater. Groundwater and surface water monitoring will be implemented at least every 5 years as provided under CERCLA Section 121(c). Monitoring will continue until the sampling data and information demonstrate that there are no releases or further threat of releases of groundwater contamination that fail to attain the SDWA MCLs and Texas MSCs for GW-Ind, and that no releases or threat of releases of contaminated groundwater into Harrison Bayou at levels that fail to attain the Texas Surface Water Quality Standards, the SDWA MCLs, and the Texas MSCs for GW-Res are present."

Section 2.11.3, Page 2-53, Cost Estimate for the Selected Remedy - Modify/Replace "LUC" in this section of "LUCs."

Also, delete the use of the word, "passive" before the word, "biobarrier."

32. Section 2.11.4, Page 2-53 - 2-54, Expected Outcomes of the Selected Remedy, First Paragraph - Modify/Replace first paragraph of this section to read, "The purpose of this response action is to attain the RAOs stated in Section 2.8 of this ROD. The groundwater will be restored to attain groundwater cleanup standards/levels. With respect to the COCs and by-product contaminants found in the groundwater at the Site, the groundwater cleanup standards/levels include attainment of the SDWA MCL for those COCs

and by-product (i.e., daughter) contaminants that have a MCL, to the extent practicable, and consistent with 40 C.F.R. § 300.430(e)(2)(i)(B & C). Because no SDWA MCL exists for some COCs and by-product contaminants including perchlorate, manganese and nickel, the MSCs (GW-Ind) as authorized under 30 TAC 335.559(d) constitutes the groundwater cleanup standard to be attained (Table 2-7). (***all ARARs tables must be modified to include ARARs listed in these comments).** Surface water standards in surface waters impacted by the contaminated groundwater discharges at LHAAP will be attained as well. The Texas Surface Water Quality Standards found at 30 TAC 307, or if those standards are not available, the SDWA MCLs, or if MCLs are not available the Texas MSCs (GW-Res) as authorized under 30 TAC 335.559(b), constitute the surface water cleanup standards/levels to be attained at Harrison Bayou, which flows into Caddo Lake (a drinking water source).

The expected outcome of the selected remedy is that the contaminants and by-product contaminants in the groundwater will be reduced to attain the SDWA MCLs and Texas MSCs for GW-Ind, and that any groundwater plume discharging into Harrison Bayou will be at concentrations that attain the Texas Surface Water Quality Standards, the SDWA MCLs and the Texas MSCs for GW-Res. Achievement of the groundwater cleanup standards/levels is anticipated to be completed in approximately ~~280~~ 30 - 75 years. (***it may be appropriate to delete the 280 year time-frame throughout this document [e.g., pp. 1-3, 2-54, 2-55] and include a more realistic time-frame based upon the active treatment employed and MNA [e.g. see p. 2-51; 30 - 75 year time-frame estimate], versus using a time-frame based solely on MNA).** The actual time frame depends on the success of the active remediation, but for cost estimating purposes, it was assumed that five-year reviews will continue until Year 30. When the groundwater cleanup levels have been attained, and the groundwater supports unrestricted use without limitations, the groundwater LUC restriction will be removed. However, the LUCs to protect the landfill remedy will remain in place as long as the landfill waste remains at the Site. The landfill LUCs will remain in place until the contaminated soil, and subsurface soil attain cleanup standards/levels that support unlimited use and unrestricted exposure.

Same Section, Page 2-54, Second Paragraph, Last Sentence - The last sentence of the second paragraph should be modified to read "Groundwater LUCs will remain in place until groundwater COC and by-product contaminants concentrations drop to levels below the SDWA MCLs and Texas MSCs, that support unrestricted and unlimited use of the groundwater. The groundwater LUCs will limit the use of the Site's groundwater to environmental monitoring and testing."

33. Section 2.12.1, Page 2-54 - 2-55, Protection of Human Health and the Environment, First Paragraph, First Sentence - Modify/Replace the first sentence to read, "The selected remedy, Alternative 7 will achieve the RAOs for LHAAP-16 by protecting human health from exposure to landfill waste and contaminated groundwater, reducing the COC and by-product contaminant concentrations within the groundwater plume to attain groundwater cleanup standards/levels, and reducing surface water quality impacts to Harrison Bayou (which flows into Caddo Lake) such that surface water standards/levels are attained.

Same Section, First Paragraph, Last Two Sentences - Modify/Replace the last two sentences with, "If LHAAP is transferred out of federal control, this ROD will be modified consistent with the CERCLA Section 117 and 40 C.F.R. § 300.435(c), to address prohibitions and/or restrictions concerning property uses (e.g., drinking water well installation), in order to prevent exposure to landfill waste or contaminated groundwater. The LUCs associated with the contaminated groundwater would be required until COCs and by-product contaminants attained the SDWA MCLs and Texas MSCs for GW-Ind, and supported unlimited use and unrestricted exposure."

Same Section, Page 2-55, Second Paragraph - delete the word "passive" when used in conjunction with biobarriers.

Same Section, Page 2-55, Second Paragraph, Last Two Sentences - Modify/Replace with, "Further monitoring would be used to evaluate contaminant and by-product contaminant migration, confirm that the COCs and by-product (daughter) contaminants in the groundwater plumes continue to degrade, and verify that contaminant and by-product contaminant concentration levels in Harrison Bayou do not exceed the attainment standards/levels of the Texas Surface Water Quality Standards, SDWA MCLs and Texas MSC for GW-Res standards. The eventual groundwater concentration remedial action objective is to restore the contaminated groundwater to its potential beneficial use, which in this case is, the attainment of the SDWA MCLs and Texas MSCs for GW-Ind for all COCs and by-product contaminants.

34. Section 2.12.2, Page 2-55 - 2-56, Compliance with ARARs, Chemical-Specific ARARs - Modify/Replace this specific section with, "The chemical-specific ARAR is the attainment of the SDWA MCL for all groundwater COCs and by-product contaminants. For those COCs and by-product contaminants that do not have an MCL, the Texas MSCs for GW-Ind as authorized under 30 TAC 335.559(d) constitutes the groundwater chemical-specific ARAR to be attained. The selected remedial action employs treatment including in situ bioremediation and biobarriers, and passive remedial action (i.e., MNA) to return the contaminated shallow and intermediate groundwater zones at LHAAP-16 to its potential beneficial use as a drinking water, wherever practicable. For purposes of this ROD, attainment of the SDWA MCL or the Texas MSC for GW-Ind if no MCL is available, constitutes a return of the contaminated groundwater to it potential beneficial use as a drinking water. If a return to potential beneficial uses is not practicable based upon 40 C.F.R.§ 300.430(f)(1)(ii)(C), this alternative would still meet the NCP remedy selection requirements by reducing or controlling exposure to the contaminated groundwater consistent with 40 C.F.R.§ 300.430(e)(9). With respect to the surface waters impacted by the contaminated groundwater discharging into Harrison Bayou, which flows into Caddo Lake (a drinking water source), the Texas Surface Water Quality Standards found at 30 TAC 307, or if those standards are not available, the SDWA MCLs, or if MCLs are not available the Texas MSCs for GW-Res as authorized under 30 TAC 335.559(b), constitute the surface water cleanup levels/standards to be attained at the Site."

Note that Table 2-7 should be modified to reference all groundwater and surface water standards addressed in this comment. In addition, the GW-Res for Manganese seems to be included under the UTL column, and looks like an error - it is hard to follow the appropriate standard; the column for GW-Res for Manganese should be modified to fit under the GW-Res column for other contaminants.

35. Same Section, Page 2-56, Action-Specific ARARs - This section fails to address ARARs relevant to the landfill located at the Site. This comment serves as a reminder concerning a previous comment (i.e., #13) made with respect to landfill closure/post-closure requirements. Note that this section, and the ARARs table 2-10 will have to be modified to reflect that there are certain requirements concerning the closure and post-closure care for landfills. 40 C.F.R. §§ 264.111 and 264.300 - 310 are relevant and appropriate requirements here, and the standards must met.

Also, Table 2-10 will have to be modified to include the RCRA treatment and disposal requirements for all wastewater and debris generated at the Site, in addition to the contaminated groundwater managed at the Site. Any disposal (i.e., including spills will have to satisfy) the RCRA land disposal waste analysis, treatment and disposal standards under 40 C.F.R. §§ 262 and 268. As stated earlier, the ARARs table does not address surface water standards; it does address groundwater standards.

36. Section 2.12.4, Page 2-57, Utilization of Permanent Solutions - Delete the word "passive" before use with biobarriers.

37. Section 2.12.5, Page 2-58, Preference for Treatment - Delete the word "passive" before use with biobarriers. This section clearly satisfies the statutory preference for treatment but fails to make such a

statement. Include the following statement at the beginning of the Section."The selected remedy satisfies the statutory preference for treatment as a principal element of the remedy."

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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 6
1445 ROSS AVENUE, SUITE 1200
DALLAS TX 75202-2733

OCT 13 2011

Ms. Rose M. Zeiler, Ph.D.
Department of the Army
Longhorn Army Ammunition Plant
Post Office Box 220
Ratcliff, AR 72951

Re: Comments on Draft Final MMRP Record of Decision (ROD)
LHAAP-001-R South Test Area/Bomb Test Area
LHAAP-003-R Ground Signal Test Area
Longhorn Army Ammunition Plant, Karnack, Texas

Dear Ms. Zeiler:

The Environmental Protection Agency (EPA) has completed its review of the *Draft Final MMRP ROD (LHAAP-001-R South Test Area/Bomb Test Area, LHAAP-003-R Ground Signal Test Area)* submitted on September 27, 2011, and have the following comments:

1. Overall ROD, Table 2-4: Although the anticipated future use of the facility as a wildlife refuge does not include the use of the groundwater at LHAAP-001-R and LHAAP-003-R as a drinking water source, the State of Texas designates all groundwater as potential drinking water, unless otherwise classified, and consistent with 30 TAC 335.563(h)(1). Therefore, the appropriate standard to be applied at LHAAP-001-R and LHAAP-003-R should be the State of Texas Groundwater MSC for Residential Use, which for perchlorate is at 26 ug/L, per 40 CFR 300.430(a)(iii)(F), and 300.430(f)(1)(ii)(B) .

   The ROD language needs to reflect this State of Texas groundwater designation and the appropriate residential standard in order to be consistent with the EPA July 2011 OSWER Directive 9283.1-34, EPA June 2009 OSWER Directive 9283.1-33, and the DoD April 2009 Perchlorate Release Management Policy.

   - EPA July 2011 OSWER Directive 9283.1-34, Groundwater Road Map Recommended Process for Restoring Contaminated Groundwater at Superfund Sites: http://www.epa.gov/superfund/health/conmedia/gwdocs/pdfs/gwroadmapfinal.pdf

   - EPA June 2009 OSWER Directive 9283.1-33: http://www.epa.gov/superfund/health/conmedia/gwdocs/pdfs/9283_1-33.pdf

   - DoD April 2009 Perchlorate Release Management Policy: http://www.denix.osd.mil/cmrmd/upload/dod_perchlorate_policy_04_20_09.pdf

   - TCEQ March 2006 MSC and risk-based screening levels tables: http://www.tceq.texas.gov/assets/public/remediation/rrr/msc-rbscn_2006.xls

2. Table of Contents: The 'Section 2.10.2 Compliance with ARARs' is missing and subsequent sections mis-numbered.

3. Section 1.5, Section 2.14.5: Revise to state that: "Although the statutory preference for treatment was not fully satisfied, the MEC removal action removed..."

4. Section 2.2.2: The last two sentences of this section should either be deleted or explained to reflect that the MMRP sites LHAAP-001-R and LHAAP-003-R are now NPL sites under the FFA and that EPA is the lead regulatory agency for these sites.

5. Section 2.5.2.2, first sentence: Please refer to the ROD as the 1998 NFA ROD.

6. Section 2.12.1: Before the first sentence in this Section add the following sentence, "Notwithstanding any other provision in this ROD, all remedial action selections made at Sites LHAAP-001-R and LHAAP-003-R shall comply with CERCLA Sections 113, 117, 120(e), 121, 40 C.F.R. §§ 300.430(f) and 300.820, and the FFA.

7. IC Checklist #4: The ROD confuses the term "LUC" and "objective" and includes inconsistent and unclear objectives. The LUC objectives appear to be partially listed in section 1.4, p. 1-2, although they are also generally described in 2.12.1. and 2.9.1. Note that the list includes signs and education programs and these are LUCs, not objectives. Please replace the listing on in section 1.4, p. 1-2 as follows: "The LUC objectives are: **1) to maintain the integrity of any current and/or future groundwater monitoring system such as monitoring wells, 2) to prohibit the development and use of the property for residential housing, elementary and secondary schools, and child care facilities and playgrounds, and 3) prohibit intrusive activities such as digging or any other activity which could result in detonation of explosive hazards."**

8. IC Checklist #5: LUCs. The "LUC" means the legal or administrative mechanism by which the LUC objective is implemented. In this case, the property appears to be still under Army control, then the Army should identify the current mechanism (some sort of internal Army procedures) and the future mechanism (ensure the controls are maintained by USFWS in the document transferring property). The signs and education programs mentioned in several places are also part of the LUCs and should be included. as well as the TAC restriction.

9. IC Checklist #6: Duration language-- missing. Please include the following: "Land Use Controls will be maintained until the concentration of hazardous substances in the soil and groundwater are at such levels to allow for unrestricted use and exposure."

10. IC Checklist #7: Responsibility language. The language in Section 2.12.2, page. 2-25 is ok. But the reference to monitoring in Section 1.4, page 1-2 and in Section 2.12.2, page 2-26 and must be modified as EPA does not consider the 5YR a substitute for **LUC** monitoring: "~~Monitoring in the form of~~ Five-Year Reviews will be conducted to ensure that the LUCs are specified, implemented, monitored, reported on, and enforced in an efficient, cost effective..."

In addition, on page 1-3, first paragraph: "The U.S. Army will remain responsible for implementation, maintenance, periodic inspection, reporting on and enforcement of the LUCs ~~in accordance with the LUC plan in Appendix I of the removal action work plan (EODT, 2008~~)."

11. IC Checklist #8: Remedy integrity. This problematic language appears in Sections 1-4 and 2.12.2 (Page 2-25) and must be changed to: "4) reservation of authority to change, modify, or terminate the LUC with approval from EPA and consultation from TCEQ and any related transfer or lease provisions; and (5) ensuring the integrity of the selected remedy…"

12. IC Checklist #9: Commitment to provide RD for implementation actions. In Section 1.4 next to the last paragraph there is a reference to the removal MEC work plan for LUC implementation details. The removal workplan will not suffice as it is not a primary document. Please include language from the Checklist or the language or as follows: "A LUC Remedial Design will be prepared as the land use component of the Remedial Design. Within 90 days of ROD signature, the Army shall prepare and submit to EPA for review and approval a LUC remedial design that shall contain implementation and maintenance actions, including periodic inspections."

13. IC Checklist #14: Modification/termination of LUC. The problematic language appears in Section 1.4, page 1-3 and in section 2.12.2, page 2-26. Please modify as follows: "In the event that T~~CEQ and/or~~ USEPA and the U.S. Army agree with respect to any ~~significant~~ modification of the selected remedy, including the LUC component of the selected remedy, the remedy will be changed consistent with the Federal Facility Agreement (FFA) and 40 CFR. §300.435(c)(2)."

    Again, the qualifier ("significant") must come out because EPA MUST agree with any change to a remedy (no matter what its significance) due to our statutory authority to jointly select remedies which is all the Army has no matter what. TCEQ needs to come out because Texas' agreement is not needed to modify the remedy. The statement above, as written, gives Texas an equal role in remedy selection which is not provided by the statute. Finally the "and/or" language could be read to state that EPA's agreement is not necessary.

14. Pages 1-3 and 2-25 (1st 2 bullets), please make it clear that it is the Army who notifies the county and insert a deadline, for example: "In addition, within 90 days of signature of this ROD, the Army shall: 1) request the Texas Department of Licensing and Regulation ~~will be requested~~ to notify well drillers of groundwater restrictions;and2)~~the Army shall~~ notify the ~~a notification of the LUC with the~~ Harrison County Courthouse of the LUC to include ~~would include~~ a map showing the areas of groundwater restriction at the site, in accordance with 30 TAC 335.565."

15. Section 2.12.1, Section 2.12.2: The language (i.e.: The details and description of the LUC…" on page 2-24 and page 2-26 is confusing in that it seems to state that the LUC implementation actions are already in an approved remedial design. This language need to be clarified to reflect that: "A LUC Remedial Design will be prepared as the land use component of the Remedial Design. Within 90 days of ROD signature, the Army shall

> prepare and submit to EPA for review and approval a LUC remedial design that shall contain implementation and maintenance actions, including periodic inspections."

Under Section VIII.C.2. and Section XV.B. of the Federal Facilities Agreement, EPA may invoke Dispute Resolution for any unresolved comments. Please feel free to contact me at (214) 665-8409, or by email at tzhone.stephen@epa.gov, if there are any questions or comments.

Sincerely,

Carlos A. Sanchez
for
Stephen L. Tzhone
Remedial Project Manager

cc:
Ms. Fay Duke, TCEQ
Mr. Richard Mayer, EPA R6
Mr. George Malone, EPA R6
Ms. Sally Dalzell, EPA FFEO
Ms. Allison Abernathy, EPA FFRRO
Mr. Timothy Mott, EPA FFRRO
Ms. Ellen Treimel, EPA FFRRO

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United States
Environmental Protection
Agency

Interim Drinking Water Health Advisory For Perchlorate

Interim Drinking Water Health Advisory for Perchlorate

Prepared by:

Health and Ecological Criteria Division
Office of Science and Technology
Office of Water
U.S. Environmental Protection Agency
Washington, DC 20460

http://www.epa.gov/waterscience/

EPA 822-R-08-025
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TABLE OF CONTENTS

ACKNOWLEDGMENTS

This document was prepared by Oak Ridge National Laboratory, Oak Ridge, Tennessee, work assignment 2006-002-2, under the U.S. EPA IAG Number DW-89-92209701. The Lead EPA Scientist is Elizabeth Doyle, Ph.D., Health and Ecological Criteria Division, Office of Science and Technology, Office of Water, U. S. Environmental Protection Agency.

LIST OF ABBREVIATIONS

ATSDR	Agency for Toxic Substances and Disease Registry
BMD	benchmark dose
BMDL	benchmark dose level
BW	body weight
CAS	Chemical Abstracts Registry
CSF	Cancer Slope Factor
CDC	Centers for Disease Control and Prevention
CSF	cancer slope factor
DWEL	Drinking Water Equivalent Level
GD	gestation day
HA	Health Advisory
HSDB	Hazardous Substance Data Bank
IRIS	Integrated Risk Information System
kg	kilogram
L	liter
LOAEL	lowest observed adverse effect level
MDL	method detection limit
mg	milligram
mg/kg	milligram per kilogram of body weight
mg/L	milligrams per liter (equivalent to parts per million [ppm])
µg	microgram (one-millionth of a gram)
NHANES	National Health and Nutrition Examination Survey
NOAEL	no observed adverse effect level
NOEL	no observed effect level
NRC	National Research Council
OW	Office of Water
PBPK	Physiologically-Based Pharmacokinetic
ppb	parts per billion
ppm	parts per million
RAIU	Radioactive Iodide Uptake
RfD	reference dose
RSC	relative source contribution
SIR	standardized incidence ratio
SDWA	Safe Drinking Water Act
T3	Triiodothyronine: thyroid hormone containing three iodine atoms
T4	Thyroxine: a biologically inactive prohormone containing four iodine atoms that is activated to triiodothyronine by deiodinase. (also known as tetraiodothyronine)
TSH	Thyroid stimulating hormone (also known as thyrotropin)
UCMR	Unregulated Contaminant Monitoring Regulation
UF	uncertainty factor

EPA	U.S. Environmental Protection Agency
FDA	U.S. Food and Drug Administration
USDA	U.S. Department of Agriculture

1.0 INTRODUCTION

The Health Advisory (HA) Program, sponsored by the Office of Water (OW), provides information on the environmental properties, health effects, analytical methodology, and treatment technology for regulated and unregulated drinking water contaminants. HAs establish non-regulatory concentrations of drinking water contaminants at which adverse health effects are not anticipated to occur over specific exposure durations (one day, ten days, a subchronic period, several years, and a lifetime). For perchlorate, EPA is establishing an interim health advisory level for subchronic exposure. HAs serve as informal technical guidance to assist Federal, State and local officials, and managers of public or community water systems in protecting public health when emergency spills or contamination situations occur. They are not legally enforceable Federal standards and are subject to change as new information becomes available.

The Interim Drinking Water Health Advisory level (15 µg/l) is based on the recommendations of the National Research Council (NRC) of the National Academies as reported in "Health Implications of Perchlorate Ingestion" (NRC, 2005). The NRC recommended and EPA adopted a Reference Dose (RfD) of 0.7 µg/kg/day. The NRC perchlorate committee took into consideration presentations at the committee's public meetings, submitted public comments, and the comments made by technical experts on the draft NRC perchlorate report. The NRC review followed two external draft toxicological reviews of perchlorate prepared by EPA (1998, 2002) that were also subject to public comment and independent external review. The NRC report can be accessed at http://www.nap.edu/catalog.php?record_id=11202.

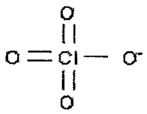
On October 10, 2008, the Agency issued a preliminary determination for perchlorate in the *Federal Register* for public review and comment (USEPA, 2008a). The notice described the Agency's preliminary decision that there is not a "meaningful opportunity for health risk reduction" through a national drinking water regulation. Based on the comments that it received, EPA believes that it would benefit once again from NRC input regarding perchlorate, this time in the context of the application of the physiologically-based pharmacokinetic (PBPK) modeling and assumptions regarding sensitive populations in development of the interim HA level. Thus in 2009, EPA will engage the NRC to provide additional advice.

The Agency is issuing this interim health advisory to assist state and local officials in advance of a final regulatory determination. EPA expects to issue a final health advisory concurrent with the final regulatory determination for perchlorate.

2.0 GENERAL INFORMATION AND PROPERTIES

2.1 Physical and Chemical Properties

Perchlorate is an inorganic contaminant containing one chlorine atom bound to four oxygen atoms in a tetrahedral configuration. As such, perchlorate (ClO_4^-) is an anion that forms salts with most cations. Commonly used perchlorate salts include ammonium perchlorate and potassium perchlorate. Perchlorate is also used as sodium perchlorate, aluminum perchlorate, hydrazine perchlorate, hydrogen perchlorate, hydroxylammonium perchlorate, lithium perchlorate, magnesium perchlorate, nitronium perchlorate, and as perchloric acid. Chemical Abstracts Service (CAS) registry numbers, as well as certain physical and chemical properties for the most common forms of perchlorate are presented in Table 2-1.



$$O{=}\overset{\overset{\large O}{\|}}{\underset{\underset{\large O}{\|}}{Cl}}{-}O^-$$

Perchlorate

Table 2-1. CAS Numbers and Physical/Chemical Properties of PerchloratePerchlorate and Its Common Salts

	Perchlorate	**Ammonium perchlorate**	**Potassium perchlorate**	**Magnesium perchlorate**	**Sodium perchlorate**
CAS number	14797-73-0	7790-98-9	7778-74-7	10034-81-8	7601-89-0
Molecular Formula	ClO_4^-	NH_4ClO_4	$KClO_4$	$Mg(ClO_4)_2$	$NaClO_4$
Physical and Chemical Properties					
Decomposition Point	-----	-----	630°C[7]	-----	-----
Melting Point	-----	439 °C[2]	525 °C[4]	250 °C[4]	480 °C[4]
Molecular Weight	99.45 g/mol[1]	117.49 g/mol[2]	138.55 g/mol[1]	223.20 g/mol[4]	122.4 g/mol[1]
Water Solubility	-----	200 g/L @ 25°C[3]	15 g/L @ 25°C[3]	99 g/1000g @ 25°C[5]	209 g/100 g @ 25 °C[6]

[1] Budavari, 1996, [2] HSDB, 2004, [3] Ashford, 1994, [4] Lide, 2000, [5] Weast, 1979, [6] Gerhartz, 1985, [7]Kubota, 2007

2.2 Uses

While perchlorate has a wide variety of uses, it is primarily used in the form of ammonium perchlorate as an oxidizer in solid fuels used in explosives, fireworks, road flares, and rocket motors. Perchlorate can also be present as an ingredient or as an impurity in road flares, lubricating oils, matches, aluminum refining, rubber manufacturing, paint and enamel manufacturing, leather tanning, paper and pulp processing (as an ingredient in bleaching powder), and as a dye mordant. Sodium hypochlorite solutions used in water and wastewater treatment plants have also been identified as a potential source of perchlorate contamination (US EPA, 2007).

3.0 OCCURRENCE AND EXPOSURE

Perchlorate occurs in the environment from its past and present use primarily in rocket fuels, explosives, and fireworks. Perchlorate can also occur naturally in the environment. For example, Chile possesses caliche ores rich in sodium nitrate ($NaNO_3$), which are also a natural source of perchlorate. These Chilean nitrate salts (saltpeter) have been mined and refined to produce commercial fertilizers (US EPA, 2001). The US EPA (2001) conducted a broad survey of fertilizers and other raw materials and found that all products surveyed were devoid of perchlorate except for those known to contain or to be derived from mined Chilean saltpeter.

3.1 Air

Perchlorate salts have very low vapor pressures and therefore are not expected to volatilize to the air as fugitive emissions during their manufacture, processing, transport, disposal, or use (ATSDR, 2005). However, persons may be exposed to perchlorate dust or particles in an occupational setting, where the risk posed by that exposure would depend on the particle size distribution (NRC, 2005).

3.2 Water

Perchlorate was sampled in drinking water supplies as part of the Unregulated Contaminant Monitoring Regulation (UCMR) 1, List 1 Assessment Monitoring program. Occurrence data for perchlorate was collected from 3,865 public water supplies between 2001 and 2005. Approximately 160 (4.1%) of these systems had at least 1 analytical detection of perchlorate (in at least 1 entry/sampling point) at levels greater than or equal to 4 μg/L. These 160 systems are located in 26 states and 2 territories. Approximately 1.9% (or 637) of the 34,331 samples collected by all 3,865 public water supplies had positive detections of perchlorate at levels greater than or equal to 4 μg/L. The maximum reported concentration of perchlorate, 420 μg/L, was found in a single surface water sample from a public water supply in Puerto Rico. The average concentration of perchlorate for those samples with positive detections for perchlorate was 9.85 μg/L and the median concentration was 6.40 μg/L.

There is limited information on the release of perchlorate to ambient water. Perchlorate may be released to water from its manufacture, processing, or use. Perchlorate may ultimately be released to surface water from the runoff or erosion of sand or soil contaminated with the compound, while the percolation of water through contaminated sand or soil could result in perchlorate contaminating groundwater (ATSDR, 2005).

Public water systems that have not previously monitored their drinking water for perchlorate may want to review their source water assessments to determine if there are any potential sources of perchlorate contamination within the contributing area of their source.

3.3 Food

The U.S. Food and Drug Administration's (FDA) Total Diet Study (TDS) combines nationwide sampling and analysis of hundreds of food items along with national surveys of food intake to develop comprehensive dietary exposure estimates for a variety of demographic groups in the US. In addition, the Centers for Disease Control and Prevention's (CDC) National Health and Nutrition Examination Survey (NHANES) data base measured perchlorate in the urine of a representative sample of Americans. EPA and CDC used data from the NHANES data base and UCMR monitoring results to estimate perchlorate exposure from food and water together, and food alone, for different sub-populations. This section provides details on the results of these studies.

3.3.1 Food Monitoring Studies. The FDA, the United States Department of Agriculture (USDA), and other researchers have studied perchlorate in foods. The most recent and most comprehensive information available on the occurrence of perchlorate in the diet has been published by FDA. This section describes two perchlorate studies released by FDA – the TDS and FDA's *Exploratory Survey Data on Perchlorate in Food.*

3.3.1.1 FDA Total Diet Study, 2005 and 2006. Since 1961, FDA has periodically conducted a broad-based food monitoring study known as the *Total Diet Study* (TDS). The purpose of the TDS is to measure substances in foods representative of the total diet of the US population, and to make estimates of the average dietary intake of those substances for selected age-gender groups. A detailed history of the TDS can be found at the following Web site: http://www.cfsan.fda.gov/~comm/tds-toc.html.

Murray *et al.* (2008) briefly describe the design of the current TDS. Dietary intakes of perchlorate were estimated by combining the analytical results from the TDS with food consumption estimates developed specifically for estimating dietary exposure from the TDS results. While the perchlorate data for TDS foods were collected in 2005-2006, the food consumption data in the current TDS food list is based on results (Egan *et al.*, 2007) from the USDA's 1994–96, 1998 *Continuing Survey of Food Intakes by Individuals* (94-98 CSFII), which includes data for all age groups collected in 1994-96, and for children from birth through age 9 collected in 1998. Although over 6,000 different foods and beverages were included in the food consumption surveys, these foods and beverages were collapsed into a set of 285 representative foods and beverages by aggregating the foods according to the similarity of their primary ingredients and then selecting the specific food consumed in greatest quantity from each group as the representative TDS food for that group. The consumption amounts of all the foods in a group were aggregated and assigned to the representative food for that group. It is these 285 representative foods and beverages that are on the current TDS food list. This approach to estimating dietary intake assumes that the analytical profiles (e.g., perchlorate concentrations) of the representative foods are similar to those of the larger group of foods from the original consumption survey to which they correspond. This approach provides a reasonable estimate of total dietary exposure to the analytes from all foods in the diet, and not from the representative TDS foods alone. The sampled TDS foods are purchased from grocery stores and fast-food restaurants. The foods are prepared table-ready prior to analyses, using distilled water when water is called for in the recipe. The analytical method developed and used by FDA to measure perchlorate in food samples has a nominal limit of detection (LOD) of 1.00 ppb and a limit of quantitation (LOQ) of 3.00 ppb (Krynitsky *et al.*, 2006).

Murray *et al.* (2008) reports that FDA included perchlorate as an analyte in TDS baby foods in 2005 and in all other TDS foods in 2006. Iodine also was analyzed in all TDS foods from five market baskets surveyed in late 2003 through 2004. Using these data collectively, FDA developed estimates of the average dietary perchlorate and iodine intake for 14 age-gender groups. To account for uncertainties associated with samples with no detectable concentrations of perchlorate or iodine (non-detects or NDs), FDA calculated a lower-bound and upper-bound for each estimate of the average dietary exposure, assuming that NDs equal zero and the LOD, respectively. Specifically, FDA multiplied these upper- and lower-bound average concentrations by the average daily consumption amount of the representative food for the given subpopulation group to provide a range of average intakes for each TDS food.

Table 3-1 summarizes the FDA estimated upper- and lower-bound average dietary perchlorate intakes (from food) for 14 age-gender groups on a per kilogram of body weight per day basis. Murray *et al.* (2008) reports that average body weights for each population group were based on self-reported body weights from respondents in the 94–98 CSFII.

Table 3-1. Lower- and Upper-bound (ND = 0 and LOD) Perchlorate Intakes from FDA's TDS Results for 2005–2006.

Population Group		Average Perchlorate Intake from Food (µg/kg/day)	
		Lower-bound	Upper-bound
Infants	6-11 mo	0.26	0.29
Children	2 yr	0.35	0.39
Children	6 yr	0.25	0.28
Children	10 yr	0.17	0.20
Teenage Girls	14-16 yr	0.09	0.11
Teenage Boys	14-16 yr	0.12	0.14
Women	25-30 yr	0.09	0.11
Men	25-30 yr	0.08	0.11
Women	40-45 yr	0.09	0.11
Men	40-45 yr	0.09	0.11
Women	60-65 yr	0.09	0.10
Men	60-65 yr	0.09	0.11
Women	70+ yr	0.09	0.11
Men	70+ yr	0.11	0.12

Based on their analysis of TDS data, FDA reports that detectable levels of perchlorate were found in at least one sample in 74 percent (211 of 286) of TDS foods (Murray *et al.*, 2008). The average estimated perchlorate intakes for the 14 age-gender groups range from 0.08 (for 25-30 year old men) to 0.39 (for children 2 years old) µg/kg/day, compared with the RfD of 0.7 µg/kg/day. Though not shown here, Murray *et al.* (2008) reports that the average estimated iodine intake for the 14 age-gender groups range from 138 to 353 µg/person/day, and for all groups exceed the relevant US dietary reference values used for assessing the nutritional status of populations.[1]

The results of the TDS dietary intake assessment provide an estimate of the average dietary perchlorate intake by specific age-gender groups in the US. However, Murray *et al.* note that the current TDS design "does not allow for estimates of intakes at the

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[1] Murray *et al.* (2008) compared estimated average iodine intake with US Dietary Reference Intakes for iodine (NAS, 2000). The reference values cited by Murray *et al.* (2008) are as follows: 130 µg/person/day for infants, 65 µg/person/day for children 1–8 years, 73 µg/person/day for children 9–13 years, and 95 µg/person/day for the remainder of population.

extremes (i.e., upper or lower percentiles of food consumption) or for population subgroups within the 14 age/sex groups that may have specific nutritional needs (e.g., the subgroups of pregnant and lactating women within the groups of women of child bearing age)." Nevertheless, Murray *et al.* stated that: "These TDS results increase substantially the available data for characterizing dietary exposure to perchlorate and provide a useful basis for beginning to evaluate overall perchlorate and iodine estimated dietary intakes in the US population."

3.3.1.2 FDA Exploratory Survey Data on Perchlorate in Food, 2003–2005. Prior to including perchlorate in the TDS, FDA conducted exploratory surveys from October 2003 to September 2005 to determine the occurrence of perchlorate in a variety of foods. In May 2007, FDA provided an estimate of perchlorate exposure from these surveys (http://www.cfsan.fda.gov/~dms/clo4ee.html). Using the data from these exploratory studies and food and beverage consumption values from USDA's 94–98 CSFII, FDA estimated mean perchlorate exposures of 0.053 µg/kg/day for all ages (2+ years), 0.17 µg/kg/day for children (2–5 years), and 0.037 µg/kg/day for females (15–45 years). There are uncertainties associated with the preliminary exposure assessment because the 27 foods and beverages selected represent only about 32 to 42 percent of the total diet depending on the population group. Additionally, the overall goal of the sampling plan was to gather initial information on occurrence of perchlorate in foods from various locations with a high likelihood of perchlorate contamination. With the preceding caveats in mind, the results of these exploratory studies are generally consistent with the more complete results of the 2005-2006 TDS. For the purpose of developing a national estimate of dietary perchlorate exposure, while the results of FDA's exploratory studies generally support the TDS results, they are superseded by the results of the TDS, and as such they are not being used in arriving at an interim HA.

3.3.1.3 Other Published Food Studies. Pearce *et al.* (2007) published an analysis of perchlorate concentrations in 17 brands of prepared ready to eat and concentrated liquid infant formula. Perchlorate concentrations in the 17 samples ranged from 0.22 to 4.1 µg/L, with a median concentration of 1.5 µg/L. The researchers did not estimate the perchlorate dose to which infants would be exposed at the concentrations observed in the study. FDA also included sampling and analysis of infant formula in their current TDS analysis, discussed above.

Studies such as those published by Kirk *et al.* (2003, 2005) and Sanchez *et al.* (2005a, 2005b) have examined perchlorate in milk and produce.

3.4 Biomonitoring Studies

Researchers have also begun to investigate perchlorate occurrence in humans by analyzing for perchlorate in urine and breast milk. For example, CDC has included perchlorate in its National Biomonitoring Program, which develops methods to measure environmental chemicals in humans. With this information, CDC can obtain data on the levels and trends of exposure to environmental chemicals in the US population.

3.4.1 Urinary Biomonitoring. In the largest study of its kind, Blount *et al.* (2006c) measured perchlorate in urine samples collected from a nationally representative sample of 2,820 US residents as part of the 2001–2002 NHANES. Blount *et al.* (2006c) detected perchlorate at concentrations greater than 0.05 µg/L in all 2,820 urine samples tested, with a median concentration of 3.6 µg/L and a 95th percentile of 14 µg/L. Women of reproductive age (15–44 years) had a median urinary perchlorate concentration of 2.9 µg/L and a 95th percentile of 13 µg/L. The demographic with the highest concentration of urinary perchlorate was children (6–11 years), who had a median urinary perchlorate concentration of 5.2 µg/L. Blount *et al.* (2006c) estimated a total daily perchlorate dose for the NHANES participants aged 20 and older (for whom a creatinine correction method was available) and found a median dose of 0.066 µg/kg/day (about one tenth of the RfD) and a 95th percentile dose of 0.234 µg/kg/day (about one third of the RfD). Eleven adults (0.7 percent) had estimated perchlorate exposure greater than perchlorate's RfD of 0.7 µg/kg/day (the highest calculated exposure was 3.78 µg/kg/day). Because of daily variability in diet and perchlorate exposure, and the short residence time of perchlorate in the body, these single sample measurements may overestimate long-term average exposure for individuals at the upper end of the distribution and may underestimate the long-term average exposure for individuals at the lower end of the distribution. Blount *et al.* did not estimate daily perchlorate dose for children and adolescents due to the limited validation of estimation methods for these age groups at that time (Blount *et al.*, 2006c). Analyses on pregnant and lactating women were limited because no information was available regarding the trimester or stage of pregnancy for women reported as pregnant in the study, and no specific information was available on the characteristics of lactating women.

EPA and CDC investigators merged the data sets from NHANES and UCMR 1 to identify the NHANES participants from counties which had one or more perchlorate detections during the UCMR survey (USEPA, 2008b). The study assumes, based on previous analyses of perchlorate pharmacokinetics, that urine is the sole excretion pathway of perchlorate from participants other than lactating women. Since all NHANES participants' urine contained perchlorate, separating out those who had a higher potential for additional exposure via drinking water from those who had a lower potential for drinking water exposure left the remainder as those participants whose exposure was expected to be primarily from food.

The advantage of a urinary biomonitoring study is that it reflects the perchlorate actually ingested in the diets of a large number of individuals rather than using estimators of perchlorate ingestion from a variety of foods for a diverse population. The analysis of biomonitoring data also provides a novel opportunity to use public water system occurrence and human biomonitoring data to compare perchlorate concentration in urine from people in areas with perchlorate in their drinking water with perchlorate concentration in urine from people in areas with no reported perchlorate in their drinking water. The approach is reasonable for estimating perchlorate intake at various percentiles from food and to gain an understanding of the relative contribution from drinking water. A limitation is in the use of NHANES's spot urine testing, and creatinine corrections for a population with diverse physiological characteristics, to calculate the daily perchlorate dose. The cross sectional study attempts to capture a representative exposure, but was limited by the need to match up drinking water occurrence data with biomonitoring data on a county-wide basis, even though county and public water system service area boundaries often do not coincide. There also may have been some temporal mismatch between the occurrence and biomonitoring data.

The primary goal of the study was to derive the dose of perchlorate coming from food alone by eliminating possible sources of water contribution. Individuals' data were separated based on the likelihood of perchlorate being in their tap water. Groups were further sorted by age and sex. Bin I was comprised of NHANES 2001-2002 data for individuals residing in the same counties as public water systems that had at least one positive measurement of perchlorate during the sample period, as measured in UCMR 1. This group represented those who were more likely to be exposed to perchlorate in both food and water. For the most part, the average perchlorate level in urine for all age groups was the highest in this bin, and the creatinine-corrected average dose for all individuals in this group was 0.101 µg/kg/day, with a geometric mean of 0.080 µg/kg/day.

A second group was defined in one of three ways and was comprised of data for individuals considered less likely to have exposure to perchlorate via drinking water and thus, more likely to have their perchlorate exposure caused solely by intake from food: (1) they resided in counties where there were no quantified detections of perchlorate in public drinking water systems sampled as part of UCMR (i.e., UCMR 1 results were below the minimum reporting limit of 4 µg/L); or (2) they self-reported that they had not consumed tap water in the previous 24 hours regardless of where they resided (i.e., they may have resided in a county with a positive UCMR finding, but did not drink tap water); or (3) not considering the UCMR status of the county, their response to NHANES indicated they used a reverse osmosis filter to filter their tap water, which would likely be effective for removing perchlorate. The average creatinine-corrected perchlorate dose for these individuals was 0.090 µg/kg/day, with a geometric mean of 0.062 µg/kg/day.

A summary of selected results for individuals in these two groups is shown in Table 3-2. The estimates of daily perchlorate intake presented in Table 3-2 from the NHANES-UCMR analysis are somewhat higher than those of Blount *et al.* (2006a). The Blount *et al.* (2006a) estimates were limited to adults 20 years of age and older because application of the set of creatinine excretion equations used by Blount *et al.* to estimate perchlorate dose was limited to adults. Mage *et al.* (2007) provides an expanded set of equations that allows for estimating daily creatinine excretion rates for children, as well as for adults. Since children tend to have higher exposure on a per body weight basis than adults, it is not surprising that the estimates based on both adults and children are somewhat higher than the Blount estimates based on adults alone. The mean total exposure for persons that are more likely to be exposed to perchlorate in food and water was calculated to be 0.101 µg/kg/day. The average exposure for persons more likely to be exposed to perchlorate from food alone was 0.090 µg/kg/day.

Table 3-2. Estimated Daily Perchlorate Intakes (µg/kg/day) for Individuals With and Without Exposure Through Drinking Water

Group	Perchlorate Likely in Water (+/-)	Number of people	Average (Mean)	Geometric Mean	50th %ile	90th %tile
Total	+	320	0.101	0.080	0.075	0.193
	-	2063	0.090	0.062	0.058	0.167
Age: 6-11	+	52	0.152	0.132	0.131	0.237
	-	270	0.150	0.118	0.124	0.280
Age: 12-19	+	100	0.109	0.078	0.070	0.286
	-	608	0.080	0.061	0.060	0.158
Age: ≥20	+	168	0.091	0.074	0.071	0.186
	-	1185	0.085	0.057	0.055	0.143
Females: 15-44	+	57	0.081	0.062	0.071	0.141
	-	505	0.093	0.055	0.052	0.143
Pregnant Females	+	8	0.097	0.086	0.060	0.121
	-	98	0.123	0.064	0.056	0.263

Comparison of exposure estimates for individuals more likely to be exposed only through food to the FDA TDS, shown in Table 3-1, indicates good agreement at the mean. For example, for females 14-16, women 25-30, and women 40-45 years old, the FDA mean food dose was 0.09–0.1 µg/kg/day, while in the EPA-CDC biomonitoring study of NHANES-UCMR, the mean food dose for women of child-bearing age (15–44 years old) was 0.093 µg/kg/day. The results from calculating likely food intakes (TDS study) and from urinalysis from actual intakes (NHANES/UCMR) are in close agreement where comparisons can be made.

3.4.2 Breast Milk. A number of studies have investigated perchlorate in human breast milk. The most recent study included measurements from 49 healthy Boston-area volunteers (10–250 days postpartum, median 48 days; Pearce, *et al.*, 2007). Perchlorate was found in all samples, ranging from 1.3–411 µg/L, with a median concentration of 9.1 µg/L and a mean concentration of 33 µg/L. No correlation was found between perchlorate and iodine concentrations in breast milk. EPA notes that the Boston-area public water systems did not detect perchlorate in drinking water samples collected for the US EPA's UCMR from 2001 to 2003, nor did Boston area systems detect perchlorate in samples collected in response to the Massachusetts Department of Environmental Protection (DEP) 2004 emergency regulations for perchlorate.

Kirk *et al.* (2005) analyzed 36 breast milk samples from 18 States (CA, CT, FL, GA, HI, MD, ME, MI, MO, NC, NE, NJ, NM, NY, TX, VA, WA, WV) and found perchlorate concentrations in all samples ranging from 1.4 to 92.2 µg/L, with a mean concentration of 10.5 µg/L. Kirk *et al.* (2007) later did a smaller study involving 10 women, which included 6 samples on each of 3 days in a temporal study. Half the women were from Texas, but the others were from CO, FL, MO, NM, and NC. They found significant variation in all samples (n=147), with a range, mean, and median perchlorate concentration of 0.5–39.5 µg/L, 5.8 µg/L, and 4.0 µg/L, respectively.

Téllez *et al.* (2005) reported maternal parameters for participants from a study conducted in Chile. Breast milk samples indicated that a significant amount of perchlorate leaves the body of the nursing mother through breast milk, in addition to urine. However, the breast milk perchlorate levels were highly variable and no significant correlations could be established between breast milk perchlorate concentrations and either urine perchlorate concentrations or breast milk iodide concentrations for the individuals evaluated in these Chilean cities (Téllez *et al.*, 2005).

Blount *et al.* (2007) also suggested breast milk as an excretion pathway and the NHANES-UCMR study authors observed a difference between the urinary perchlorate concentration of breast feeding women versus pregnant women with an overall mean concentration of 0.130 µg/kg/day for 117 pregnant women compared to a concentration of 0.073 µg/kg/day for the 24 breast-feeding women (USEPA, 2008b).

Dasgupta *et al.* (2008) analyzed breast milk samples and 24 hour urine samples from 13 lactating women from Texas for perchlorate and iodine. For breast milk, they found perchlorate concentrations ranging from 0.01 to 48 µg/L, with a median concentration of 7.3 µg/L and a mean concentration of 9.3 µg/L (457 total samples), while for iodine, concentrations ranged from 1 to 1,200 µg/L, with a median concentration of 43 µg/L and a mean concentration of 120 µg/L (447 total samples). For urine they found perchlorate concentrations ranging from 0.6 to 80 µg/L, with a median concentration of 3.2 µg/L and a mean concentration of 4.0 µg/L (110 total samples), while for iodine, concentrations ranged from 26 to 630 µg/L, with a median concentration of 110 µg/L and a mean concentration of 140 µg/L (117 total samples).

3.5 Soil

As discussed above (see section 3.0), perchlorate has been detected in fertilizers derived from Chilean caliche (US EPA, 2001), and perchlorate-containing fertilizers could result in contamination of soil as a direct result of their intended use (ATSDR, 2005). Perchlorate has also been found in other geologic materials. Orris *et al.* (2003) measured perchlorate at levels exceeding 1,000 parts per million (ppm or mg/kg) in several samples of natural minerals, including potash ore from New Mexico and Saskatchewan (Canada), playa crust from Bolivia, and hanksite from California.

4.0 HEALTH EFFECTS DATA

4.1 Human Studies and Modeling

4.1.1 Mode of Action. Perchlorate interacts with the sodium iodide symporter, reducing iodine uptake into the thyroid gland and, at sufficiently high doses, the amount of T4 produced and available for release into circulation. Sustained changes in thyroid hormone secretion can result in hypothyroidism. Thyroid hormones stimulate diverse metabolic activities in most tissues and individuals suffering from hypothyroidism experience a general slowing of metabolism of a number of organ systems. In adults, these effects are reversed once normal hormone levels are restored (NRC, 2005).

In fetuses, infants, and young children, thyroid hormones are critical for normal growth and development. Irreversible changes, particularly in the brain, are associated with hormone insufficiencies during development in humans (Chan and Kilby, 2000 and Glinoer, 2007). Disruption of iodide uptake presents particular risks for fetuses and infants (Glinoer, 2007 and Delange, 2004). Because the fetus depends on an adequate supply of maternal thyroid hormone for its central nervous system development during the first trimester of pregnancy, iodide uptake inhibition from perchlorate exposure has been identified as a concern in connection with increasing the risk of neurodevelopmental impairment in fetuses of high-risk mothers (NRC, 2005). Poor iodide uptake and subsequent impairment of the thyroid function in pregnant and lactating women have been linked to delayed development and decreased learning capability in infants and children with fetal and neonatal exposure (NRC, 2005).

The RfD used in this assessment was developed by the NRC (2005). The NRC recommended basing the RfD on a precursor to an adverse effect rather than an adverse effect *per se*. The precursor event precedes a downstream adverse effect in the dose response continuum. In this case, NRC used prevention of iodide uptake inhibition, a precursor to adverse thyroid effects, to establish a level at which no adverse effects would be anticipated in exposed populations. NRC (2005) noted that "Using a nonadverse effect that is upstream of the adverse effect is a more conservative, health-protective approach to the perchlorate risk assessment." This approach is consistent with the Agency's policy on the use of precursor events when appropriate in establishing the critical effect upon which an RfD is based (U.S. EPA, 2002c).

Children born with congenital hypothyroidism may suffer from mild cognitive deficits despite hormone remediation (Rovet, 2002; Zoeller and Rovet, 2004), and subclinical hypothyroidism and reductions in T4 (i.e., hypothyroxinemia) in pregnant women have been associated with neurodevelopmental delays and IQ deficits in their children (Pop *et al.*, 1999, 2003; Haddow *et al.*, 1999; Kooistra *et al.*, 2006; Morreale de Escobar *et al.*, 2004a, 2004b). Animal studies support these observations, and recent findings indicate that neurodevelopmental deficits are evident under conditions of hypothyroxinemia and occur in the absence of growth retardation (Auso *et al.*, 2004; Gilbert and Sui, 2008; Sharlin *et al.*, 2008; Goldey *et al.*, 1995).

4.1.2 Epidemiology Data. The data from epidemiological studies of the general population provide some information on possible effects of perchlorate exposure. Based on an analysis of the data available at the time, NRC (2005) acknowledged that ecologic epidemiological data alone are not sufficient to demonstrate whether or not an association is causal, and that these studies can provide evidence bearing on possible associations. Noting the limitations of specific studies, the NRC (2005; chapter 3) committee concluded that the available epidemiological evidence is not consistent with a causal association between perchlorate and congenital hypothyroidism, changes in thyroid function in normal-birth weight, full-term newborns, or hypothyroidism or other thyroid disorders in adults. The committee considered the evidence to be inadequate to determine whether or not there is a causal association between perchlorate exposure and adverse neurodevelopmental outcomes in children. The committee noted that no studies have investigated the relationship between perchlorate exposure and adverse outcomes among especially vulnerable groups, such as the offspring of mothers who had low dietary iodide intake, or low-birth weight or preterm infants (US EPA, 2005a).

Results from studies of the effects of perchlorate exposure on hormone levels have been mixed. One recent study did not identify any effects of perchlorate on blood serum hormones (Amitai *et al.*, 2007), while another study (Blount *et al.*, 2006b) did identify such effects.

4.1.3 Biomonitoring Studies. After the NRC report was released, several papers were published that investigated whether biomonitoring data associated with NHANES could be used to discern if there was a relationship between perchlorate levels in the body and thyroid function. These papers also help to evaluate populations that might be considered to be more sensitive to perchlorate exposure.

Blount *et al.* (2006b) published a study examining the relationship between urinary levels of perchlorate and blood serum levels of TSH and total T4 in 2,299 men and women (ages 12 years and older) who participated in CDC's 2001–2002 NHANES[2]. Blount *et al.* (2006b) evaluated perchlorate along with a number of covariates known or likely to be associated with T4 or TSH levels to assess the relationship between perchlorate and these hormones, and the influence of other factors on this relationship. These covariates included gender, age, race/ethnicity, body mass index, serum albumin, serum cotinine (a marker of nicotine exposure), estimated total caloric intake, pregnancy status, post-menopausal status, premenarche status, serum C-reactive protein, hours of fasting before sample collection, urinary thiocyanate, urinary nitrate, and use of selected medications. The study found that perchlorate was a statistically significant predictor of thyroid hormones in women, but not in men.

After finding evidence of gender differences, the researchers focused on further analyzing the NHANES data for the 1,111 women participants. They divided these 1,111 women into two categories, those women with higher-iodide and lower-iodide urinary content, using a cut point of 100 µg/L of urinary iodide based on the median level the World Health Organization (WHO) considers indicative of sufficient iodide intake[3] for a population. Hypothyroid women were excluded from the analysis. According to the study's authors, about 36 percent of women living in the United States have urinary iodide levels less than 100 µg/L (Caldwell *et al.*, 2005). For women with urinary iodide levels less than 100 µg/L, the study found that urinary perchlorate is associated with a decrease in (a negative predictor for) T4 levels and an increase in (a positive predictor for) TSH levels. For women with urinary iodide levels greater than or equal to 100 µg/L, the researchers found that perchlorate is a significant positive predictor of TSH, but not a predictor of T4. The researchers state that perchlorate could be a surrogate for another unrecognized determinant of the thyroid function.

Also, the study reports that while large doses of perchlorate are known to decrease thyroid function, this is the first time an association of decreased thyroid function has been observed at these low levels of perchlorate exposure. The clinical significance of the variations in T4/TSH levels, which were generally within normal limits, has not been determined. The researchers noted several limitations of the study (e.g., assumption that urinary perchlorate correlates with perchlorate levels in the stroma and tissue and measurement of total T4 rather than free T4) and recommended that these findings be affirmed in at least one more large study focusing on women with low urine iodide levels. It is also not known whether the association between perchlorate and thyroid hormone levels is causal or mediated by some other correlate of both, although the relationship between urine perchlorate and total TSH and T4 levels persisted after statistical adjustments for some additional covariates known to predict thyroid hormone levels (e.g., total kilocalorie intake, estrogen use, and serum C-reactive protein levels). A planned follow-up study will include additional measures of thyroid health and function (e.g., TPO-

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[2] While CDC researchers measured urinary perchlorate concentration for 2,820 NHANES participants, TSH and total T4 serum levels were only available for 2,299 of these participants.

[3] WHO notes that the prevalence of goiter begins to increase in populations with a median urinary iodide level below 100 µg/L (WHO, 1994).

antibodies, free T4). An additional paper by Blount *et al.* (2006c) found that almost all participants in the NHANES survey, including the participants in this group, had urinary levels of perchlorate corresponding to estimated dose levels that are below the RfD of 0.7 µg/kg/day.

The Blount study suggested that perchlorate could be a surrogate for another unrecognized determinant of thyroid function. There are other chemicals, including nitrate and thiocyanate, which can affect the thyroid function. Steinmaus *et al.* (2007) further analyzed the data from NHANES 2001–2002 to assess the impact of smoking, cotinine and thiocyanate on the relationship between urinary perchlorate and blood serum T4 and TSH. Thiocyanate is a metabolite of cyanide found in tobacco smoke and is naturally occurring in some foods, including cabbage, broccoli, and cassava. Increased serum thiocyanate levels are associated with increasing levels of smoking. Thiocyanate affects the thyroid by the same mechanism as perchlorate (competitive inhibition of iodide uptake). Steinmaus *et al.* analyzed the data to determine whether smoking status (smoker or nonsmoker), serum thiocyanate, or serum cotinine were better predictors of T4 and TSH changes than perchlorate, or if the effects reflected the combined effects of perchlorate and thiocyanate

Of female subjects 12 years of age and older in NHANES 2001-2002, 1,203 subjects had data on blood serum T4, serum TSH, urinary perchlorate, iodine and creatinine. Subjects with extreme T4 or TSH (3 individuals) or with a reported history of thyroid disease (91) were excluded from further analyses. Of the remaining women, 385 (35 percent) had urinary iodine levels below 100 µg /l. Steinmaus, *et al.* evaluated serum cotinine as an indicator of nicotine exposure, with levels greater than 10 ng/ml classified as high and levels less than 0.015 ng/ml classified as low.

The authors found no association between perchlorate or T4 and smoking, cotinine or thiocyanate in men or in women with urinary iodine levels greater than 100 µg/l. In addition, they found no association between cotinine and T4 or TSH in women with iodine levels lower than 100 µg/l. However, in women with urinary iodine levels lower than 100 µg/l, an association between urinary perchlorate and decreased serum T4 was stronger in smokers than in non-smokers, and stronger in those with high urinary thiocyanate levels than in those with low urinary thiocyanate levels. Although noting that their findings need to be confirmed with further research, the authors concluded that for these low-iodine women, the results suggest that at commonly-occurring perchlorate exposure levels, thiocyanate in tobacco smoke and perchlorate interact in affecting thyroid function, and agents other than tobacco smoke might cause similar interactions (Steinmaus *et al.* 2007).

EPA also evaluated whether health information is available regarding children, pregnant women and lactating mothers. The NRC report discussed a number of epidemiological studies that looked at thyroid hormone levels in infants. A more recent study by Amitai *et al.* (2007) assessed T4 values in newborns in Israel whose mothers resided in areas where drinking water contained perchlorate at "very high" (340 µg/L), "high" (12.94 µg/L), or "low" (<3 µg/L) perchlorate concentrations. The mean (± standard deviation) T4 value of the newborns in the very high, high, and low exposure groups was 13.8 ± 3.8, 13.9 ± 3.4, and 14.0 ± 3.5 µg/dL, respectively, showing no significant difference in T4 levels between the perchlorate exposure groups. This is consistent with the conclusions drawn by the NRC review of other epidemiological studies of newborns. The NRC (2005) also noted "no epidemiologic studies are available on the association between perchlorate exposure and thyroid dysfunction among low-birth weight or preterm newborns, offspring of mothers who had iodide deficiency during gestation, or offspring of hypothyroid mothers."

4.1.4 Physiologically-Based Pharmacokinetic (PBPK) Models. PBPK models represent an important class of dosimetry models that can be used to predict internal doses to target organs, as well as some effects of those doses (e.g., radioactive iodide uptake inhibition in the thyroid). To predict an internal dose level, PBPK models use physiological, biochemical, and physicochemical data to construct mathematical representations of processes associated with the absorption, distribution, metabolism, and elimination of compounds. With the appropriate data, these models can be used to extrapolate across and within species and for different exposure scenarios, and to address various sources of uncertainty in health assessments, including the uncertainty regarding the relative sensitivities of various subpopulations.

Clewell *et al.* (2007) developed multi-compartment PBPK models describing the absorption and distribution of perchlorate for the pregnant woman and fetus, the lactating woman and neonate, and the young child. This work built upon Merrill *et al.*'s (2005) model for the average adult. Related research that served as the basis for the more recent PBPK modeling efforts was discussed by the NRC in their January 2005 report on perchlorate.

The models estimated the levels of perchlorate absorbed through the gastrointestinal tract and its subsequent distribution within the body. Clewell *et al.* (2007) provided estimates of the internal dose and resulting iodide uptake inhibition across all life stages, and for pregnant and lactating women. The paper reported iodide uptake inhibition levels for external doses of 1, 10, 100, and 1000 μg/kg/day. Results at the lower two doses indicated that the highest perchlorate blood concentrations in response to an external dose would occur in the fetus, followed by the lactating woman and the neonate. Predicted blood levels for all three groups (i.e., fetus, lactating women and neonates) were four to five times higher than for non-pregnant adults. Smaller relative differences were predicted at external doses of 100 and 1000 μg/kg/day. The authors attributed this change to saturation of uptake mechanisms. The model predicted minimal effect of perchlorate on iodide uptake inhibition in all groups at the 1 μg/kg/day external dose (about one and one half times the RfD), estimating 1.1 percent inhibition or less across all groups. Inhibition was predicted to be 10 percent or less in all groups at an external dose of 10 μg/kg/day (about 14 times the RfD).

The results of the model extrapolations were evaluated against data developed in two epidemiologic studies performed in Chile, one studying school children (Tellez *et al.*, 2005) and another following women through pregnancy and lactation (Gibbs *et al.*, 2004).

The model predicted average blood serum concentrations of perchlorate in women from the Gibbs *et al.* (2004) study which were nearly identical to their measured perchlorate blood serum concentrations. The blood serum perchlorate concentrations predicted from the Tellez *et al.* (2005) study also were within the range of the measured concentrations, and the concentrations of perchlorate in breast milk predicted from the model were within two standard deviations of the measured concentrations. The authors concluded that the model predictions were consistent with empirical results and that the predicted extent of iodide inhibition in the most sensitive population (the fetus) is not significant at EPA's RfD of 0.7 µg/kg-day.

The NRC recommended that inhibition of iodide uptake by the thyroid, which is a precursor event and not an adverse effect, should be used as the basis for the perchlorate risk assessment (NRC, 2005). Consistent with this recommendation, iodide uptake inhibition was used by EPA as the critical effect in determining the reference dose (RfD) for perchlorate. Therefore, PBPK models of perchlorate and radioiodide, which were developed to describe thyroidal radioactive iodide uptake (RAIU) inhibition by perchlorate for the average adult (Merrill *et al.*, 2005), pregnant woman and fetus, lactating woman and neonate, and the young child (Clewell *et al.*, 2007) were evaluated by EPA based on their ability to provide additional information surrounding this critical effect for potentially sensitive subgroups and reduce some of the uncertainty regarding the relative sensitivities of these subgroups.

EPA evaluated the PBPK model code provided by the model authors and found minor errors in mathematical equations and computer code, as well as some inconsistencies between model code files. EPA made several changes to the code in order to harmonize the models and more adequately reflect the biology (see USEPA, 2008c) for more information.

Model parameters describing urinary excretion of perchlorate and iodide were determined to be particularly important in the prediction of RAIU inhibition in all subgroups; therefore, a range of biologically plausible values available in the peer-reviewed literature was evaluated in depth using the PBPK models. Exposure rates were also determined to be critical for the estimation of RAIU inhibition by the models and were also further evaluated.

Overall, detailed examination of Clewell *et al.* (2007) and Merrill *et al.* (2005) confirmed that the model structures were appropriate for predicting percent inhibition of RAIU by perchlorate in most life stages. Unfortunately, the lack of biological information during early fetal development limits the applicability of the PBPK modeling of the fetus to a late gestational timeframe (i.e., near full term pregnancy, ~GW 40), so EPA did not make use of model predictions regarding early fetal RAIU inhibition. Although quantitative outputs of EPA's revised PBPK models differ somewhat from the published values, the EPA evaluation confirmed that, with modifications (as described in USEPA, 2008c), the Clewell *et al.* (2007) and Merrill *et al.* (2005) models provide an appropriate basis for calculating the life stage differences in the degree of thyroidal RAIU inhibition at a given level of perchlorate exposure.

4.1.5 Carcinogenicity. The NRC (2005) reviewed the available human data and reached the following conclusion: "The epidemiologic evidence is insufficient to determine whether there is a causal association between perchlorate exposure and thyroid cancer. Only two studies related to this issue have been done, and both were ecologic. In one study, the number of thyroid-cancer cases was too small to have a reasonable chance of detecting an association if one existed (Li *et al.*, 2001). In the second, larger study (Morgan and Cassady, 2002), mixed exposures were present (to perchlorate and TCE). In neither study was it possible to adjust for potential confounding variables. The committee notes, however, that on the basis of its understanding of the biology of human and rodent thyroid tumors, it is unlikely that perchlorate poses a risk of thyroid cancer in humans."

4.2 Animal Studies

The NRC (2005) conducted a thorough review of the animal studies and reached the following conclusions:

"The committee found that the animal studies of potential adverse effects of perchlorate provided qualitative information, but the usefulness of the studies for quantitatively estimating the risk of adverse effects in humans is small. The major conclusions from the animal data are summarized below.

- Perchlorate has an antithyroid effect on rats at high doses (30 mg/kg of ammonium perchlorate per day). That effect is characterized by decreases in serum thyroid hormone and increases in serum TSH with morphologic changes in the thyroid gland.
- The data are inadequate to determine whether or not a causal relationship exists between perchlorate exposure of pregnant rats and neurodevelopmental abnormalities in their pups, given the flaws in experimental design and methods in the studies conducted to evaluate that end point.
- The data are inadequate to determine whether or not perchlorate exposure during gestation and lactation in rats has effects on behavior, given the lack of sensitivity of the tests conducted to evaluate that end point.
- Exposure to perchlorate can increase the incidence of thyroid tumors in rats when the doses are high enough to decrease thyroid hormone production and increase TSH secretion.
- The data favor rejection of a causal relationship between perchlorate exposure and immunotoxicity.
- There are no data to suggest that perchlorate has effects that are not mediated through inhibition of iodide transport in the thyroid gland.
- It is not possible to extrapolate data quantitatively from rodents to humans for purposes of human health risk assessment. Most experimental studies in animals

> designed to characterize the effects of perchlorate exposure have been done in rats. However, rats are much more sensitive to agents that disturb thyroid function than are humans, so the relevance of rat studies in quantitative terms to humans is limited."

5.0 QUANTIFICATION OF TOXICOLOGICAL EFFECTS

A subchronic HA covers a period of more than 30 days, but less than a year, and considers the following exposure assumptions: a 70 kg adult consuming 2 Liters of water per day. A relative source contribution (RSC) from water is also factored into the subchronic HA calculation to account for contaminant exposures from other sources (air, food, soil, etc.) of the contaminant.

The subchronic HA is calculated in a three-step process:

Step 1: Adopt a pre-existing Reference Dose (RfD) or calculate an RfD using the following equation:

$$\text{RfD} = \frac{\text{NOAEL or LOAEL or BMDL}}{\text{UF}}$$

Where:

NOAEL or LOAEL	=	No- or Lowest-Observed-Adverse-Effect Level (in mg/kg bw/day).
BMDL	=	Lower confidence bound on the Bench Mark Dose (BMD). The BMD and BMDL are obtained through modeling of the dose-response relationship.
UF	=	Uncertainty factor established in accordance with EPA guidelines.

The RfD is an estimate (with uncertainty spanning perhaps an order of magnitude) of a daily human exposure to the human population (including sensitive subgroups) that is likely to be without an appreciable risk of deleterious effects. It can be derived from a NOAEL, LOAEL, or benchmark dose (BMD) with uncertainty factors generally applied to reflect limitations in the data used. It is also sometimes derived from a NOEL, as is the case for perchlorate, which provides a more health-protective value than using a NOAEL, LOAEL or BMD.

Step 2: From the RfD, calculate a Drinking Water Equivalent Level (DWEL). The DWEL assumes that 100% of the exposure comes from drinking water.

$$\text{DWEL} = \frac{\text{RfD} \times \text{BW}}{\text{DWI}}$$

Where:

RfD = Reference Dose (in mg/kg bw/day).
BW = Assumed body weight of an adult (70 kg).
DWI = Assumed human daily consumption for an adult (2 L/day)

Step 3: The subchronic HA is calculated by factoring in other sources of exposure (such as air, food, soil) in addition to drinking water using the relative source contribution (RSC) for the drinking water.

$$\text{Subchronic HA} = \text{DWEL} \times \text{RSC}$$

Where:

DWEL = Drinking Water Equivalent Level (calculated from step 2)
RSC = Relative source contribution

Note. The procedure for establishing the RSC for perchlorate is below.

5.1 Reference Dose Derivation

The NRC recommended data from the Greer *et al.* (2002) human clinical study as the basis for deriving a reference dose (RfD) for perchlorate (NRC, 2005). Greer *et al.* (2002) report the results of a study that measured thyroid iodide uptake, hormone levels, and urinary iodide excretion in a group of 37 healthy adults who were administered perchlorate doses orally over a period of 14 days. Dose levels ranged from 7 to 500 µg/kg/day in different experimental groups. The investigators found that the 24 hour inhibition of iodide intake ranged from 1.8 percent in the lowest dose group to 67.1 percent in the highest dose group. However, no significant differences were seen in measured blood serum thyroid hormone levels (T3, T4, total and free) in any dose group. The statistical no observed effect level (NOEL) for the perchlorate-induced inhibition of thyroid iodide uptake was determined to be 7 µg/kg/day, corresponding to iodide uptake inhibition of 1.8 percent. Although the NRC committee concluded that hypothyroidism is the first adverse effect in the continuum of effects of perchlorate exposure, NRC recommended that "the most health-protective and scientifically valid approach" was to base the perchlorate RfD on the inhibition of iodide uptake by the thyroid (NRC, 2005). NRC concluded that iodide uptake inhibition, although not adverse, is the most appropriate precursor event in the continuum of possible effects of perchlorate exposure and would precede any adverse health effects of perchlorate exposure. The NRC also stated "if that nonadverse biochemical event is used to derive the RfD, chronic exposure will have no greater effect than that resulting from short term exposure." The lowest dose (7 μg/kg/day) administered in the Greer *et al.* (2002) study was considered a NOEL (rather than a no-observed-adverse-effect level or NOAEL) because iodide uptake inhibition is not an adverse effect, but a biochemical precursor. The NRC further determined that, "the very small decrease (1.8 percent) in thyroid radioiodide uptake in the lowest dose group was well within the variation of repeated measurements in normal subjects." A summary of the data considered and the NRC deliberations can be found in the NRC report (2005).

The NRC recommended that EPA apply an intraspecies uncertainty factor of 10 to the NOEL to account for differences in sensitivity between the healthy adults in the Greer *et al.* (2002) study and the most sensitive population, fetuses of pregnant women who might have hypothyroidism or iodide deficiency. Because the fetus depends on an adequate supply of maternal thyroid hormone for its central nervous system development during the first trimester of pregnancy, iodide uptake inhibition from low-level perchlorate exposure has been identified as a concern in connection with increasing the risk of neurodevelopmental impairment in fetuses of high-risk mothers (NRC, 2005). The NRC (2005) viewed the uncertainty factor of 10 as conservative and protective of health given that the point of departure (the NOEL) is based on a non-adverse effect (iodide uptake inhibition), which precedes the adverse effect in a continuum of possible effects of perchlorate exposure. The NRC panel concluded that no additional uncertainty factor was needed for the use of a less-than chronic study, for deficiencies in the database, or for interspecies variability. EPA's Integrated Risk Information System (IRIS) adopted the NRC's recommendations resulting in an RfD of 0.7 μg/kg/day, derived by applying a ten-fold total uncertainty factor to the NOEL of 7 μg/kg/day (USEPA, 2005b).

The NRC emphasized that its recommendation "differs from the traditional approach to deriving the RfD." The NRC recommended "using a nonadverse effect rather than an adverse effect as the point of departure for the perhlorate risk assessment. Using a nonadverse effect that is upstream of the adverse effect is a more conservative, health-protective approach to the perchlorate risk assessment." The NRC also noted that the purpose of the 10-fold uncertainty factor is to protect sensitive subpopulations in the face of uncertainty regarding their relative sensitivity to perchlorate exposure. The NRC recognized that additional information on these relative sensitivities could be used to reduce this uncertainty factor in the future (NRC, 2005).[4]

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[4] "There can be variability in responses among humans. The intraspecies uncertainty factor accounts for that variability and is intended to protect populations more sensitive than the population tested. In the absence of data on the range of sensitivity among humans, a default uncertainty factor of 10 is typically applied. The factor could be set at 1 if data indicate that sensitive populations do not vary substantially from those tested." (NRC, 2005, p 173)

5.2 Relative Source Contribution Derivation

Sufficient exposure data are available for perchlorate to enable EPA to estimate a data- derived RSC for fetuses of pregnant women (the most sensitive subpopulations identified by the NRC). These exposure data include the analysis by EPA of the UCMR data and CDC's NHANES biomonitoring data, as well as FDA's TDS. The following sections describe EPA's analyses of each of these data sources to estimate RSCs and HA level for sensitive subpopulations.

5.2.1. Total Diet Study for Estimation of an RSC. The results of FDA's recent evaluation of perchlorate under the TDS were presented above. The TDS estimates are representative of average, national, dietary perchlorate exposure, for the age-gender groups that were selected. EPA used FDA's dietary exposure estimates to calculate RSC values by subtracting the dietary estimates from the RfD (0.7 µg/kg/day), dividing this difference by the RfD, and multiplying the result by 100 (to convert it to a percentage). Because EPA believes that dietary ingestion is the only significant pathway for non-drinking-water perchlorate exposure, the resulting RSCs represent the amount of perchlorate exposure (as a percentage of the RfD) that the average individual within a subgroup would have to ingest via drinking water in order to reach a level of total perchlorate exposure that equals the RfD. These RSCs, displayed as percentages, are presented in Table 5-1.

Table 5-1. Relative Source Contributions Remaining for Water Based on TDS for Various Subgroups

Population Group	Total Perchlorate Intake from Food (µg/kg/day)	RfD that Remains (µg/kg/day)	RSC Remaining for Drinking Water (as %age of the RfD)
Infants, 6–11 mo	0.26–0.29	0.41-0.44	59%–63%
Children, 2 yr	0.35–0.39	0.31-0.35	44%–50%
Children, 6 yr	0.25–0.28	0.42-0.45	60%–64%
Children, 10 yr	0.17–0.20	0.50-0.53	71%–76%
Teenage Girls, 14–16 yr	0.09–0.11	0.59-0.61	84%–87%
Teenage Boys, 14–16 yr	0.12–0.14	0.56-0.58	80%–83%
Women, 25–30 yr	0.09–0.11	0.59-0.61	84%–87%
Men, 25–30 yr	0.08–0.11	0.69-0.62	84%–89%
Women, 40–45 yr	0.09–0.11	0.59-0.61	84%–87%
Men, 40–45 yr	0.09–0.11	0.59-0.61	84%–87%

Population Group	Total Perchlorate Intake from Food (µg/kg/day)	RfD that Remains (µg/kg/day)	RSC Remaining for Drinking Water (as %age of the RfD)
Women, 60–65 yr	0.09–0.10	0.60-0.61	86%–87%
Men, 60–65 yr	0.09–0.11	0.59-0.61	84%–87%
Women, 70+ yr	0.09–0.11	0.59-0.61	84%–87%
Men, 70+ yr	0.11–0.12	0.58-0.59	83%–84%

The subpopulation that is the most sensitive to perchlorate exposure is the fetus of an iodine-deficient pregnant woman. The FDA TDS does not estimate the dietary intake of perchlorate specifically for pregnant women (nor can it specifically address iodine-deficient women), but it does present dietary estimates for three groups of women of childbearing age (Teenage girls 14–16, Women 25–30 and Women 40–45). The calculated RSCs range from 84 to 87 percent for women of childbearing age. Murray *et al.* (2008) suggested that perchlorate intake rates for pregnant and lactating women are "likely to be somewhat higher than those of women of childbearing age as a whole." If this is true, an RSC derived based upon the TDS mean dietary intake for women of childbearing age may underestimate the RSC from food for pregnant women.

5.2.2. Urinary Data for Estimation of an RSC. EPA and CDC researchers analyzed NHANES urinary data in conjunction with UCMR occurrence data at the CDC's National Center for Environmental Health (NCEH) to evaluate exposure to perchlorate. These data were partitioned to provide an estimate of what portion of the overall exposure likely came from food alone. In this analysis, EPA and CDC researchers were able to characterize the distribution of actual perchlorate exposure as seen in their urine for pregnant women. This means that the analysis could determine not only the mean exposure, but also the exposure of highly exposed individuals. Results of this analysis, presented in Table 5-2, indicate that for pregnant women, exposure to perchlorate from food is 0.263 µg/kg/day at the 90th percentile, representing nearly 38 percent of the RfD, and thus leaving an RSC for water of 62 percent.

Table 5-2. Fraction of RfD (Relative Source Contribution) Based On NHANES-UCMR Analysis Calculations of Perchlorate in Food

Group	Mean Food Dose (µg/kg/day)	RfD that Remains (µg/kg/day)	RSC From Drinking Water as % of RfD	90th Percentile Food Dose (µg/kg/day)	RfD that Remains (µg/kg/day)	RSC From Drinking Water as % of RfD
Total population	0.090	0.61	87	0.167	0.533	76
Ages 6-11	0.150	0.55	79	0.280	0.42	60
Ages 12-19	0.080	0.62	89	0.158	0.542	77

Group	Mean Food Dose (µg/kg/day)	RfD that Remains (µg/kg/day)	RSC From Drinking Water as % of RfD	90th Percentile Food Dose (µg/kg/day)	RfD that Remains (µg/kg/day)	RSC From Drinking Water as % of RfD
Ages 20 +	0.085	0.615	88	0.143	0.557	80
Female 15-44	0.093	0.607	87	0.143	0.557	80
Pregnant	0.123	0.58	82	0.263	0.437	62

EPA believes the NHANES-UCMR analysis is the best available information to characterize non-drinking water exposures to perchlorate for the most sensitive subpopulation. The FDA *Total Diet Study* provides a nationally representative estimate of the mean dietary exposure to perchlorate for 14 age and gender groups, including women of childbearing age. However, this study does not provide specific estimates for the most sensitive subpopulation, the iodine-deficient pregnant woman and her fetus. Also, this study estimates only mean exposures, so it does not account for the perchlorate exposure of highly exposed individuals. The NHANES-UCMR analysis provides a distribution of exposure (not just a mean) specific to almost 100 pregnant women who are not likely to have been exposed to perchlorate from their drinking water, although it also does not separate out iodine-deficient pregnant women because of data limitations. Table 5-3 presents the potential RSC values for the most sensitive subpopulation using the TDS data and the NHANES-UCMR data. EPA notes that the mean RSC for pregnant women estimated from the NHANES-UCMR data is very close to, but slightly lower than, the mean for women of childbearing age estimated from the TDS data. This shows close agreement between the two data sets and is consistent with the suggestion in Murray *et al.* (2008) that food exposures for pregnant women are likely to be somewhat higher than for women of childbearing age as a whole. (Note that higher food exposure equates to a lower RSC because a smaller fraction of the RfD is left to be allocated to drinking water.) While the *means* are available (and in close agreement) from both data sets, EPA believes it is more protective to determine the interim HA level for drinking water by subtracting the 90th percentile exposure in food from the reference dose to assure that the highly exposed individuals from this most sensitive subpopulation are considered in the evaluation of whether perchlorate is found at levels of health concern. The NHANES-UCMR data allow for the calculation of the 90th percentile food exposure, which results in an interim HA level of 15 µg/L for the pregnant woman.

Table 5-3. Potential Health Advisory Levels for Pregnant Women Using TDS Data and NHANES-UCMR Data To Derive Relative Source Contribution

Sub population	Body Weight[a]	Drinking Water Consumption[a]	Source of RSC Derivation	RSC From Drinking Water as % RfD	Potential HA level
Women of Childbearing Age	70 kg	2 liters	TDS mean (Table 5-1)	84 - 87%	21 µg/L
Pregnant Women	70 kg	2 liters	NHANES-UCMR mean (Table 5-2)	82%	20 µg/L
Pregnant Women	70 kg	2 liters	NHANES-UCMR 90th percentile (Table 5-2)	62%	15 µg/L

Footnotes:
[a]Default values used by EPA in the derivation of HA levels.

5.3 Subchronic Interim Health Advisory

Based upon the recommendations of the NRC (2005), the subchronic interim HA was calculated for a pregnant woman as presented below:

$$\text{Subchronic HA} = \frac{0.007\ \text{mg/kg/day} \times 70\ \text{kg} \times 0.62}{10 \times 2\ \text{L/day}} = 0.0152\ \text{mg/L (rounded to 0.015 mg/L or 15}\ \mu\text{g/L)}$$

Where:

0.007 mg/kg/day = NOEL (Greer *et al.*, 2002)

70 kg = Assumed body weight of an adult

10 = Uncertainty factor

2 L = Assumed daily water consumption of an adult

0.62 = Relative source contribution (Using urinary data from the 2001-2002 National Health and Nutrition Examination Survey (NHANES) combined with UCMR occurrence data evaluating nationwide exposure to perchlorate (using the 90th percentile of the distribution), an RSC of 62% was calculated.)

Note: The application of a 10-fold uncertainty factor accounts for variability in responses among humans, and is intended to protect populations that are more sensitive than the population tested. Because the critical study (Greer *et al.*, 2002) for perchlorate was based on healthy adult men and women, an uncertainty factor of 10 is applied to protect the most sensitive population, the fetuses of pregnant women who might have hypothyroidism or iodide deficiency.

EPA developed the interim health advisory for the subchronic drinking water exposure of the pregnant mother and her fetus. However, as noted by the NRC in their recommendations, "chronic exposure will have no greater effect than that resulting from short-term exposure. In fact, it may well have less effect because of the capacity of the pituitary –thyroid system to compensate for iodide deficiency by increasing iodide uptake."

5.4 Subchronic Health Advisories for Other Sensitive Subpopulations

Under the Safe Drinking Water Act, EPA must consider possible risk to sensitive subpopulations. EPA developed its subchronic interim HA using body weight, drinking water and food exposure data for pregnant women, in order to protect the most sensitive subpopulation identified by the NRC (i.e., the fetuses of these women), and used the 90th percentile rather than mean food exposure data to ensure that the interim HA protects highly exposed pregnant women and their fetuses. However, infants, developing children, and persons with iodine deficiency or thyroid disorders were also identified as sensitive subpopulations by the NRC. Because infants and children eat and drink more on a per body weight basis than adults, eating a normal diet and drinking water with 15 μg/L of perchlorate may result in exposure that is greater than the reference dose in these subgroups. To address this concern, the potential effect of this intake on inhibition of iodide uptake in these subgroups (i.e., relative sensitivity) was evaluated using PBPK modeling. Because the NRC (NRC, 2005) found that the inhibition of iodide uptake by the thyroid, which is a non-adverse precursor to any adverse effect, should be used as the basis for perchlorate risk assessment, evaluating iodide uptake inhibition is important for determining whether the interim level of 15 μg/L (derived for pregnant women) is also an appropriate interim HA level for the other sensitive subpopulations. Reducing some of the uncertainty regarding the relative sensitivities of these subpopulations will help address the concerns that some groups may be exposed above the reference dose (calculated using group-specific body weight and intake information), particularly if PBPK modeling predicts that at the interim HA level, these groups do not experience precursor effects (RAIU inhibition) that exceed the no effect level from which the reference dose was derived.

5.4.1 Published PBPK Models. The Clewell *et al.* (2007) and Merrill *et al.* (2005) PBPK models predict the distribution and elimination of perchlorate after it is ingested. The models also predict the level of RAIU inhibition that would result from different levels of perchlorate exposure for different subpopulations, including children and infants.

Clewell *et al.* (2007) predicted that at a perchlorate dose of 0.001 mg/kg/day (1 µg/kg/day), approximately one and one half times the RfD, iodide uptake inhibition in the most sensitive populations, i.e., fetuses and infants, was no greater than 1.1 percent. This is below the level (1.8 percent) of inhibition at the NRC identified no-effect level (NOEL) in healthy adults and recommended as the point of departure for calculating the RfD, applying a 10-fold intraspecies uncertainty factor. The fact that for all subpopulations the predicted RAIU at a level slightly above the RfD is still below the RAIU at the NOEL is consistent with the NRC's conclusion that the RfD would protect even the most sensitive sub-populations. However, because the Clewell model does not account for reduced urinary clearance that occurs in young infants, EPA modified the model as discussed above.

5.4.2 Results of EPA's Application of the Published Models. EPA evaluated the published models (Clewell *et al.*, 2007, and Merrill *et al.*, 2005) and used them to further explore the relationship between water concentrations and iodide uptake inhibition in different subpopulations. EPA determined that it was appropriate to make several changes to the models' computer codes in order to harmonize them and more adequately reflect the biology. EPA considered in detail the data currently available for parameters determined to be particularly important to the models' predictions, and modified the model parameters describing exposure, as well as urinary excretion of perchlorate and iodide. These modifications resulted in predicted RAIU inhibition rates that were up to 1.5 times the predicted inhibition rates in the earlier versions of the model. EPA believes its revisions have improved the predictive power of the model and has used its results as the basis for the following discussion.

Consistent with both the unmodified Clewell model and the NRC's conclusions, EPA's analysis identified the near-term fetus (gestation week 40 fetus) as the most sensitive subgroup, with a percent RAIU inhibition that was 5-fold higher than the percent inhibition of the average adult at a dose equal to the point of departure (7 µg/kg/day). After correcting the model for reduced urinary clearance in infants, the same analysis shows that the predicted percent RAIU inhibition is approximately 1- to 2-fold higher for the breast-fed and bottle-fed infant (7-60 days) than for the average adult, and is slightly lower for the 1-2 year old child than for the average adult. While uncertainty remains regarding the model's predictions, EPA believes that it is a useful tool, in conjunction with appropriate exposure information, for evaluating the relative sensitivity of particular subpopulations (infants and children) that can inform our assessment of whether the interim HA is an appropriate level for all subpopulations (not just pregnant women).

EPA thus applied the adjusted model to the interim HA level of 15 µg/L to determine the predicted percent RAIU inhibition (Table 5-4). Iodide uptake inhibition levels for all other subpopulations, including infants and children, were estimated to be not greater than 2.0 percent at the 15 µg/L drinking water concentration, and not greater than 2.2 percent when also considering perchlorate in food. The highest iodide update inhibition level (2.2 percent) was seen for the 7-day bottle-fed infant; all other subpopulations, including the 60-day bottle-fed infant, as well as the 7- and 60-day breast-fed infant had inhibition levels below 1.4 percent when also considering perchlorate in food. The 2.2 percent inhibition level for 7-day old bottle-fed infants is comparable to the 1.8 percent inhibition level that the NRC identified as a no effect level in healthy adults and recommended as the point of departure for calculating the RfD. [5]

Table 5-4 also shows the exposure to each subpopulation in µg/kg of body weight. EPA notes that for some subgroups, the modeled exposure exceeds the RfD, though not for the most sensitive subgroup (i.e., pregnant women and their fetuses) from which the interim HA level was derived. EPA has used these exposure estimates as one input into the PBPK model to reduce the uncertainty associated with the relative sensitivities of other subgroups, particularly infants and children. EPA believes use of the model enhances its assessment beyond considering exposure alone by predicting the resulting iodide uptake inhibition that may result from that exposure. As noted above, the NRC concluded that the "most health protective and scientifically valid approach" was to base the point of departure for the RfD on the inhibition of iodide uptake by the thyroid (NRC, 2005), a non-adverse precursor effect. The predicted RAIU inhibition for all subgroups is comparable to or less than the RAIU at the NOEL selected by the NRC. Therefore, EPA believes the interim HA level of 15 µg/L derived for pregnant women is also an appropriate interim HA level for other sub-populations, against which to evaluate monitored levels of perchlorate occurrence in drinking water systems.

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[5] The model does not exactly match the average measured inhibition at each exposure concentration. At the point of departure (7 ug/kg/day), the model predicts a value of 2.1 percent for adults, rather than the 1.8 percent from the Greer *et al.* (2002) study. Thus, the model slightly over-predicts the level of inhibition for this group at this exposure level, though this relationship may not hold true for other sub-groups and exposure levels. In any event, the difference between the average measured value of 1.8 percent and the model-predicted value of 2.1 percent is well within the statistical uncertainty in the data.

Table 5-4. Predicted percent radioactive iodide uptake (RAIU) inhibition and corresponding perchlorate intake from water at 15 µg/L with and without food intake.

	Body Weight (kg) [a]	90th Percentile Water Intake (L/day) [b]	Perchlorate Intake from only water at 15 µg/L (µg/kg-day)	Percent RAIU Inhibition from only water at 15 µg/L	TDS estimated perchlorate intake from food (µg/kg-day) [c]	Perchlorate Intake from food and water at 15 µg/L (µg/kg-day)	Percent RAIU Inhibition from food and water at 15 µg/L
Average adult	70	2.24	0.48	0.15	0.10	0.58	0.18
Non-pregnant woman	66	2.11	0.48	0.21	0.10	0.58	0.26
Pregnant woman							
Mom -- GW 13	69	2.18	0.50	0.49	0.10	0.60	0.59
Mom -- GW 20	71	2.34	0.50	0.49	0.10	0.60	0.59
Mom -- GW 40	78	2.57	0.50	0.47	0.10	0.60	0.57
Fetus -- GW 40[g]	3.5	--	--	0.90	--	--	1.1
Breast-fed infant							
Mom -- 7 d	74	2.96	0.60	0.18	0.10	0.70	0.21
Infant -- 7 d	3.6	0.52[d]	1.36	1.1	-- [d]	1.59	1.3
Mom -- 60 d	72	2.96	0.61	0.17	0.10	0.71	0.20
Infant -- 60 d	5	0.74[d]	1.27	0.73	-- [d]	1.48	0.84

	Body Weight (kg) [a]	90th Percentile Water Intake (L/day) [b]	Perchlorate Intake from only water at 15 µg/L (µg/kg-day)	Percent RAIU Inhibition from only water at 15 µg/L	TDS estimated perchlorate intake from food (µg/kg-day)[c]	Perchlorate Intake from food and water at 15 µg/L (µg/kg-day)	Percent RAIU Inhibition from food and water at 15 µg/L
Bottle-fed infant							
Infant -- 7 d	3.6	0.84[e]	3.53	2.0	1.42 µg/L	3.87	2.2
Infant -- 60 d	5	1.14[e]	3.42	1.3	1.42 µg/L	3.74	1.4
Child							
6-12 mo[f]	9.2	1.03	1.68	0.46	0.275	1.96	0.53
1-2 yr[f]	11.4	0.64	0.84	0.23	0.370	1.21	0.33

[a] Calculations for a 70 kg "average" adult are shown, while the body weight (BW) for the non-pregnant woman is from US EPA 2004 (based on CSFII 94-96,98) and BWs for the child are mean values from Kahn and Stralka (2008). BWs for pregnant and breast feeding moms, fetuses, bottle- and breast-fed infants are predicted weights (functions of age or gestation week) using growth equations from Gentry *et al.* (2002) as implemented in the PBPK models (Clewell *et al.* 2007; non-pregnant value is BW at day 0 of gestation).

[b] Water intake levels for adults other than the lactating mother are based on normalized 90th percentile values for total water intake (direct and indirect) multiplied by the age- or gestation-week-dependent BW, as follows: 0.032 L/kg-day for average adult and non-pregnant woman; 0.033 L/kg-day for the pregnant woman. A fixed ingestion rate was used for the lactating mother because, while her BW is expected to drop during the weeks following the end of pregnancy, the demands of breast-feeding will be increasing. Values are from Kahn and Stralka (2008), except values for women are from U.S. EPA (2004).

[c] The dietary values used correspond to the midpoint of the range of lower- and upper-bound average perchlorate levels for each subgroup, as identified from the FDA TDS in Murray *et al.* (2008), except for the bottle-fed infant. EPA used 1.42 µg/L as the concentration of perchlorate in infant formula. This is based on an average of available FDA TDS data, with ½ LOD included in the average for the samples in which perchlorate was not detected.

[d] The breast-fed infants are assumed to have no direct exposure via food or water. The prediction for breast-fed infants in this table results from the dose from both food and water to the mother providing breast milk to the infant. Breast-fed infant "water intake" is the breast milk ingestion rate obtained by fitting an age-dependent function to the breast-milk ingestion data

(L/kg-day) from Arcus-Arth *et al.* (2005). Urinary clearance rates for the lactating woman equal to that of the average adult were used, consistent with data presented in Delange (2004).

[e] For the bottle-fed infant, normalized total water intake (direct and indirect, L/kg-day) was described as a smooth function of infant age fit to the results from Kahn and Stralka (2008), and multiplied by BW(age). For the 7-day-old infant, the data used to fit the function included the 90th percentile community water-consumers only intake (0.235 L/kg-day, N=40) for the < 1 month old infant. For the 60-day-old infant, the 90th percentile community water-consumers only intake (0.228 L/kg-day, N=114) for the 1- to <3 months-old infant was used.

[f] For the 6- to 12-month and 1- to 2-year-old children, EPA set the water ingestion based on published exposure tables and selected the age at which the model-predicted BW (from growth equations) matched the exposure-table mean. This approach resulted in model predictions for a 9.6-month old child (to represent 6- to 12-month-old children) and a 1.3-year old (to represent 1- to 2-year-old children).

[g] Due to data limitations, RAIU inhibition is calculated only for fetuses at GW 40.

5.4.3 Modeling Uncertainties. EPA recognizes that there are uncertainties associated with this modeling, as there are for any modeling effort. For example, this analysis does not take into account within-group variability in pharmacokinetics, uncertainty in model parameters and predictions, or population differences in pharmacodynamics (PD) of receptor binding and upregulation. Also, the NRC identified fetuses of pregnant women that are hypothyroid or iodine deficient as the most sensitive subpopulation. The model predictions of RAIU inhibition in the various subgroups are average inhibition for typical, healthy individuals, not for hypothyroid or iodine deficient individuals. However, EPA did not rely on this analysis for determining the HA. Rather, the interim HA level of 15 μg/L was calculated directly from the RfD to protect the most sensitive subpopulation, the fetuses of pregnant women, using high end exposure assumptions (e.g., estimated 90th percentile drinking water consumption and estimated 90th percentile perchlorate dietary (food) exposure). The PBPK modeling was used to provide information on the potential effects of exposure at the interim HA level for other subgroups, such as infants and children.

In addition, the predicted inhibitions are averages for the subgroup as a whole, given the exposure assumptions used in the model. Thus, some members of a group would be expected to have RAIU inhibition greater than indicated in Table 5-4 for a particular perchlorate concentration, while others would have lesser inhibition. EPA was able to partially address this variability by using 90th percentile water consumption rates and mean body weights in the analysis to consider the highly exposed portions of the various subgroups. Most members of the subgroups would be expected to have exposures less than those indicated in Table 5-4.

There is also some uncertainty regarding the water intake rates, particularly for infants. EPA described water intake by infants as a smooth function fit to the 90th percentile community water-consumers intake-rate data (intake per unit BW) of Kahn and Stralka (2008), which is then multiplied by the age-dependent BW to account for the changes occurring over the first weeks of life. This resulted in an estimated 90th percentile water intake rate of 0.84 L/day for the 7-day bottle-fed infant and used by EPA in PBPK model simulations. General information on water and formula intake for 7-day old infants is also available in guidelines for healthy growth and nutrition of the American Academy of Pediatrics (AAP, 2008). The values estimated using the guidelines from the AAP (0.126 L/kg-day assuming 80% is the percent water used in preparation of formula) for 7-day-old infants are close to the mean consumers-only intake rate for the 1-30 day-old infants from Kahn and Stralka (2008; 0.137 L/kg-day N=40).

There is also uncertainty regarding the appropriate duration of exposure (i.e., days, weeks, months) to compare to the perchlorate RfD, which EPA defines as "an estimate (with uncertainty spanning perhaps an order of magnitude) of a daily exposure to the human population (including sensitive subgroups) that is likely to be without an appreciable risk of deleterious effects during a lifetime." Reference values, like the RfD, are derived based on an assumption of continuous exposure throughout the duration specified, while intake levels may rapidly change day to day or during certain life stages. For comparability with the RfD, continuous perchlorate exposure was assumed in EPA's modeling analysis. Using perchlorate levels predicted for a continuous exposure (constant rate of introduction to the stomach), rather than incorporating changes in exposure and other input parameters over time (i.e., simulating the timing and quantity of specific ingestion events during the day), substantially reduced the effects of parameter uncertainty in the modeling. RAIU inhibition, on the other hand, is evaluated as the change in thyroid uptake of a pulse of iodide (radiolabeled, from an IV injection) at a time 24 hours after the pulse is administered. Thus, it represents the inhibition on a given day. This was true in the Greer study on which the RfD is based, and it is also true in the model. For all life stages except the developing infant, the day-to-day variation in RAIU inhibition at the levels under consideration will have little or no effect. However, the effects of short-term inhibition in the infant (and fetus) may be of greater consequence than in the adult, although infants may also have less short-term variability in their diet and intake levels than adults. To address this concern, we present the results for the infant at both 7 days and 60 days after birth. The model predicts a fairly smooth variation in effect between these two ages.

5.4.4 Summary of Modeling Analysis. EPA focused attention on the most sensitive subpopulation, a pregnant woman and her fetus. EPA calculated an interim HA level of 15 µg/L for pregnant women using RSC information derived from an analysis of NHANES and UCMR data. EPA also conducted PBPK modeling to evaluate predicted biological outcomes associated with drinking water concentrations at the interim HA level for different sensitive subpopulations. For pregnant women, EPA assumed a 90th percentile water ingestion rate of 0.033 L/kg-day, a food intake rate that represented the midpoint of the range of average perchlorate dietary exposures reported in Murray *et al.* (2008), and used the Clewell *et al.* (2007) PBPK model-fitted body weight. EPA believes that the model-fitted body weight provides a more realistic weight for the pregnant woman than EPA's 70 kg default assumption for adults. In addition, rather than using the default assumption of 2L/day water ingestion, EPA used a 90th percentile water ingestion rate normalized for body weight and based on data specifically for pregnant women (USEPA, 2004b). Using these assumptions, the model predicted that the pregnant woman's dose of perchlorate would not exceed the reference dose if she consumed drinking water with a concentration of 15 µg/L or less, which is consistent with the derivation of the interim HA level from the reference dose, based on average body weight, 90th percentile water consumption, and 90th percentile food exposure for pregnant women. The model further predicted that the percent inhibition in the fetus of a pregnant woman consuming drinking water with 15 µg/L perchlorate (in combination with a normal diet) is 1.1 percent which is below the 1.8 percent that the NRC determined to be a no-effect level in healthy adults. EPA evaluated other subpopulations to estimate iodide uptake inhibition and determined that 7-day old bottle-fed infants were predicted to have a 2.2 percent inhibition level, after also accounting for food exposure, and all other subpopulations, including 60-day old bottle-fed infants, 7 and 60 day old breast-fed infants, and children, were predicted to have levels of inhibition of 1.4 percent or less, after accounting for food. All of these levels are comparable to or below the 1.8 percent no effect inhibition level from the Greer study.

Based on the health protective approach for deriving the RfD (i.e., use of a NOEL rather than a NOAEL as the point of departure), the conservative assumptions used in deriving the RSC and corresponding interim HA level (use of 90th percentile food exposure data specifically from pregnant women), and the PBPK modeling analysis of RAIU inhibition in potentially sensitive subpopulations, EPA believes that drinking water with perchlorate concentrations at or below the interim HA level of 15 µg/L is protective of all subpopulations.

5.5 Evaluation of Carcinogenic Potential

The EPA currently requires that all new cancer risk assessments comply with the Guidelines for Carcinogen Risk Assessment (U.S. EPA, 2005). The EPA (2005) describes perchlorate's weight of evidence classification as "not likely to pose a risk of thyroid cancer in humans, at least at doses below those necessary to alter thyroid hormone homeostasis, based on the hormonally-mediated mode of action in rodent studies and species differences in thyroid function. The epidemiological evidence is insufficient to determine whether or not there is a causal association between exposure to perchlorate and thyroid cancer."

6.0 OTHER CRITERIA, GUIDANCE, AND STANDARDS

Two states have established regulatory standards for perchlorate in drinking water. In July 2006, Massachusetts promulgated a drinking water standard of 2 µg/L for perchlorate (Mass DEP, 2006), while California established an MCL of 6 µg/L in October 2007 (CDPH, 2007). The states used the same NOEL from the Greer *et al.* (2002) study as EPA, but different methodologies for calculating RSC and addressing sensitive subpopulations. EPA believes that its analysis is based on the best currently available science, data, and analyses, including some analyses that were not available at the time these state standards were established, and that drinking water with perchlorate concentrations at or below its interim HA level of 15 µg/L is protective of all subpopulations. The SDWA allows States to establish drinking water standards that are more stringent than EPA's national standards, as well as for contaminants which EPA has determined not to regulate. EPA supports such state action, especially in cases where there are not enough public water systems above the interim HA level to warrant a national standard, but where a few individual states may have a higher concentration of such systems.

7.0 ANALYTICAL METHODS

Perchlorate can be detected in drinking water by EPA methods 314.0, 314.1, 314.2, 331.0 and 332.0. EPA method 314.0 was approved for the 2001 through 2003 monitoring of perchlorate, required in the UCMR, and employs ion chromatography with conductivity detection. The method detection limit (MDL) for method 314.0 is 0.53 µg/L and the average recovery is reported to range from 86 to 113 percent, depending on the matrix.

EPA Methods 314.1, 314.2, 331.0, and 332.0 are newer methods that were published from May 2005 through May 2008. Method 314.1 relies on ion chromatography with suppressed conductivity detection, has an MDL of approximately 0.03 µg/L and an average recovery ranging from 75.9 to 108 percent, depending on the matrix and the type of analytical column used. Method 314.2 uses two-dimensional ion chromatography followed by suppressed conductivity detection. The MDL for perchlorate using this method is 0.012 to 0.018 µg/L, depending upon the volume of sample analyzed, and the average recovery of perchlorate ranges from 92 to 110 percent, depending upon the matrix. Method 331.0 employs liquid chromatography with electrospray ionization mass spectrometry. The MDL for perchlorate using this method is 0.008 µg/L in selected ion monitoring mode (single stage mass spectrometry) and 0.005 µg/L in multiple reactions monitoring mode (tandem mass spectrometry). The average recovery for perchlorate using Method 331.0 ranges from 95.1 to 105 percent, depending on the matrix. Method 332.0 employs ion chromatography with electrospray ionization mass spectrometry detection. The MDL for perchlorate using this method is 0.02 µg/L and the average recovery ranges for 90 to 105 percent, depending on the matrix.

8.0 TREATMENT TECHNOLOGIES

The physiochemical properties of perchlorate make its removal difficult by chemical precipitation processes, such as conventional treatment. Researchers, however, have shown that perchlorate can be effectively removed by using advanced treatment technologies, such as anion exchange, modified granular activated carbon (GAC), reverse osmosis/nanofiltration membrane filtration, chemical/electrochemical reduction (Gu and Coates, 2006) and biological reduction (Logan *et al.*, 2004).

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7

From: Tzhone.Stephen@epamail.epa.gov
To: Zeiler, Rose Ms CIV USA OSA; Srivastav, Praveen
Cc: Williams, Aaron K SWT; Mayila, Agnes; Fay Duke; Jones, Greg N; Lambert, John R SWT; Everett, Kay; Watson, Susan
Subject: Re: LHAAP-16 Draft Final Proposed Plan
Date: Friday, September 03, 2010 10:52:01 AM
Attachments: 09 10 DRAFT FINAL PP-16 Rev1 (w trkng and cmnts).doc
ATT55327.gif
ATT55328.gif
ATT55329.gif
ATT55330.gif
ATT55331.gif

Hi Rose, Praveen:

The EPA has reviewed the revised Draft Final Proposed Plan and concurs with the changes.

Thanks,

Stephen L. Tzhone
Superfund Remedial Project Manager
USEPA Region 6 (6SF-RA)
214.665.8409
tzhone.stephen@epa.gov

From: "Srivastav, Praveen" <Praveen.Srivastav@shawgrp.com>
To: Stephen Tzhone/R6/USEPA/US@EPA, "Fay Duke" <FDUKE@tceq.state.tx.us>
Cc: "Williams, Aaron K SWT" <Aaron.K.Williams@usace.army.mil>, "Lambert, John R SWT" <John.R.Lambert@SWT03.usace.army.mil>, "Zeiler, Rose Ms CIV USA OSA" <rose.zeiler@us.army.mil>, "Watson, Susan" <Susan.Watson@shawgrp.com>, "Everett, Kay" <Kay.Everett@shawgrp.com>, "Mayila, Agnes" <Agnes.Mayila@shawgrp.com>, "Jones, Greg N" <Greg.N.Jones@shawgrp.com>
Date: 09/02/2010 03:03 PM
Subject: LHAAP-16 Draft Final Proposed Plan

Steve/Fay:

The revised Draft Final Proposed Plan for LHAAP-16 is attached for your review. We had received one comment from TCEQ which has been addressed with text changes and addition of a figure showing zones of active treatment. The document is in tracked-change mode. We will issue it as final once we get your concurrence.

Thank you,
Praveen Srivastav, PhD, PG, PMP
Project Manager
Federal Division/Project Management
Shaw Environmental & Infrastructure
1401 Enclave Parkway, Suite 250
Houston, TX 77077
281.531.3188 direct
281.639.8743 cell
praveen.srivastav@shawgrp.com <mailto:firstname.lastname@shawgrp.com>

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From: Mena, Kim
Sent: Thursday, September 02, 2010 2:40 PM
To: Srivastav, Praveen
Subject: RE: LHAAP - TCEQ comments on the DF Proposed Plan for LHAAP-16

Hi Praveen

Okay, the I made the revision to include the word "certain" before the word "portions" on the pages that your specified. The updated file is attached.

-Kim
From: Srivastav, Praveen
Sent: Thursday, September 02, 2010 12:55 PM
To: Mena, Kim
Subject: RE: LHAAP - TCEQ comments on the DF Proposed Plan for LHAAP-16

Kim:

One additional change: on pages 11, 18, and 20, please add "certain" before "portions" which I already in tracked change.

Thanks
Praveen Srivastav, PhD, PG, PMP
Project Manager
Federal Division/Project Management
Shaw Environmental & Infrastructure
1401 Enclave Parkway, Suite 250
Houston, TX 77077
281.531.3188 direct
281.639.8743 cell
praveen.srivastav@shawgrp.com <mailto:firstname.lastname@shawgrp.com>

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From: Mena, Kim
Sent: Thursday, September 02, 2010 12:42 PM
To: Srivastav, Praveen
Subject: RE: LHAAP - TCEQ comments on the DF Proposed Plan for LHAAP-16

Hi Praveen

Attached is the updated Draft Final Rev. 1 Proposed Plan for LHAAP-16. I rejected all of the "Draft" changes, reverting back to "Draft Final". I added Rev. 1 on the title page and in the footer. I also fixed any formatting issues as good as possible, given that this document is in track changes mode. (formatting issues are easiest to fix once changes/comments have been addressed and tracking is turned off)

Kimberly K. Mena
Technical Publications Assistant 3
Federal Technical Services
Shaw Environmental & Infrastructure Inc.
1401 Enclave Parkway, Suite 250
Houston, Texas 77077

281.531.3125 direct

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From: Srivastav, Praveen
Sent: Thursday, September 02, 2010 12:15 PM
To: Mena, Kim
Subject: FW: LHAAP - TCEQ comments on the DF Proposed Plan for LHAAP-16

Kim:

Please change this document to Draft Final Rev 01 and send me a tracked change document in Word.

Thanks
Praveen Srivastav, PhD, PG, PMP
Project Manager
Federal Division/Project Management
Shaw Environmental & Infrastructure
1401 Enclave Parkway, Suite 250
Houston, TX 77077
281.531.3188 direct
281.639.8743 cell
praveen.srivastav@shawgrp.com <mailto:firstname.lastname@shawgrp.com>

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From: Jones, Greg N
Sent: Thursday, September 02, 2010 11:39 AM
To: Srivastav, Praveen
Cc: Everett, Kay; Watson, Susan
Subject: RE: LHAAP - TCEQ comments on the DF Proposed Plan for LHAAP-16

Praveen,

The NEW revised document is attached.

Response to TCEQ Comment (August 10, 2010):
In agreement with the recommendation, a figure that presents the approximate location of the remedies to be implemented at the site will be included in the Proposed Plan. A reference within the text will be added on page 23. Also, three instances of the phrase "feasible remedy for the majority of the site" will be replaced with "feasible remedy for portions of the site". A copy of the document, showing the proposed text changes and figure, is attached.

Since EPA agreed with the document via email on August 23rd, the document can be issued following TCEQ concurrence. However, it should be noted that the dates of public review period and public meeting remain to be inserted. The tentative date for the meeting was September 21st, but we should verify that we can issue media notices by that date before we establish the dates in the document.

Thanks,
Gregary N. Jones, PhD, PE
Senior Environmental Engineer
Applied Science & Engineering
Shaw Environmental & Infrastructure Group
7741 Sandpiper Road
Huntsville, AL 35808
256/213-2197 direct
256/213-2200 main office
281/796-1212 cell

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From: Fay Duke [mailto:FDUKE@tceq.state.tx.us <mailto:FDUKE@tceq.state.tx.us>]
Sent: Tuesday, August 10, 2010 5:15 PM
To: Srivastav, Praveen; Rose Ms CIV USA OSA Zeiler
Cc: Burton.Terry@epamail.epa.gov; Forsythe.Barry@epamail.epa.gov; Tzhone.Stephen@epamail.epa.gov; paul_bruckwicki@fws.gov; Everett, Kay; Watson, Susan; John R SWT Lambert; Dale Vodak; Aaron K SWT Williams; Kent D Becher
Subject: LHAAP - TCEQ comments on the DF Proposed Plan for LHAAP-16

Rose/Praveen,

The TCEQ has completed its review of the Draft Final Proposed Plan for LHAAP-16, Longhorn Army Ammunition Plant, Karnack, Texas, July 2010. We have the following comment:

It states in several locations that "a preliminary natural attenuation evaluation indicates that MNA is a feasible remedy for the majority of the site but not as a sole remedy due to..."We are concern with the usage of the word " majority." It is our opinion that the preliminary natural attenuation evaluation only supports natural attenuation in limited areas of the plume and as such we envisioned that MNA remedy would be implemented as the remedy for portion of the plume where concentration is low and where there are no active remedy. We recommend that a figure showing the location where the active remedies are to b be implemented be included for clarity.

Please let me know if you should have any questions or comments.

Fay Duke (MC-136)
Remediation Division, TCEQ
PO Box 13087
Austin, Texas 78711-3087
512-239-2443
512-239-2450 (Fax)

From: Tzhone.Stephen@epamail.epa.gov
To: Zeiler, Rose Ms CIV USA OSA
Cc: Fay Duke; Burton.Terry@epamail.epa.gov; Lambert, John R SWT; Williams, Aaron K SWT; Srivastav, Praveen; Jones, Greg N; Watson, Susan; Duffield, Robert; Everett, Kay
Subject: Longhorn: EPA Review on LHAAP-16 DF FS Addendum RTCs
Date: Thursday, March 25, 2010 12:47:43 PM
Attachments: 03 10 FINAL FS Addendum LHAAP-16 (REV w trkng).doc
ATT149528.gif
ATT149529.gif

Hi Rose:

The EPA has completed review of the revised Army RTCs to the regulatory comments on DF Feasibility Study Addendum for LHAAP-16 (email 3/19/2010 and email 3/22/2010) and agrees with all revised RTCs and tracked changes.

Please proceed with finalization of the document.

Thanks,

Stephen L. Tzhone
Superfund Remedial Project Manager
USEPA Region 6 (6SF-RA)
214.665.8409
tzhone.stephen@epa.gov

From: "Jones, Greg N" <Greg.N.Jones@shawgrp.com>
To: Stephen Tzhone/R6/USEPA/US@EPA, "Fay Duke" <FDUKE@tceq.state.tx.us>
Cc: "Lambert, John R SWT" <John.R.Lambert@SWT03.usace.army.mil>, "Williams, Aaron K SWT" <Aaron.K.Williams@usace.army.mil>, "Zeiler, Rose Ms CIV USA OSA" <rose.zeiler@us.army.mil>, "Watson, Susan" <Susan.Watson@shawgrp.com>, "Duffield, Robert" <robert.duffield@shawgrp.com>, "Everett, Kay" <Kay.Everett@shawgrp.com>, "Srivastav, Praveen" <Praveen.Srivastav@shawgrp.com>
Date: 03/22/2010 03:27 PM
Subject: FW: LHAAP-16 FS Addendum - New Track-Changes Version

---

Steve,

This is a follow-up to Praveen's earlier email. I extracted Comment #10 from Terry Burton's earlier comments in order to associate the appropriate text (from the track-changes document) with that specific comment. Please see the additional text (the 2nd paragraph with bullet items) that has been added and underlined.

Comment #
Page
Section/Paragraph
Comment
C, D1, E or X
Revised Response
A or
D2

10

I feel that the reduction plan in sampling is overly aggressive. Given that source containment is not fully reached (more on that later), I would prefer a maintenance of quarterly sampling for a longer period of time, followed by a longer period of annual sampling.
C
As noted on pages 4-5 and 4-6, the monitoring frequencies on those pages have been assumed for estimating purposes and will be adjusted as data are collected.

As noted in the track-changes document issued to EPA and TCEQ on March 19th, the text of the FS Addendum has been modified to indicate quarterly sampling for the first two years following initiation of MNA. The overall assumptions regarding monitoring of groundwater were revised to read as follows (Section 4.5):

* * * * * MNA sampling will be performed quarterly for the first two years.
* * * * * After at least eight quarterly sampling events, the sampling frequency will be changed to semi-annually if the data suggests that less frequent sampling is appropriate.
* * * * * After at least three years of semi-annual sampling events, the sampling frequency will be changed to annual if the data suggests that less frequent sampling is appropriate.
* * * * * Annual sampling will continue until the next five-year review, then will be changed to once every five years if the data suggests that less frequent sampling is appropriate.

Thanks,
Gregary N. Jones, PhD, PE
Senior Environmental Engineer
Applied Science & Engineering
Shaw Environmental & Infrastructure Group
1401 Enclave Parkway, Suite 250
Houston, TX 77077
281/531-3172 direct
281/796-1212 cell

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From: "Srivastav, Praveen" <Praveen.Srivastav@shawgrp.com>
To: "Fay Duke" <FDUKE@tceq.state.tx.us>, Stephen Tzhone/R6/USEPA/US@EPA
Cc: "Lambert, John R SWT" <John.R.Lambert@SWT03.usace.army.mil>, "Williams, Aaron K SWT" <Aaron.K.Williams@usace.army.mil>, "Zeiler, Rose Ms CIV USA OSA" <rose.zeiler@us.army.mil>, "Jones, Greg N" <Greg.N.Jones@shawgrp.com>, "Watson, Susan" <Susan.Watson@shawgrp.com>, "Duffield, Robert" <robert.duffield@shawgrp.com>, "Everett, Kay" <Kay.Everett@shawgrp.com>
Date: 03/19/2010 11:20 AM
Subject: FW: LHAAP-16 FS Addendum - New Track-Changes Version

---

Attached is a tracked-change document for DF LHAAP-16 Feasibility Study Addendum. Please provide concurrence so we can prepare the Final document for submittal by the end of the month.

Steve: We will send you a revised response for your concurrence on Monday with respect to the sampling frequency. As you stated, the change is already reflected in the TCEQ response but we will get you a revised RTC anyway.

Thank you

Praveen Srivastav, PhD, PG, PMP
Project Manager
Federal Division/Project Management
Shaw Environmental & Infrastructure
1401 Enclave Parkway, Suite 250
Houston, TX 77077
281.531.3188 direct
281.639.8743 cell
praveen.srivastav@shawgrp.com <mailto:firstname.lastname@shawgrp.com>

Subject Re: Longhorn: EPA Review of Draft ROD LHAAP-16
From <rose.zeiler@us.army.mil>
Date Monday, July 18, 2011 17:10
To Stephen Tzhone <Tzhone.Stephen@epamail.epa.gov>
Cc "'Lambert, John R SWT'" <John.R.Lambert@SWT03.usace.army.mil> , "Williams, Aaron K SWT" <Aaron.K.Williams@usace.army.mil> , "Srivastav, Praveen" <Praveen.Srivastav@shawgrp.com> , "Watson, Susan" <Susan.Watson@shawgrp.com> , "Duffield, Robert" <robert.duffield@shawgrp.com> , "Jones, Greg N" <Greg.Jones2@shawgrp.com> , Fay Duke <Fay.Duke@tceq.texas.gov> , Dale Vodak <Dale.Vodak@tceq.texas.gov> , Alan Henderson <Alan.Henderson@tceq.texas.gov> , Terry Burton <Burton.Terry@epamail.epa.gov> , Forsythe.Barry@epamail.epa.gov , kdbecher@usgs.gov

Steve,
Thanks for getting your comments back so quickly. It is my understanding that we should expect to see additional comments from EPA legal.

Thanks,
Rose

Rose M. Zeiler, Ph.D.,
Site Manager
Longhorn Army Ammunition Plant
479-635-0110 (0112 – fax)

----- Original Message -----
From: Stephen Tzhone <Tzhone.Stephen@epamail.epa.gov>
Date: Monday, July 18, 2011 14:05
Subject: Longhorn: EPA Review of Draft ROD LHAAP-16
To: "Zeiler, Rose Ms CIV USA OSA" <rose.zeiler@us.army.mil>, "'Lambert, John R SWT'" <John.R.Lambert@SWT03.usace.army.mil>, "Williams, Aaron K SWT" <Aaron.K.Williams@usace.army.mil>, "Srivastav, Praveen" <Praveen.Srivastav@shawgrp.com>, "Watson, Susan" <Susan.Watson@shawgrp.com>, "Duffield, Robert" <robert.duffield@shawgrp.com>, "Jones, Greg N" <Greg.Jones2@shawgrp.com>
Cc: Fay Duke <Fay.Duke@tceq.texas.gov>, Dale Vodak <Dale.Vodak@tceq.texas.gov>, Alan Henderson <Alan.Henderson@tceq.texas.gov>, Terry Burton <Burton.Terry@epamail.epa.gov>, Forsythe.Barry@epamail.epa.gov, kdbecher@usgs.gov

> Hi Rose,
>
> The EPA has completed its review of the Draft ROD for LHAAP-16 and
> have
> the following comments:
>
> 1. Section 1.4 Description of the Selected Remedy, Pages 1-3
> (last
> paragraph) and 1-4 (first paragraph): Please clarify or add
> details on
> expected cleanup timeframe (see Comment #2).
>
> 2. Please clarify these two statements:
> *Section 2.11.2 Description of the Selected Remedy, Page 2-51:
> ?After the
> application of in situ bioremediation, the half-life for TCE is
> expected
> to drop to between 2 and 5 years, giving a projected time to
> completed
> remediation of approximately 30 to 75 years?.
> *Section 2.11.4 Expected Outcomes of Selected Remedy, Page 2-54:
> ?Achievement of the cleanup levels is anticipated to be completed
> in
> approximately 280 years?.
>
> 3. Table 2-9: It does not appear that inflation costs are
> included in cap

> maintenance, biobarrier, and LTM O&M costs. The cost table should
> include
> more detail, especially on the sampling (i.e., How many wells are
> included
> in the performance monitoring, MNA, and LTM programs? How many
> surface
> water locations will be taken and at what frequency? Where are
> the
> surface water monitoring costs identified in the cost table?).
>
> 4. Section 3.1 Stakeholder Issues and Lead Agency Responses, Page
> 3-8:
> The response to the question on antimony and thallium exceeding
> EPA MCL in
> groundwater should mention what the levels of those constituents
> were in
> the background monitoring wells at the site, not in the soil.
> Also, the
> Army added thallium to the list of contaminants of concern but did
> not add
> antimony? what is the rationale that antimony was not added?
>
> Thanks,
>
> Stephen L. Tzhone
> Superfund Remedial Project Manager
> USEPA Region 6 (6SF-RA)
> 214.665.8409
> tzhone.stephen@epa.gov
>
>
>
>
> From:
> "Jones, Greg N" <
> To:
> Stephen Tzhone/R6/USEPA/US@EPA, Fay Duke <
> Cc:
> "'Williams, Aaron K SWT'" <, "'Lambert,
> John R SWT'" <, "'Zeiler, Rose Ms CIV
> USA OSA'" <, "Everett, Kay"
> <, "Duffield, Robert"
> <, "Watson, Susan" <,
> "Mayila, Agnes" <, "Srivastav, Praveen"
> <
> Date:
> 06/21/2011 08:23 AM
> Subject:
> Draft ROD LHAAP-16
>
>
>
>
> Fay & Steve,
>
> The draft Record of Decision for LHAAP-16 is attached for your review.
> If you need hard copies as well, just let us know.
>
> Thanks,
> Gregary N. Jones, PhD, PE
> Senior Environmental Engineer
> Applied Science & Engineering
> Shaw Environmental & Infrastructure Group
> 7741 Sandpiper Road
> Huntsville, AL 35808
> 256/213-2197 direct
> 256/213-2200 main office
> 256/714-0267 cell

\>
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\>
\>

\>
\>

Subject	Site 16 ROD RTCs
From	<rose.zeiler@us.army.mil>
Date	Wednesday, August 3, 2011 14:35
To	"Tzhone.Stephen@epa.gov" <Tzhone.Stephen@epa.gov>
Cc	Fay Duke <fay.duke@tceq.texas.gov> , "Lambert, John R SWT" <John.R.Lambert@SWT03.usace.army.mil> , "Wililams, Aaron" <aaron.k.williams@usace.army.mil>

Hi Steve - Any idea when we might get feedback on the RTCs?
Thanks,
Rose

Rose M. Zeiler, Ph.D.,
Site Manager
Longhorn Army Ammunition Plant
479-635-0110 (0112 – fax)

Subject	Re: Site 16 ROD RTCs
From	<rose.zeiler@us.army.mil>
Date	Wednesday, August 3, 2011 15:13
To	Stephen Tzhone <Tzhone.Stephen@epamail.epa.gov>
Cc	"Wililams, Aaron" <aaron.k.williams@usace.army.mil> , Fay Duke <fay.duke@tceq.texas.gov> , "Lambert, John R SWT" <John.R.Lambert@SWT03.usace.army.mil>

Thanks for the feedback - will await further comment.
Rose

Rose M. Zeiler, Ph.D.,
Site Manager
Longhorn Army Ammunition Plant
479-635-0110 (0112 – fax)

----- Original Message -----
From: Stephen Tzhone <Tzhone.Stephen@epamail.epa.gov>
Date: Wednesday, August 3, 2011 15:07
Subject: Re: Site 16 ROD RTCs
To: "Zeiler, Rose Ms CIV USA OSA" <rose.zeiler@us.army.mil>
Cc: "Wililams, Aaron" <aaron.k.williams@usace.army.mil>, Fay Duke <fay.duke@tceq.texas.gov>, "Lambert, John R SWT" <John.R.Lambert@SWT03.usace.army.mil>

> Hi Rose,
>
> The responses to the current RTCs are agreeable to EPA, but there
> will be
> additional comments forthcoming on the LHAAP-16 ROD (mainly on
> ARARs and
> more uniform acknowledgement of surface water pathway). George is
> finishing them up and I will send to you
>
> Thanks,
>
> Stephen L. Tzhone
> Superfund Remedial Project Manager
> USEPA Region 6 (6SF-RA)
> 214.665.8409
> tzhone.stephen@epa.gov
>
>
>
>
> From:
> "Zeiler, Rose Ms CIV USA OSA" <
> To:
> Stephen Tzhone/R6/USEPA/US@EPA
> Cc:
> Fay Duke <, "Lambert, John R SWT"
> <, "Wililams, Aaron"
> <
> Date:
> 08/03/2011 02:36 PM
> Subject:
> Site 16 ROD RTCs
>
>
>
> Hi Steve - Any idea when we might get feedback on the RTCs?
> Thanks,
> Rose
>
> Rose M. Zeiler, Ph.D.,
> Site Manager
> Longhorn Army Ammunition Plant
> 479-635-0110 (0112 ? fax)
>
>
>

Subject	Anything from George on Site 16 ROD?
From	<rose.zeiler@us.army.mil>
Date	Tuesday, August 16, 2011 6:02
To	"Tzhone.Stephen@epa.gov" <Tzhone.Stephen@epa.gov>

Rose M. Zeiler, Ph.D.,
Site Manager
Longhorn Army Ammunition Plant
479-635-0110 (0112 – fax)

Longhorn: additional EPA comments on LHAAP -16 ROD

Stephen Tzhone to: Zeiler, Rose Ms CIV USA OSA, 'Lambert, John R SWT', Williams, Aaron K SWT, Srivastav, Praveen, Watson, Susan, 08/17/2011 10:42 PM
Cc Fay Duke, "Dale Vodak", Terry Burton, Forsythe.Barry, kdbecher

From: Stephen Tzhone/R6/USEPA/US
To: "Zeiler, Rose Ms CIV USA OSA" <rose.zeiler@us.army.mil>, "'Lambert, John R SWT'" <John.R.Lambert@SWT03.usace.army.mil>, "Williams, Aaron K SWT" <Aaron.K.Williams@usace.army.mil>, "Srivastav, Praveen"
Cc: Fay Duke <Fay.Duke@tceq.texas.gov>, "Dale Vodak" <Dale.Vodak@tceq.texas.gov>, Terry Burton/R6/USEPA/US@EPA, Forsythe.Barry@epamail.epa.gov, kdbecher@usgs.gov

---

Hi Rose,

Here are the additional EPA comments on LHAAP-16 ROD:

additional EPA comments on LHAAP-16 ROD.docx

Thanks,

Stephen L. Tzhone
Superfund Remedial Project Manager
USEPA Region 6 (6SF-RA)
214.665.8409
tzhone.stephen@epa.gov

"Zeiler, Rose Ms CIV USA OSA" Rose M. Zeiler, Ph.D., Site Manager 08/16/2011 06:02:26 AM

From: "Zeiler, Rose Ms CIV USA OSA" <rose.zeiler@us.army.mil>
To: Stephen Tzhone/R6/USEPA/US@EPA
Date: 08/16/2011 06:02 AM
Subject: Anything from George on Site 16 ROD?

Rose M. Zeiler, Ph.D.,
Site Manager
Longhorn Army Ammunition Plant
479-635-0110 (0112 - fax)

Stephen Tzhone Hi Rose, The responses to the current RTCs are... 08/03/2011 03:07:08 PM

From: Stephen Tzhone/R6/USEPA/US
To: "Zeiler, Rose Ms CIV USA OSA" <rose.zeiler@us.army.mil>
Cc: "Wililams, Aaron" <aaron.k.williams@usace.army.mil>, Fay Duke <fay.duke@tceq.texas.gov>, "Lambert, John R SWT" <John.R.Lambert@SWT03.usace.army.mil>
Date: 08/03/2011 03:07 PM
Subject: Re: Site 16 ROD RTCs

Hi Rose,

The responses to the current RTCs are agreeable to EPA, but there will be additional comments forthcoming on the LHAAP-16 ROD (mainly on ARARs and more uniform acknowledgement of surface water pathway). George is finishing them up and I will send to you

Thanks,

Stephen L. Tzhone
Superfund Remedial Project Manager
USEPA Region 6 (6SF-RA)
214.665.8409
tzhone.stephen@epa.gov

"Zeiler, Rose Ms CIV USA OSA" Hi Steve - Any idea when we migh... 08/03/2011 02:36:02 PM

From: "Zeiler, Rose Ms CIV USA OSA" <rose.zeiler@us.army.mil>
To: Stephen Tzhone/R6/USEPA/US@EPA
Cc: Fay Duke <fay.duke@tceq.texas.gov>, "Lambert, John R SWT" <John.R.Lambert@SWT03.usace.army.mil>, "Williams, Aaron" <aaron.k.williams@usace.army.mil>
Date: 08/03/2011 02:36 PM
Subject: Site 16 ROD RTCs

Hi Steve - Any idea when we might get feedback on the RTCs?
Thanks,
Rose

Rose M. Zeiler, Ph.D.,
Site Manager
Longhorn Army Ammunition Plant
479-635-0110 (0112 - fax)

Response to Comments on
Draft Record of Decision (June 2011)
LHAAP-16 Landfill
Longhorn Army Ammunition Plant, Karnack, Texas

August 2011

Reviewers: Stephen Tzhone, U.S. EPA Region 6
Respondents: Shaw Environmental, Inc.

1. Respondent Concurs (C), Does Not Concur (D), Takes Exception (E), or Delete (X).
2. Commenter Agrees (A) with response, or Does not Agree (D) with response.

Comment #	Page	Section/ Paragraph	Comment	C, D[1], E or X	Response	A D
Comments from Stephen Tzhone (USEPA)						
1	Pg 1-2	Section 1.4	Description of the Selected Remedy, 3rd Bullet - This bullet should be revised to read, "Installation of a biobarrier in the downgradient portion of the contaminant plume to prevent contaminated groundwater from discharging into Harrison Bayou, which flows into Caddo Lake, at concentrations that would cause surface waters to exceed Texas Surface Water Quality standards, the SDWA MCLs, and Texas Media-Specific Concentration (MSC) levels. A second biobarrier will be installed at the edge of the landfill to control potential migration of volatile organic compounds (VOCs) from the landfill. The purpose of the biobarriers in conjunction with natural attenuation will be to reduce groundwater contaminant and by-product contaminant concentrations to levels that will prevent surface waters from exceeding surface water cleanup levels, to reduce groundwater contaminant and by-product contaminant concentrations to levels that attain groundwater cleanup standards, to reduce the potential migration of contaminants and by-product contaminants from the landfill, and to reduce groundwater contaminant and by-product contaminant mass."	C	The text will be revised to reflect the comment.	
			General Comment - Delete the word, "passive" whenever it is used before the word "biobarrier," as the use of biobarriers constitute "treatment" in accordance with CERCLA's statutory preference for treatment. The word "passive" is used many times in this section and should be deleted. Other areas to delete the word "passive" can be found on pp. 2-22, 2-23,2-25, 2-27, 2-30, 2-36, 2-38, 2-40, 2-42, 2-43, 2-45, 2-46, 2-47, 2-48, 2-50, 2-51, 2-53, 2-55,	C	The word "passive" will be deleted here and in the mentioned sections of the document.	

Subject Re: LHAAP-16 ROD RTCs (UNCLASSIFIED)
From <rose.zeiler@us.army.mil>
Date Tuesday, September 27, 2011 8:39
To Tzhone.Stephen@epamail.epa.gov
Cc "Lambert, John R SWT" <John.R.Lambert@SWT03.usace.army.mil> , "Williams, Aaron K SWT" <Aaron.K.Williams@usace.army.mil> , Fay Duke <Fay.Duke@tceq.texas.gov>

Hi Steve,
We agree that post closure requirements are appropriate and relevant - please call as soon as you get a chance this morning.
Thanks,
Rose

Rose M. Zeiler, Ph.D.,
Site Manager
Longhorn Army Ammunition Plant
479-635-0110 (0112 – fax)

----- Original Message -----
From: Tzhone.Stephen@epamail.epa.gov
Date: Monday, September 26, 2011 14:30
Subject: Re: LHAAP-16 ROD RTCs (UNCLASSIFIED)
To: "Zeiler, Rose Ms CIV USA OSA" <rose.zeiler@us.army.mil>, "Lambert, John R SWT" <John.R.Lambert@SWT03.usace.army.mil>, "Williams, Aaron K SWT" <Aaron.K.Williams@usace.army.mil>
Cc: Fay Duke <Fay.Duke@tceq.texas.gov>

> Hi Rose,
>
> For RTC #13, 30, 31, and 35: The RCRA post closure (40 CFR 264.111
> and
> 264.310(b) rules are relevant and appropriate for LHAAP-16 as this
> is the
> final remedy for the closed landfill and it includes post-closure
> landfill
> maintenance.
>
> To resolve, let's carry forward the ARARs already cited in the
> interim
> ROD... this approach would be acceptable to both EPA and TCEQ:
>
>
>
> Thanks,
>
> Stephen L. Tzhone
> Superfund Remedial Project Manager
> USEPA Region 6 (6SF-RA)
> 214.665.8409
> tzhone.stephen@epa.gov
>
>
>
>
>
> From: "Williams, Aaron K SWT" <
> To: Stephen Tzhone/R6/USEPA/US@EPA, Fay Duke <
> Cc: Rose Ms CIV USA OSA Zeiler <, "Lambert,
> John R SWT" <
> Date: 09/23/2011 03:42 PM
> Subject: LHAAP-16 ROD RTCs (UNCLASSIFIED)
>
>
> Classification: UNCLASSIFIED

Subject Re: LHAAP-16 ROD RTCs (UNCLASSIFIED)
From <rose.zeiler@us.army.mil>
Date Tuesday, September 27, 2011 8:39
To Tzhone.Stephen@epamail.epa.gov
Cc "Lambert, John R SWT" <John.R.Lambert@SWT03.usace.army.mil> , "Williams, Aaron K SWT" <Aaron.K.Williams@usace.army.mil> , Fay Duke <Fay.Duke@tceq.texas.gov>

Hi Steve,
We agree that post closure requirements are appropriate and relevant - please call as soon as you get a chance this morning.
Thanks,
Rose

Rose M. Zeiler, Ph.D.,
Site Manager
Longhorn Army Ammunition Plant
479-635-0110 (0112 – fax)

----- Original Message -----
From: Tzhone.Stephen@epamail.epa.gov
Date: Monday, September 26, 2011 14:30
Subject: Re: LHAAP-16 ROD RTCs (UNCLASSIFIED)
To: "Zeiler, Rose Ms CIV USA OSA" <rose.zeiler@us.army.mil>, "Lambert, John R SWT" <John.R.Lambert@SWT03.usace.army.mil>, "Williams, Aaron K SWT" <Aaron.K.Williams@usace.army.mil>
Cc: Fay Duke <Fay.Duke@tceq.texas.gov>

> Hi Rose,
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> For RTC #13, 30, 31, and 35: The RCRA post closure (40 CFR 264.111
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> Thanks,
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> Stephen L. Tzhone
> Superfund Remedial Project Manager
> USEPA Region 6 (6SF-RA)
> 214.665.8409
> tzhone.stephen@epa.gov
>
>
>
>
>
> From: "Williams, Aaron K SWT" <
> To: Stephen Tzhone/R6/USEPA/US@EPA, Fay Duke <
> Cc: Rose Ms CIV USA OSA Zeiler <, "Lambert,
> John R SWT" <
> Date: 09/23/2011 03:42 PM
> Subject: LHAAP-16 ROD RTCs (UNCLASSIFIED)
>
>
> Classification: UNCLASSIFIED

> Caveats: NONE
>
> Steve,
>
> Please see attached RTCs for LHAAP-16 ROD.
>
>
>
> Thanks,
>
> Aaron K. Williams
> Environmental Engineer, ARMY/FUDS Section
> HTRW Design Center
> Tulsa District
> U.S. Army Corps of Engineers
> 918-669-4915
>
>
>
>
> Classification: UNCLASSIFIED
> Caveats: NONE

Subject Re: LHAAP-16 ROD RTCs (UNCLASSIFIED)
From <rose.zeiler@us.army.mil>
Date Tuesday, September 27, 2011 11:00
To Tzhone.Stephen@epamail.epa.gov
Cc "Lambert, John R SWT" <John.R.Lambert@SWT03.usace.army.mil> , "Williams, Aaron K SWT" <Aaron.K.Williams@usace.army.mil> , Fay Duke <Fay.Duke@tceq.texas.gov>

Steve,

This email is to clarify that Longhorn did respond that post-closure requirements are appropriate and relevant for Site 16 in the RTCs and though not all of the ARARs were included, 263.310(b)(1), (3), and (4) were.

Howver, Longhorn concurs with EPA's suggestion to carry forward the ARARs identified in the IRA ROD. Specifically, closure and post-closure requirements that were identified as ARARs in the IRA ROD for Site 16 include 30 TAC 335.112, 335.118, 335.119 and 335.174 and 40 CFR Sections 264.228 and 264.310 addressing landfills and surface impoundments storing hazardous waste. The applicable sections (referenced in EPA's comments # 13,30, 31 and 35) will be revised to clarify this where indicated, listing all of the closure and post-closure ARARs in the IRA ROD and noting that the closure requirements were met during implementation of the (cap) presumptive remedy and that the post-closure requirements are appropriate and relevant and are carried through to the final ROD (and added to the table of ARARs). These are: 40 CFR 264.228 (b)(1), (2), and (3), 264.310 (b)(1), (3), (4) and (5) (not (2) because there is no leachate collection system) and 30 TAC 335.174.

Please let me know if this addresses EPA's concern.

Thanks,
Rose

Rose M. Zeiler, Ph.D.,
Site Manager
Longhorn Army Ammunition Plant
479-635-0110 (0112 – fax)

----- Original Message -----
From: Tzhone.Stephen@epamail.epa.gov
Date: Monday, September 26, 2011 14:30
Subject: Re: LHAAP-16 ROD RTCs (UNCLASSIFIED)
To: "Zeiler, Rose Ms CIV USA OSA" <rose.zeiler@us.army.mil>, "Lambert, John R SWT" <John.R.Lambert@SWT03.usace.army.mil>, "Williams, Aaron K SWT" <Aaron.K.Williams@usace.army.mil>
Cc: Fay Duke <Fay.Duke@tceq.texas.gov>

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> To resolve, let's carry forward the ARARs already cited in the
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> ROD... this approach would be acceptable to both EPA and TCEQ:
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> Stephen L. Tzhone
> Superfund Remedial Project Manager
> USEPA Region 6 (6SF-RA)
> 214.665.8409

> tzhone.stephen@epa.gov
>
>
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>
> From: "Williams, Aaron K SWT" <
> To: Stephen Tzhone/R6/USEPA/US@EPA, Fay Duke <
> Cc: Rose Ms CIV USA OSA Zeiler <, "Lambert,
> John R SWT" <
> Date: 09/23/2011 03:42 PM
> Subject: LHAAP-16 ROD RTCs (UNCLASSIFIED)
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>
> Classification: UNCLASSIFIED
> Caveats: NONE
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> Steve,
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> Please see attached RTCs for LHAAP-16 ROD.
>
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>
> Thanks,
>
> Aaron K. Williams
> Environmental Engineer, ARMY/FUDS Section
> HTRW Design Center
> Tulsa District
> U.S. Army Corps of Engineers
> 918-669-4915
>
>
>
>
> Classification: UNCLASSIFIED
> Caveats: NONE
>
>
>
>

From: Fay Duke
To: Srivastav, Praveen; Tzhone, Stephen
Cc: Duffield, Robert; Everett, Kay; Jones, Greg N; Lambert, John R SWT; Watson,Susan; Williams, Aaron K SWT; Zeiler, Rose Ms CIV USA OSA
Subject: Re: FW: LHAAP-16 FS Addendum - New Track-Changes Version
Date: Friday, March 26, 2010 10:06:48 AM
Attachments: ATT180135.gif

Rose/Praveen,

The TCEQ has reviewed the tracked-change version of the main text of the LHAAP-16 Feasibility Study Addendum. We concur with the revisions made and have no additional comments. Please proceed.

Thank you, fd

Fay Duke (MC-136)
Remediation Division, TCEQ
PO Box 13087
Austin, Texas 78711-3087

512-239-2443
512-239-2450 (Fax)

>>> On 3/19/2010 at 11:20 AM, <Praveen.Srivastav@shawgrp.com> wrote:

Attached is a tracked-change document for DF LHAAP-16 Feasibility Study Addendum. Please provide concurrence so we can prepare the Final document for submittal by the end of the month.

Steve: We will send you a revised response for your concurrence on Monday with respect to the sampling frequency. As you stated, the change is already reflected in the TCEQ response but we will get you a revised RTC anyway.

Thank you

Praveen Srivastav, PhD, PG, PMP

Project Manager
Federal Division/Project Management
Shaw Environmental & Infrastructure
1401 Enclave Parkway, Suite 250

Houston, TX 77077
281.531.3188 direct

281.639.8743 cell
praveen.srivastav@shawgrp.com <mailto:firstname.lastname@shawgrp.com>

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www.shawgrp.com <http://www.shawgrp.com/>

http://shawnetv2.shawgrp.com/weekly/PublishingImages/GoGreenIcon_rev1gif Please consider the environment before printing this e-mail.

From: Jones, Greg N
Sent: Thursday, March 18, 2010 6:37 PM
To: Williams, Aaron K SWT
Cc: Duffield, Robert; Everett, Kay; Jones, Greg N; Lambert, John R SWT; Watson, Susan; Zeiler, Rose Ms CIV USA OSA; Srivastav, Praveen
Subject: LHAAP-16 FS Addendum - New Track-Changes Version

Aaron,

The attached document is a tracked-changes version of the main text of LHAAP-16.

It incorporates revisions for the last round of TCEQ comments. Those largely address (1) additional COCs for 5 years of monitoring and (2) the removal of the compliance value table and text.

The revised text also includes a modification to the second paragraph of Section 4.5 to address TCEQ's request that we capture the bioremediation/MNA approach somewhere in the FS (see email below).

Please give this a quick look. If Army sees no problems, we plan to forward to the regulators.

Thanks,

Gregary N. Jones, PhD, PE

Senior Environmental Engineer

Applied Science & Engineering

Shaw Environmental & Infrastructure Group

1401 Enclave Parkway, Suite 250

Houston, TX 77077

281/531-3172 direct

281/796-1212 cell

http://shawnetv2.shawgrp.com/weekly/PublishingImages/GoGreenIcon_rev1gifPlease consider the environment before printing this e-mail.

From: Fay Duke [mailto:FDUKE@tceq.state.tx.us]
Sent: Thursday, March 18, 2010 12:19 PM
To: Srivastav, Praveen
Cc: Duffield, Robert; Everett, Kay; Jones, Greg N; Lambert, John R SWT; Tzhone,Stephen; Watson, Susan; Williams, Aaron K SWT; Zeiler, Rose Ms CIV USA OSA
Subject: RE: FW: LHAAP-16 FS Addendum

Praveen,

Thanks for the clarification. I have no specific preference on what to call it. Please make sure that the approach is capture somewhere in the FS and the ROD. I have no other comments.

>>> On 3/18/2010 at 12:08 PM, <Praveen.Srivastav@shawgrp.com> wrote:

Fay:

Our response meant to say that, in the second instance, where bioremediation has been implemented, we will consider re-application of bio-amendments if conditions for MNA are not established after the initial application. In other words: bioremediation -> MNA evaluation-> continuation of MNA or re-application of bio-amendments.

What we were trying to say was that the re-application of bio-amendments in the second instance will really not be a contingency but continuation of a bio remedy that has already been implemented by did not achieve the objective. We can call it a contingency if it makes you feel better. The net result will be the same.

Thank you,

Praveen Srivastav, PhD, PG, PMP

Project Manager
Federal Division/Project Management
Shaw Environmental & Infrastructure
1401 Enclave Parkway, Suite 250

Houston, TX 77077
281.531.3188 direct

281.639.8743 cell

praveen.srivastav@shawgrp.com <mailto:firstname.lastname@shawgrp.com>

ShawT a world of SolutionsT
www.shawgrp.com <http://www.shawgrp.com/>

http://shawnetv2.shawgrp.com/weekly/PublishingImages/GoGreenIcon_rev1.gif Please consider the environment before printing this e-mail.

From: Fay Duke [mailto:FDUKE@tceq.state.tx.us]
Sent: Wednesday, March 17, 2010 3:03 PM
To: Srivastav, Praveen; Tzhone, Stephen
Cc: Duffield, Robert; Everett, Kay; Jones, Greg N; Lambert, John R SWT; Watson, Susan; Williams, Aaron K SWT; Zeiler, Rose Ms CIV USA OSA
Subject: Re: FW: LHAAP-16 FS Addendum

Rose/Praveen,

We have reviewed the responses to our follow up questions/comments. With the exception of No. 3, we generally concur with the responses. We take exception to your response to Comment No. 3 which states:

The reviewer may be referring to either of two aspects of the remedy: MNA of outer regions of the shallow and intermediate plumes or MNA that follows bioremediation in the treatment areas.

In the first instance: Yes. We can indicate in the proposed plan and ROD, where appropriate, that the MNA in these areas will have a contingency, which would likely be injection of bioamendments.

In the second instance: No. Failure of MNA would be the result of failure of bioremediation. Hence, a contingency for MNA is not needed. Bioremediation itself would need to be revisited at that juncture.

It is possible in the second example that MNA failed because concentrations of chlorinated ethenes are still too high for natural attenuation to take effect.

Let me know if you should have any questions.

Fay Duke (MC-136)

Remediation Division, TCEQ

PO Box 13087
Austin, Texas 78711-3087

512-239-2443
512-239-2450 (Fax)

>>> On 3/16/2010 at 8:33 AM, <Praveen.Srivastav@shawgrp.com> wrote:

Fay/Steve:

Please see attached responses to comments for the DF Feasibility Study for LHAAP-16. The responses have been prepared according to our discussion and agreement during the March 9, 2010 monthly managers' meeting. We are also preparing a tracked-changes document for you to review before we finalize the document. However, feel free to give us your concurrence to the RTCs before you receive the tracked-changes document so that we are all on the same page with respect to the changes to be made to the document.

Reminder: We still need some input from EPA before the document goes final.

Thank you,

Praveen Srivastav, PhD, PG, PMP

Project Manager
Federal Division/Project Management
Shaw Environmental & Infrastructure
1401 Enclave Parkway, Suite 250

Houston, TX 77077
281.531.3188 direct

281.639.8743 cell
praveen.srivastav@shawgrp.com <mailto:firstname.lastname@shawgrp.com>

From: Fay Duke
To: Srivastav, Praveen; Tzhone.Stephen@epa.gov
Cc: Everett, Kay; Jones, Greg N; Lambert, John R SWT; Mayila, Agnes; Watson, Susan; Williams, Aaron K SWT; Zeiler, Rose MsCIV USA OSA
Subject: Re: LHAAP-16 Draft Final Proposed Plan
Date: Thursday, September 02, 2010 5:22:51 PM
Attachments: ATT38453.gif

Rose/Praveen,

The TCEQ has reviewed the revised Draft Final Proposed Plan and concurs with the changes.

Thanks.

Fay Duke (MC-136)
Remediation Division, TCEQ
PO Box 13087
Austin, Texas 78711-3087

512-239-2443
512-239-2450 (Fax)

>>> On 9/2/2010 at 3:00 PM, <Praveen.Srivastav@shawgrp.com> wrote:

Steve/Fay:

The revised Draft Final Proposed Plan for LHAAP-16 is attached for your review. We had received one comment from TCEQ which has been addressed with text changes and addition of a figure showing zones of active treatment. The document is in tracked-change mode. We will issue it as final once we get your concurrence.

Thank you,

Praveen Srivastav, PhD, PG, PMP

Project Manager
Federal Division/Project Management
Shaw Environmental & Infrastructure
1401 Enclave Parkway, Suite 250

Houston, TX 77077
281.531.3188 direct

281.639.8743 cell
praveen.srivastav@shawgrp.com <mailto:firstname.lastname@shawgrp.com>

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From: Mena, Kim
Sent: Thursday, September 02, 2010 2:40 PM
To: Srivastav, Praveen
Subject: RE: LHAAP - TCEQ comments on the DF Proposed Plan for LHAAP-16

Hi Praveen

Okay, the I made the revision to include the word "certain" before the word "portions" on the pages that your specified. The updated file is attached.

-Kim

From: Srivastav, Praveen
Sent: Thursday, September 02, 2010 12:55 PM
To: Mena, Kim
Subject: RE: LHAAP - TCEQ comments on the DF Proposed Plan for LHAAP-16

Kim:

One additional change: on pages 11, 18, and 20, please add "certain" before "portions" which I already in tracked change.

Thanks

Praveen Srivastav, PhD, PG, PMP

Project Manager
Federal Division/Project Management
Shaw Environmental & Infrastructure
1401 Enclave Parkway, Suite 250

Houston, TX 77077
281.531.3188 direct

281.639.8743 cell
praveen.srivastav@shawgrp.com <mailto:firstname.lastname@shawgrp.com>

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www.shawgrp.com <http://www.shawgrp.com/>

http://shawnetv2.shawgrp.com/weekly/PublishingImages/GoGreenIcon_rev1.gif Please consider the environment before printing this e-mail.

From: Mena, Kim
Sent: Thursday, September 02, 2010 12:42 PM

To: Srivastav, Praveen
Subject: RE: LHAAP - TCEQ comments on the DF Proposed Plan for LHAAP-16

Hi Praveen

Attached is the updated Draft Final Rev. 1 Proposed Plan for LHAAP-16. I rejected all of the "Draft" changes, reverting back to "Draft Final". I added Rev. 1 on the title page and in the footer. I also fixed any formatting issues as good as possible, given that this document is in track changes mode. (formatting issues are easiest to fix once changes/comments have been addressed and tracking is turned off)

Kimberly K. Mena

Technical Publications Assistant 3

Federal Technical Services

Shaw Environmental & Infrastructure Inc.

1401 Enclave Parkway, Suite 250

Houston, Texas 77077

281.531.3125 direct

From: Srivastav, Praveen
Sent: Thursday, September 02, 2010 12:15 PM
To: Mena, Kim
Subject: FW: LHAAP - TCEQ comments on the DF Proposed Plan for LHAAP-16

Kim:

Please change this document to Draft Final Rev 01 and send me a tracked change document in Word.

Thanks

Praveen Srivastav, PhD, PG, PMP

Project Manager
Federal Division/Project Management
Shaw Environmental & Infrastructure
1401 Enclave Parkway, Suite 250

Houston, TX 77077
281.531.3188 direct

281.639.8743 cell
praveen.srivastav@shawgrp.com <mailto:firstname.lastname@shawgrp.com>

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www.shawgrp.com <http://www.shawgrp.com/>

http://shawnetv2.shawgrp.com/weekly/PublishingImages/GoGreenIcon_rev1.gif Please consider the environment before printing this e-mail.

From: Jones, Greg N
Sent: Thursday, September 02, 2010 11:39 AM
To: Srivastav, Praveen
Cc: Everett, Kay; Watson, Susan
Subject: RE: LHAAP - TCEQ comments on the DF Proposed Plan for LHAAP-16

Praveen,

The NEW revised document is attached.

Response to TCEQ Comment (August 10, 2010):

In agreement with the recommendation, a figure that presents the approximate location of the remedies to be implemented at the site will be included in the Proposed Plan. A reference within the text will be added on page 23. Also, three instances of the phrase "feasible remedy for the majority of the site" will be replaced with "feasible remedy for portions of the site". A copy of the document, showing the proposed text changes and figure, is attached.

Since EPA agreed with the document via email on August 23rd, the document can be issued following TCEQ concurrence. However, it should be noted that the dates of public review period and public meeting remain to be inserted. The tentative date for the meeting was September 21st, but we should verify that we can issue media notices by that date before we establish the dates in the document.

Thanks,

Gregary N. Jones, PhD, PE

Senior Environmental Engineer

Applied Science & Engineering

Shaw Environmental & Infrastructure Group

7741 Sandpiper Road

Huntsville, AL 35808

256/213-2197 direct

256/213-2200 main office

281/796-1212 cell

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www.shawgrp.com <http://www.shawgrp.com/>

From: Fay Duke [mailto:FDUKE@tceq.state.tx.us]
Sent: Tuesday, August 10, 2010 5:15 PM
To: Srivastav, Praveen; Rose Ms CIV USA OSA Zeiler
Cc: Burton.Terry@epamail.epa.gov; Forsythe.Barry@epamail.epa.gov; Tzhone.Stephen@epamail.epa.gov; paul_bruckwicki@fws.gov; Everett, Kay; Watson, Susan; John R SWT Lambert; Dale Vodak; Aaron K SWT Williams; Kent D Becher
Subject: LHAAP - TCEQ comments on the DF Proposed Plan for LHAAP-16

Rose/Praveen,

The TCEQ has completed its review of the Draft Final Proposed Plan for LHAAP-16, Longhorn Army Ammunition Plant, Karnack, Texas, July 2010. We have the following comment:

It states in several locations that "a preliminary natural attenuation evaluation indicates that MNA is a feasible remedy for the majority of the site but not as a sole remedy due to..."We are concern with the usage of the word " majority." It is our opinion that the preliminary natural attenuation evaluation only supports natural attenuation in limited areas of the plume and as such we envisioned that MNA remedy would be implemented as the remedy for portion of the plume where concentration is low and where there are no active remedy. We recommend that a figure showing the location where the active remedies are to b be implemented be included for clarity.

Please let me know if you should have any questions or comments.

Fay Duke (MC-136)

Remediation Division, TCEQ

PO Box 13087
Austin, Texas 78711-3087

512-239-2443
512-239-2450 (Fax)

From: Fay Duke
To: "Zeller, Rose Ms CIVUSA OSA"
Cc: Duffield, Robert; Everett, Kay; Jones, Greg N; Lambert, John R SWT; Mavila,Agnes; Srivastav, Praveen; Tzhone, Stephen; Watson, Susan; Williams, Aaron K SWT
Subject: Re: LHAAP-16 Draft ROD - Responses to TCEQ and EPA Comments
Date: Friday, July 29, 2011 3:12:51 PM
Attachments: ATT1389468.gif

Rose,

The TCEQ has completed its review of the responses to TCEQ comments. We concur with all with one exception: Comment No. 8, we request that the language associated with the MNA and and LTM be consistent with the LHAAP-17 ROD (page 2-32 to 2-33).

We have no additional comments. Please let me know if you should have any question.

>>> On 7/29/2011 at 2:25 PM, <Greg.Jones2@shawgrp.com> wrote:

Fay & Steve,

Praveen asked me to send the attached file. It provides the responses to EPA and TCEQ comments on the draft Record of Decision for LHAAP-16.

Let us know if you feel these address your concerns and we will proceed with revision of the document.

Thanks,

Gregary N. Jones, PhD, PE

Senior Environmental Engineer

Applied Science & Engineering

Shaw Environmental & Infrastructure Group

7741 Sandpiper Road

Huntsville, AL 35808

256/213-2197 direct

256/213-2200 main office

256/714-0267 cell

From: Stephen Tzhone
To: Zeiler, Rose Ms CIV USA OSA; Lambert, John R SWT; Williams, Aaron K SWT
Cc: Fay Duke; George Malone
Subject: Re: Fwd: FW: LHAAP-17 ROD (draft) (UNCLASSIFIED)
Date: Wednesday, July 27, 2011 5:04:14 PM
Attachments: LHAAP-17 figures set.pdf
LHAAP-17 ROD draft to regulators 2011 0722.doc

Hi Rose,

EPA has no further comments (other than the 'unless' -> 'until' change as discussed yesterday).

Please proceed to have the package prepared for Army staffing.

Thanks,

Stephen L. Tzhone
Superfund Remedial Project Manager
USEPA Region 6 (6SF-RA)
214.665.8409
tzhone.stephen@epa.gov

From: "Zeiler, Rose Ms CIV USA OSA" <rose.zeiler@us.army.mil>
To: Stephen Tzhone/R6/USEPA/US@EPA
Cc: Fay Duke <fay.duke@tceq.texas.gov>, "Lambert, John R SWT" <John.R.Lambert@SWT03.usace.army.mil>, "Wililams, Aaron" <aaron.k.williams@usace.army.mil>
Date: 07/26/2011 02:15 PM
Subject: Re: Fwd: FW: LHAAP-17 ROD (draft) (UNCLASSIFIED)

And here it is.....

Rose M. Zeiler, Ph.D.,
Site Manager
Longhorn Army Ammunition Plant
479-635-0110 (0112 – fax)

From: "Zeiler, Rose Ms CIV USA OSA" <rose.zeiler@us.army.mil>
To: Stephen Tzhone/R6/USEPA/US@EPA
Cc: Fay Duke <fay.duke@tceq.texas.gov>, "Lambert, John R SWT" <John.R.Lambert@SWT03.usace.army.mil>, "Wililams, Aaron" <aaron.k.williams@usace.army.mil>
Date: 07/26/2011 02:10 PM
Subject: Fwd: FW: LHAAP-17 ROD (draft) (UNCLASSIFIED)

Steve,
See attached LHAAP-17 ROD. Please take a final look at the markups before I have the package prepared for Army staffing. Note that this ROD exceeds $2M and, therefore, requires staffing at multiple Army offices. If it is possible, please return by noon tomorrow so that BRAC can get the package moving up the chain.

Thanks!
Rose

Rose M. Zeiler, Ph.D.,
Site Manager
Longhorn Army Ammunition Plant
479-635-0110 (0112 – fax)

From: Tzhone.Stephen@epamail.epa.gov
To: Zeiler, Rose Ms CIV USA OSA
Cc: Lambert, John R SWT; Watson, Susan; Williams, Aaron K SWT; Everett, Kay; Srivastav, Praveen; Fay Duke
Subject: Longhorn: EPA Review of LHAAP-17 Draft Final Proposed Plan
Date: Wednesday, May 19, 2010 5:46:47 PM
Attachments: 05 10 electr sbmttl Army DF PP LHAAP-17.pdf
ATT40624.jpg
ATT40625.gif
ATT40626.gif

Hi Rose:

The EPA has completed review of the Army LHAAP-17 Draft Final Proposed Plan (emails 5/19/2010), and agrees with the submittal. Please proceed with finalization of the LHAAP-17 Proposed Plan.

Thanks,

Stephen L. Tzhone
Superfund Remedial Project Manager
USEPA Region 6 (6SF-RA)
214.665.8409
tzhone.stephen@epa.gov

From: "Srivastav, Praveen" <Praveen.Srivastav@shawgrp.com>
To: "Fay Duke" <FDUKE@tceq.state.tx.us>, Stephen Tzhone/R6/USEPA/US@EPA
Cc: "Everett, Kay" <Kay.Everett@shawgrp.com>, "Jones, Greg N" <Greg.N.Jones@shawgrp.com>, "Lambert, John R SWT" <John.R.Lambert@SWT03.usace.army.mil>, "Watson, Susan" <Susan.Watson@shawgrp.com>, "Williams, Aaron K SWT" <Aaron.K.Williams@usace.army.mil>, "Rose Ms CIV USA OSA Zeiler" <rose.zeiler@us.army.mil>
Date: 05/19/2010 04:12 PM
Subject: RE: pdf of Draft Final Proposed Plan, LHAAP-17

Fay/Steve:

We propose to add the following sentence at the end of the first paragraph under Introduction on page 1:

"The preferred alternative for LHAAP-17 is Alternative 4 (excavation and offsite disposal of soil; groundwater extraction, monitored natural attenuation [MNA], and land use controls [LUCs] for groundwater)."

Thank you,

Praveen Srivastav, PhD, PG, PMP
Project Manager
Federal Division/Project Management
Shaw Environmental & Infrastructure
1401 Enclave Parkway, Suite 250
Houston, TX 77077
281.531.3188 direct
281.639.8743 cell

praveen.srivastav@shawgrp.com

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From: "Srivastav, Praveen" <Praveen.Srivastav@shawgrp.com>
To: "Zeiler, Rose Ms CIV USA OSA" <rose.zeiler@us.army.mil>, Stephen Tzhone/R6/USEPA/US@EPA, "Fay Duke" <FDUKE@tceq.state.tx.us>
Cc: "Lambert, John R SWT" <John.R.Lambert@SWT03.usace.army.mil>, "Watson, Susan" <Susan.Watson@shawgrp.com>, "Williams, Aaron K SWT" <Aaron.K.Williams@usace.army.mil>, "Everett, Kay" <Kay.Everett@shawgrp.com>
Date: 05/19/2010 04:43 PM
Subject: RE: RE: pdf of Draft Final Proposed Plan, LHAAP-17

Rose:

We agree with both of Fay's comments.

Response to Comment 1: We will add the following text to first paragraph in the left hand column on page 17 after the first sentence: "The extracted contaminated groundwater would be conveyed to the existing onsite groundwater treatment plan for disposal".

Response Comment 2: Agreed. The text will be modified according to the comment.

Let me know if there are any other questions.

Thanks

Praveen Srivastav, PhD, PG, PMP
Project Manager
Federal Division/Project Management
Shaw Environmental & Infrastructure
1401 Enclave Parkway, Suite 250
Houston, TX 77077
281.531.3188 direct
281.639.8743 cell
praveen.srivastav@shawgrp.com

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www.shawgrp.com

Please consider the environment before printing this e-mail.

From: "Srivastav, Praveen" <Praveen.Srivastav@shawgrp.com>
To: Stephen Tzhone/R6/USEPA/US@EPA, "Fay Duke" <FDUKE@tceq.state.tx.us>
Cc: "Zeiler, Rose Ms CIV USA OSA" <rose.zeiler@us.army.mil>, "Lambert, John R SWT" <John.R.Lambert@SWT03.usace.army.mil>, "Williams, Aaron K SWT"

<Aaron.K.Williams@usace.army.mil>, "Watson, Susan" <Susan.Watson@shawgrp.com>, "Jones, Greg N" <Greg.N.Jones@shawgrp.com>, "Everett, Kay" <Kay.Everett@shawgrp.com>
Date: 05/18/2010 04:19 PM
Subject: FW: pdf of Draft Final Proposed Plan, LHAAP-17

Steve/Fay:

Draft Final Proposed Plan for LHAAP-17 is attached for your review. As discussed, please provide your comments in 1 day (I am just the messenger :-)).

Thank you,
Praveen Srivastav, PhD, PG, PMP
Project Manager
Federal Division/Project Management
Shaw Environmental & Infrastructure
1401 Enclave Parkway, Suite 250
Houston, TX 77077
281.531.3188 direct
281.639.8743 cell
praveen.srivastav@shawgrp.com <mailto:firstname.lastname@shawgrp.com>

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From: Mena, Kim
Sent: Tuesday, May 18, 2010 3:45 PM
To: Srivastav, Praveen
Cc: Watson, Susan
Subject: pdf of Draft Final Proposed Plan, LHAAP-17

Hi Praveen,

Per Susan Watson's request, attached is the updated Draft Final Proposed Plan for LHAAP-17 in pdf format.

Regards,

Kimberly K. Mena
Technical Publications Assistant 3
Federal Technical Services
Shaw Environmental & Infrastructure Inc.
1401 Enclave Parkway, Suite 250
Houston, Texas 77077

281.531.3125 direct

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cid:image001.gif@01C9C1D5.8A680F00Please consider the environment before printing this e-mail.

From: Tzhone.Stephen@epamail.epa.gov
To: Rose Zeiler
Cc: Williams, Aaron K SWT; Srivastav, Praveen; Jones, Greg N; Lambert, John R SWT; Everett, Kay; Watson, Susan; Fay Duke; Burton.Terry@epamail.epa.gov
Subject: Longhorn: EPA Review of RTC LHAAP-17 DF Feasibility Study
Date: Tuesday, December 08, 2009 1:41:19 PM
Attachments: RTCs LHAAP-17 DF FS TCEQ.doc
RTCs LHAAP-17 DF FS USEPA.doc
ATT740408.gif

Hi Rose,

The EPA has completed its review of the Army RTC LHAAP-17 DF Feasibility Study (email October 30, 2009) and agree with all responses to comments. Please incorporate these responses to comments and finalize the LHAAP-17 Feasibility Study.

Stephen L. Tzhone
Superfund Remedial Project Manager
USEPA Region 6 (6SF-RA)
214.665.8409
tzhone.stephen@epa.gov

RTC LHAAP-17 DF Feasibility Study

Srivastav, Praveen to: Stephen Tzhone, Fay Duke
10/30/2009 07:36 PM

Cc: "Aaron K SWT Williams", "Rose Zeiler", "Lambert, John R SWT", "Jones, Greg N", "Watson, Susan", "Everett, Kay"

Steve/Fay:

Responses to regulatory comments on the LHAAP-17 DF Feasibility Study are attached for your review. Please provide your concurrence or additional comments at earliest convenience so the FS can be finalized.

Thank you,

Praveen Srivastav, PhD, PG, PMP
Project Manager
Federal Division/Project Management
Shaw Environmental & Infrastructure
3010 Briarpark Drive, Suite 400
Houston, TX 77042
713.996.4588 direct

281.639.8743 cell
713.996.4436 fax
praveen.srivastav@shawgrp.com <mailto:firstname.lastname@shawgrp.com>

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http://shawnetv2.shawgrp.com/weekly/PublishingImages/GoGreenIcon_rev1.gif Please consider the environment before printing this e-mail.

From: Fay Duke
To: Tzhone.Stephen@epa.gov; Susan Watson; Williams, Aaron K SWT
Cc: Greg N Jones; Kay Everett; Praveen Srivastav; Lambert, John R SWT; rose.zeiler@us.army.mil
Subject: RE: LHAAP-17 DF FS Response to TCEQ"s 042610 Comments
Date: Wednesday, April 28, 2010 4:24:03 PM

Rose,

Thanks for the additional clarifications. We have reviewed the responses to our comments and concurs with the responses.

Thanks, fd

Fay Duke (MC-136)
Remediation Division, TCEQ
PO Box 13087
Austin, Texas 78711-3087

512-239-2443
512-239-2450 (Fax)

>>> On 4/28/2010 at 3:14 PM, <Aaron.K.Williams@usace.army.mil> wrote:

Just one point of clarification for response to comment #4- The Army did not agree that the contingency language was not appropriate for the FS but rather agreed that the contingency language would be removed from the FS and will be included in the Proposed Plan.

Thanks,
Aaron K. Williams
Environmental Engineer, ARMY/FUDS Section
HTRW Design Center
Tulsa District
U.S. Army Corps of Engineers
918-669-4915

-----Original Message-----
From: Watson, Susan [mailto:Susan.Watson@shawgrp.com]
Sent: Wednesday, April 28, 2010 2:59 PM
To: Tzhone.Stephen@epa.gov; FDUKE@tceq.state.tx.us
Cc: Williams, Aaron K SWT; rose.zeiler@us.army.mil; Lambert, John R SWT; Srivastav, Praveen; Everett, Kay; Jones, Greg N
Subject: LHAAP-17 DF FS Response to TCEQ's 042610 Comments

Fay and Steve,

Please see below for the embedded responses to Fay's April 26, 2010 comments on the Draft Final Feasibility Study for LHAAP-17. As discussed in the teleconference yesterday, we are trying to get this document out this week and your quick response will be greatly appreciated.

Thanks in advance for your review,

Susan Watson, PE

Project Engineer
Applied Science and Engineering
Shaw Environmental & Infrastructure Group

1401 Enclave Parkway, Suite 250
Houston, TX 77077
281.531.3107 direct
281.531.3136 fax

281.531.3100 main

susan.watson@shawgrp.com <mailto:firstname.lastname@shawgrp.com>

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www.shawgrp.com <http://www.shawgrp.com/>

Please see embedded responses below.

From: Fay Duke [mailto:FDUKE@tceq.state.tx.us]
Sent: Mon 4/26/2010 6:12 PM
To: Jones, Greg N; Tzhone, Stephen
Cc: Everett, Kay; Lambert, John R SWT; rose.zeiler@us.army.mil; Srivastav, Praveen; Watson, Susan; Williams, Aaron K SWT
Subject: Re: LHAAP-17 FS (Track Changes)

Rose,

We have reviewed the tracked changes and have a couple of comments on ARARs and found some inconsistencies in the text.

1.I went though the ARAR table and the absence of couple of waste management standards jump out at me. First, because LHAAP-17 is located in the 100-year flood plain, 40 CFR 264.18 requires that remediation be designed, constructed and operated to prevent washout of any hazardous waste by a 100-year flood. The standard should be added to the potential ARAR tables.

Response: Concur. The regulation is for hazardous waste facilities in floodplains. The requirement is for a hazardous waste treatment, storage, or disposal facility used for remediation of waste and located in the 100-year floodplain must be designed, constructed, operated, and maintained to prevent washout of such waste by a 100-year flood unless owner/operator shows that procedures are in effect to remove waste safely before flood water can reach the facility. These requirement would not be expected to apply to any temporary staging areas because the excavated soil is not expected to RCRA hazardous waste. However, if the soil is determined to be hazardous, the requirements would be relevant and appropriate. If the latter is the case, then if soil is staged, procedures would be instituted to remove any hazardous waste safely before flood waters can reach those areas. This will be added to the location-specific ARAR table.

Table 3-2
Potential Location-Specific ARARs/TBCs

Resource/Citation

Activity or Prerequisite Status

Requirement

Requirements for Hazardous Waste Facilities in Floodplains

Resource Conservation and Recovery Act (RCRA)

40 CFR 264.18(b)

If excavated soil is found to constitute RCRA hazardous waste, these requirements are relevant and appropriate since LHAAP-17 is located within a 100-year floodplain. However, it is not anticipated that the excavated soil will be classified as hazardous.

A hazardous waste treatment, storage, or disposal facility used for remediation waste and located in the 100-year floodplain must be designed, constructed operated, and maintained to prevent washout of such waste by a 100-year flood unless owner/operator show that procedures are in effect to remove waste safely before flood water can reach the facility.

2. The substantive requirements of TAC Chapter 331 Subchapter H should be included in the table of potential ARARs.

Response: Concur. TAC Chapter 331 Subchapter H is for Class V injection wells. The substantive requirements will be added to the potential action-specific ARAR table and text. These would apply if injection wells are used as part of the remedy. It is expected the TCEQ UIC program would review the design documents that use injection wells as part of the remedy. The following will be added to the table.

Table 3-3
Potential Action-Specific ARARs/TBCs

Citation

Activity or Prerequisite/Status

Requirement

Injection Wells

Underground Injection Control, Standards for Class V Wells

30 TAC 331.131 to 133 Subchapter H

Installation, operation, and closure of injection wells for in situ chemical oxidation fall in the category of Class V Injection Wells - relevant and appropriate.

Injection wells shall be constructed to the required specifications for isolation casing, surface completion, prevention of commingling, and confinement of undesirable groundwater to its zone of origin.

Closure shall be accomplished by removing all of the removable casing and the entire well shall be pressure filled via a tremie pipe with cement from bottom to the land surface, or closure shall be performed by the alternative method for Class V Wells completed in zones of undesirable groundwater. Groundwater concentrations at time of well closure will determine the appropriate method of abandonment.

3. Section 5.2.4.2 -Information in this section is not consistent with similar information in Section 6.3.4.5.4. For example, in Section 5.2.4.2 states that 3 wells will be sampled for performance while Section 6.3.4.5.4 states that eight wells will be sampled. Why only 3 wells will be sampled? Additionally, Section 6.3.4.5.4 needs to be revised to reflect the number of years of extraction expected. It still states that pump and treat is expected to last for 3 years.

Response: Concur. The number of wells appears inconsistent, but both are correct. In Section 5.2.4.2, 3 wells will be used for extraction and sampled specifically to evaluate the performance of the extraction wells. In Section 6.3.4.5.4, in the first paragraph, 3 years will be revised to 1.5 years for extraction. The second paragraph will be replaced with:

During extraction activities, samples will be collected from the three extraction wells in the shallow zone monthly for approximately 6 months to monitor the effectiveness of the action. After 6 months, performance monitoring will be reduced to quarterly for approximately 1 year or until pumping ceases. At this point, MNA will begin with quarterly monitoring of several wells for 2 years (Year 3.5), reducing to semiannual sampling for 3 years , and thereafter annually until the next 5-year review. MNA will be implemented in the intermediate zone concurrent with the extraction in the shallow zone. MNA monitoring in the intermediate zone will be conducted quarterly for the first 2 years, semiannual sampling for the following three years, and further reduced to annual monitoring until the next 5-year review. The sampling frequencies may change based on the results of the 5-year reviews and the contaminant concentrations at those times.

4. In case where MNA is not effective, the contingent action for the intermediate zone cited in Section 5.2.4.3 (extraction) is inconsistent with Section 5.4.4.4 (bioremediation)

Response: Concur. The sections where a contingency remedy for the intermediate zone (5.2.3.4, 5.2.4.3, and 5.2.4.4) should have been revised to remove the contingency language statement. It was agreed that the contingency language was not appropriate for the FS and will be included in the Proposed Plan.

Please let me know if you should have any questions regarding my comments.

Thanks, fd

Fay Duke (MC-136)

Remediation Division, TCEQ

PO Box 13087
Austin, Texas [illegible]8711-3087

512-239-2443
512-239-2450 (Fax)

From: Fay Duke
To: Srivastav, Praveen; Tzhone, Stephen; Zeiler, Rose Ms CIV USA OSA
Cc: Everett, Kay; Lambert, John R SWT; Watson, Susan; Williams, Aaron K SWT
Subject: RE: RE: pdf of Draft Final Proposed Plan, LHAAP-17
Date: Thursday, May 20, 2010 9:23:52 AM
Attachments: ATT56231.gif

Agree with the changes. Please proceed.

>>> On 5/19/2010 at 9:25 PM, <Praveen.Srivastav@shawgrp.com> wrote:

Fay/Steve:

Agree with the change suggested in the first comment.

With respect to the second comment regarding proposed text for the Introduction, my concern is that the language about "treatment at the GWTP" is not a part of the title of the alternative in the FS. However, we can add another sentence after the sentence we proposed earlier. In other words, the text added to the end of the first paragraph under Introduction would read:

"The preferred alternative for LHAAP-17 is Alternative 4 (excavation and offsite disposal of soil; groundwater extraction, monitored natural attenuation [MNA], and land use controls [LUCs] for groundwater). The extracted groundwater would be conveyed to the existing groundwater treatment plant for treatment"

With these two changes, we will make the proposed plan final. Let me know if you agree.

Thank you,

Praveen Srivastav, PhD, PG, PMP

Project Manager
Federal Division/Project Management
Shaw Environmental & Infrastructure
1401 Enclave Parkway, Suite 250

Houston, TX 77077
281.531.3188 direct

281.639.8743 cell
praveen.srivastav@shawgrp.com <mailto:firstname.lastname@shawgrp.com>

From: Fay Duke [mailto:FDUKE@tceq.state.tx.us]
Sent: Wednesday, May 19, 2010 5:33 PM
To: Stephen Tzhone; Srivastav, Praveen; Rose Ms CIV USA OSA Zeiler

Cc: Everett, Kay; Watson, Susan; John R SWT Lambert; Aaron K SWT Williams
Subject: RE: RE: pdf of Draft Final Proposed Plan, LHAAP-17

Not ideal but good enough. However, may I suggest not use the word 'disposal" . Can we use treatment? Also, in the added texts in the introduction, can we add the treatment by GWTP or something?

>>> On 5/19/2010 at 4:43 PM, <Praveen.Srivastav@shawgrp.com> wrote:

Rose:

We agree with both of Fay's comments.

Response to Comment 1: We will add the following text to first paragraph in the left hand column on page 17 after the first sentence: "The extracted contaminated groundwater would be conveyed to the existing onsite groundwater treatment plan for disposal".

Response Comment 2: Agreed. The text will be modified according to the comment.

Let me know if there are any other questions.

Thanks

Praveen Srivastav, PhD, PG, PMP
Project Manager
Federal Division/Project Management
Shaw Environmental & Infrastructure
1401 Enclave Parkway, Suite 250
Houston, TX 77077
281.531.3188 direct
281.639.8743 cell
praveen.srivastav@shawgrp.com

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-----Original Message-----
From: Zeiler, Rose Ms CIV USA OSA [mailto:rose.zeiler@us.army.mil]
Sent: Wednesday, May 19, 2010 4:37 PM
To: Srivastav, Praveen
Cc: Lambert, John R SWT; Watson, Susan; Williams, Aaron K SWT
Subject: Re: RE: pdf of Draft Final Proposed Plan, LHAAP-17

Praveen,
Fay and Steve are waiting to see the responses to Fay's comments. Can you respond to the comments this afternoon?
Rose

Rose M. Zeiler, Ph.D.,
Site Manager
Longhorn Army Ammunition Plant
479-635-0110 (0112 - fax)

----- Original Message -----
From: "Srivastav, Praveen" <Praveen.Srivastav@shawgrp.com>
Date: Wednesday, May 19, 2010 16:12
Subject: RE: pdf of Draft Final Proposed Plan, LHAAP-17
To: Fay Duke <FDUKE@tceq.state.tx.us>, Stephen Tzhone <Tzhone.Stephen@epa.gov>
Cc: "Everett, Kay" <Kay.Everett@shawgrp.com>, "Jones, Greg N" <Greg.N.Jones@shawgrp.com>, "Lambert, John R SWT" <John.R.Lambert@SWT03.usace.army.mil>, "Watson, Susan" <Susan.Watson@shawgrp.com>, "Williams, Aaron K SWT" <Aaron.K.Williams@usace.army.mil>, Rose Ms CIV USA OSA Zeiler <rose.zeiler@us.army.mil>

> Fay/Steve:
>
> We propose to add the following sentence at the end of the first
> paragraph under Introduction on page 1:
>
> "The preferred alternative for LHAAP-17 is Alternative 4
> (excavation and offsite disposal of soil; groundwater extraction,
> monitored natural attenuation [MNA], and land use controls [LUCs]
> for groundwater)."
>
> Thank you,
>
> Praveen Srivastav, PhD, PG, PMP
> Project Manager
> Federal Division/Project Management
> Shaw Environmental & Infrastructure
> 1401 Enclave Parkway, Suite 250
> Houston, TX 77077
> 281.531.3188 direct
> 281.639.8743 cell
> praveen.srivastav@shawgrp.com
>
> Shaw(tm) a world of Solutions(tm)
> www.shawgrp.com
>
> Please consider the environment before printing this e-mail.
>
>
> -----Original Message-----
> From: Zeiler, Rose Ms CIV USA OSA [mailto:rose.zeiler@us.army.mil]
> Sent: Wednesday, May 19, 2010 10:37 AM
> To: Fay Duke
> Cc: Srivastav, Praveen; Everett, Kay; Jones, Greg N; Lambert, John
> R SWT; Tzhone, Stephen; Watson, Susan; Williams, Aaron K SWT
> Subject: Re: pdf of Draft Final Proposed Plan, LHAAP-17
> Importance: High
>
> Fay,
> Thanks very much for your expedited review!
>
> Also want to let you know that a response to an AEC-Legal comment
> about the addition of a sentence in the introductory section
> identifying what the preferred remedy is did not make it into the
> revision. We plan to add it before it goes public.
>
> Praveen - Would you mind sending Fay and Steve the text of the
> sentence that will be added so that they can see it now?
>
> Thanks,

> Rose
>
> Rose M. Zeiler, Ph.D.,
> Site Manager
> Longhorn Army Ammunition Plant
> 479-635-0110 (0112 - fax)
>
> ----- Original Message -----
> From: Fay Duke <
> Date: Wednesday, May 19, 2010 10:22
> Subject: Re: pdf of Draft Final Proposed Plan, LHAAP-17
> To: "Srivastav, Praveen" <, "Zeiler, Rose MsCIV USA OSA" <
> Cc: "Everett, Kay" <, "Jones, Greg N" <, "Lambert, John R SWT" <, "Tzhone, Stephen" <, "Watson, Susan" <, "Williams, Aaron K SWT" <
>
>
> > Rose/Praveen,
> >
> > The TCEQ has completed the review of the Draft Final Proposed Plan
> > for site LHAAP-17. We have the following comments:
> > General - The preferred remedy (remedial alternative 2) need to
> > include a brief discussions of what happens to the extracted
> > groundwater.
> > Page 17 - We recommend the following revisions to the 2nd sentence
> > of the first paragraph as follow: "The groundwater plume is
> > contaminated with both perchlorate and TCE, and high
> > concentrations of perchlorate tends to .."
> > Please let me know if you should have any questions regarding
> > these comments.
> >
> >
> >
> > Fay Duke (MC-136)
> > Remediation Division, TCEQ
> > PO Box 13087
> > Austin, Texas 78711-3087
> >
> > 512-239-2443
> > 512-239-2450 (Fax)
> >
> > >>> On 5/18/2010 at 4:18 PM, <>
> >
> > Steve/Fay:
> > Draft Final Proposed Plan for LHAAP-17 is attached for your review. As discussed, please provide your comments in 1 day (I am just the messenger J).
> > Thank you,
> > Praveen Srivastav, PhD, PG, PMP
> > Project Manager
> > Federal Division/Project Management
> > Shaw Environmental & Infrastructure
> > 1401 Enclave Parkway, Suite 250
> > Houston, TX 77077
> > 281.531.3188 direct
> > 281.639.8743 cell
> > praveen.srivastav@shawgrp.com
> >
> > ShawT a world of SolutionsT
> > www.shawgrp.com
> >
> > Please consider the environment before printing this e-mail.

> >
> > From: Mena, Kim
> > Sent: Tuesday, May 18, 2010 3:45 PM
> > To: Srivastav, Praveen
> > Cc: Watson, Susan
> > Subject: pdf of Draft Final Proposed Plan, LHAAP-17
> >
> > Hi Praveen,
> > Per Susan Watson's request, attached is the updated Draft Final Proposed Plan for LHAAP-17 in pdf format.
> > Regards,
> > Kimberly K. Mena
> > Technical Publications Assistant 3
> > Federal Technical Services
> > Shaw Environmental & Infrastructure Inc.
> > 1401 Enclave Parkway, Suite 250
> > Houston, Texas 77077
> > 281.531.3125 direct
> >
> > ShawT a World of SolutionsT
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> >
> > Rose/Praveen,
> >
> > The TCEQ has completed the review of the Draft Final Proposed Plan
> > for site LHAAP-17. We have the following comments:
> >
> > General - The preferred remedy (remedial alternative 2) need to
> > include a brief discussions of what happens to the extracted
> > groundwater.
> >
> > Page 17 - We recommend the following revisions to the 2nd sentence
> > of the first paragraph as follow: "The groundwater plume is
> > contaminated with both perchlorate and TCE, and high
> > concentrations of perchlorate tends to .."
> >
> >
> > Please let me know if you should have any questions regarding
> > these comments.
> >
> >

> >
> >
> > Fay Duke (MC-136)
> > Remediation Division, TCEQ
> > PO Box 13087
> > Austin, Texas 78711-3087
> >
> > 512-239-2443
> > 512-239-2450 (Fax)
> >
> > >>> On 5/18/2010 at 4:18 PM, <>
> >
> >
> > Steve/Fay:
> > Draft Final Proposed Plan for LHAAP-17 is attached for your review. As discussed, please provide your comments in 1 day (I am just the messenger J).
> > Thank you,
> >
> > Praveen Srivastav, PhD, PG, PMP
> > Project Manager
> > Federal Division/Project Management
> > Shaw Environmental & Infrastructure
> > 1401 Enclave Parkway, Suite 250
> > Houston, TX 77077
> > 281.531.3188 direct
> > 281.639.8743 cell
> > praveen.srivastav@shawgrp.com
> >
> > ShawT a world of SolutionsT
> > www.shawgrp.com
> >
> > Please consider the environment before printing this e-mail.
> >
> >
> >
> > From: Mena, Kim
> > Sent: Tuesday, May 18, 2010 3:45 PM
> > To: Srivastav, Praveen
> > Cc: Watson, Susan
> > Subject: pdf of Draft Final Proposed Plan, LHAAP-17
> >
> > Hi Praveen,
> > Per Susan Watson's request, attached is the updated Draft Final Proposed Plan for LHAAP-17 in pdf format.
> >
> > Regards,
> > Kimberly K. Mena
> > Technical Publications Assistant 3
> > Federal Technical Services
> > Shaw Environmental & Infrastructure Inc.
> > 1401 Enclave Parkway, Suite 250
> > Houston, Texas 77077
> > 281.531.3125 direct
> >
> > ShawT a World of SolutionsT
> > www.shawgrp.com
> >
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> > ****Internet Email Confidentiality Footer**** Privileged/Confidential Information may be contained

Subject	FW: MMRP RTCs to EPA (UNCLASSIFIED)
From	"Williams, Aaron K SWT" <Aaron.K.Williams@usace.army.mil>
Date	Monday, October 24, 2011 14:38
To	"Zeiler, Rose Ms CIV USA OSA" <rose.zeiler@us.army.mil>

Classification: UNCLASSIFIED
Caveats: NONE

-----Original Message-----
From: Tzhone.Stephen@epamail.epa.gov [mailto:Tzhone.Stephen@epamail.epa.gov]
Sent: Wednesday, September 07, 2011 2:52 PM
To: Zeiler, Rose Ms CIV USA OSA; Lambert, John R SWT; Williams, Aaron K SWT
Cc: Fay Duke; Malone.George@epamail.epa.gov
Subject: Re: MMRP RTCs to EPA

Hi Rose,

The EPA has no further comments. Please submit ROD for final review, thanks.

Thanks,

Stephen L. Tzhone
Superfund Remedial Project Manager
USEPA Region 6 (6SF-RA)
214.665.8409
tzhone.stephen@epa.gov

From: "Zeiler, Rose Ms CIV USA OSA" <rose.zeiler@us.army.mil>
To: Stephen Tzhone/R6/USEPA/US@EPA
Cc: Fay Duke <fay.duke@tceq.texas.gov>, "Lambert, John R SWT" <John.R.Lambert@SWT03.usace.army.mil>, "Wlilams, Aaron" <aaron.k.williams@usace.army.mil>
Date: 09/06/2011 03:16 PM
Subject: MMRP RTCs to EPA

Steve,
Please see attached RTCs to the MMRP comments.
Rose

Rose M. Zeiler, Ph.D.,
Site Manager
Longhorn Army Ammunition Plant
479-635-0110 (0112 - fax)

Classification: UNCLASSIFIED
Caveats: NONE

Subject	MMRP ROD Revisions
From	<rose.zeiler@us.army.mil>
Date	Thursday, September 29, 2011 8:58
To	"Tzhone.Stephen@epa.gov" <Tzhone.Stephen@epa.gov>
Cc	"Lambert, John R SWT" <John.R.Lambert@SWT03.usace.army.mil> , "Wililams, Aaron" <aaron.k.williams@usace.army.mil>

Steve,
This is the language change we discussed for the MMRP ROD in reference to the RD in Section 1.4

"A LUC RD will be prepared within 90 days of the ROD."

and in Section 2.12.2:

"The details and description of the LUCs implementation and maintenance actions were presented in found in the approved LUC design and plan (EODT, 2008) associated with the 2008 removal action. Within 90 days of signing the ROD, the U.S. Army will prepare and submit the LUC RD to USEPA consistent with the schedule of Section XVI of the Federal Facility Agreement (FFA). The LUC RD will be the 2008 LUC design and plan revised to include the nonresidential LUC."

Rose M. Zeiler, Ph.D.,
Site Manager
Longhorn Army Ammunition Plant
479-635-0110 (0112 – fax)

From: Tzhone.Stephen@epamail.epa.gov
To: Zeiler, Rose Ms CIV USA OSA
Cc: Lambert, John R SWT; Williams, Aaron K SWT; Brian K. Gentry; Plugge, Dan SWL; Fay Duke; Vodak, Dale; Forsythe.Barry@epamail.epa.gov; Bruckwicki, Paul; Josiam.Raji@epamail.epa.gov; Burton.Terry@epamail.epa.gov
Subject: Re: RTCs for Draft Final MEC Removal Action Report
Date: Friday, September 11, 2009 3:59:54 PM
Attachments: EODT-#35887-v2-Longhorn_AAP_Final_Report_Draft_Final_Comments_EPA_21_May_2009.DOC
Fig_B-2_Grid_Layout_Site27.pdf
Fig_B-3_Grid_Layout_Site54.pdf
CSM_Graphic_Site27_OBOD_V2.pdf
CSM_Graphic_Site27_V2.pdf
CSM_Graphic_Site54_V2.pdf
ATT1505061.gif

Hi Rose,

The EPA has completed its review of the Army RTCs for EPA Comments on the Draft Final MEC Removal Action Report (email August 18, 2009) and agrees with all the Army RTCs. Please incorporate the RTCs and proceed with finalization of the MEC Removal Action Report.

Stephen L. Tzhone
Superfund Remedial Project Manager
USEPA Region 6 (6SF-RA)
214.665.8409
tzhone.stephen@epa.gov

RTCs for Draft Final MEC Removal Action Report

Lambert, John R SWT to: Stephen Tzhone
08/18/2009 04:35 PM

Cc: "Zeiler, Rose Ms CIV USA OSA", "Williams, Aaron K SWT", "Plugge, Dan W HNC", "Brian K. Gentry"

Steve:

Army's RTCs for EPA comments on the MEC Removal Action Report are attached. The contract for this project expires at the end of September 2009. Any facilitation of RTC approval/resolution would be greatly appreciated.

Thanks,

John

<<EODT-#35887-v2-Longhorn_AAP_Final_Report_Draft_Final_Comments_EPA_21_May_2009.DOC>>

<<Fig_B-2_Grid_Layout_Site27.pdf>> <<Fig_B-3_Grid_Layout_Site54.pdf>>
<<CSM_Graphic_Site27_OBOD_V2.pdf>> <<CSM_Graphic_Site27_V2.pdf>>
<<CSM_Graphic_Site54_V2.pdf>>

Subject Re: Longhorn AAP MMRP EECA RTCs
From Harris.Scott@epamail.epa.gov
Date Tuesday, July 31, 2007 11:07
To rose.zeiler@us.army.mil
cliff.murray@swt03.usace.army.mil , fduke@tceq.state.tx.us ,
Cc john.r.lambert@swt03.usace.army.mil , Tzhone.Stephen@epa.gov , "Kirwan, Eric SWF" <Stephen.E.Kirwan@swf02.usace.army.mil>

Rose,

I concur with your RTCs. Please keep us informed of the status and progress of the removal action. Steve will send you a separate email regarding potential NFA ROD issues that were discussed.

Please feel free to call me at any time if you have questions.

Scott

****
Scott Harris, Ph.D.
Superfund Remedial Project Manager
AR/TX Team
USEPA Region 6
1445 Ross Avenue, Suite 1200 (6SF-RA)
Dallas, TX 75202-2733

Office 214-665-7114
Fax 214-665-6660
Cell 214-789-9656
harris.scott@epa.gov

<rose.zeiler@us.
army.mil>
To
07/11/2007 03:37 Stephen
Tzhone/R6/USEPA/US@EPA,
PM fduke@tceq.state.tx.us
cc
Scott Harris/R6/USEPA/US@EPA,
john.r.lambert@swt03.usace.army.m
il,

cliff.murray@swt03.usace.army.mil
, "Kirwan, Eric SWF"
<Stephen.E.Kirwan@swf02.usace.army.mil>

Subject
Longhorn AAP MMRP EECA RTCs

Fay and Steve,
Please see attached responses to comments on the EECA for the three MMRP sites. Please do not hesitate to let me know if you have any additional questions or concerns.

Thanks,
Rose

Rose M. Zeiler, Ph.D.,
Site Manager
Longhorn Army Ammunition Plant
479-635-0110 (0112 – fax)
(918) 605-8398 (cell)
(See attached file: LHAAP_Draft_Final_EECA_RTCs_070711.doc)

From: Stephen Tzhone
To: Zeiler, Rose Ms CIV USA OSA; Lambert, John R SWT; Williams, Aaron K SWT; praveen.srivastav@shawgrp.com; Watson, Susan; Elliott, John
Cc: Fay Duke; Dale Vodak; Alan Henderson; Marilyn Long; Richard Mayer; Terry Burton; kdbecher@usgs.gov; Forsythe.Barry@epamail.epa.gov
Subject: Longhorn: EPA Review of Draft Final Proposed Plan and Draft Public Notice for LHAAP-001-R and LHAAP-003-R
Date: Friday, July 01, 2011 4:13:29 PM
Attachments: 06 14 Draft Final PP LHAAP-001-R and LHAAP-003-R.docx
Public Notice LHAAP-001-R and -003-R.doc
ATT86632.png
ATT86633.png

Hi Rose,

The EPA has completed its review of the Draft Final Proposed Plan and Draft Public Notice for LHAAP 001-R and LHAAP-003-R and has no further comments.

Please continue with implementation of the proposed plan public comment period and meeting.

Thanks,

Stephen L. Tzhone
Superfund Remedial Project Manager
USEPA Region 6 (6SF-RA)
214.665.8409
tzhone.stephen@epa.gov

From: "Elliott, John" <John.Elliott@shawgrp.com>
To: Stephen Tzhone/R6/USEPA/US@EPA, "Fay.duke@tceq.texas.gov" <Fay.duke@tceq.texas.gov>
Cc: "Lambert, John R SWT" <John.R.Lambert@SWT03.usace.army.mil>, "Williams, Aaron K SWT" <Aaron.K.Williams@usace.army.mil>, "Mayila, Agnes" <Agnes.Mayila@shawgrp.com>
Date: 06/20/2011 12:56 PM
Subject: Draft Public Notice for LHAAP 001-R and LHAAP-003-R

Steve and Fay-

Attached please find the Draft Public Notice for LHAAP 001-R and LHAAP-003-R. Thank you.

John C. Elliott, PMP
Project Manager
Federal Services/Project Management
Shaw Environmental & Infrastructure Group
1401 Enclave Parkway, Suite 250
Houston, Texas 77077
281.531.3117 direct
713.201.4638 cell
281.531.3101 fax
john.elliott@shawgrp.com <mailto:sudhakar.matlapudi@shawgrp.com>

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cid:image001.png@01CC04AE.72E14BD0Please consider the environment before printing this e-mail.

From: "Elliott, John" <John.Elliott@shawgrp.com>
To: Stephen Tzhone/R6/USEPA/US@EPA, "Fay.duke@tceq.texas.gov" <Fay.duke@tceq.texas.gov>
Cc: "Zeiler, Rose Ms CIV USA OSA" <rose.zeiler@us.army.mil>, "Williams, Aaron K SWT" <Aaron.K.Williams@usace.army.mil>, "Lambert, John R SWT" <John.R.Lambert@SWT03.usace.army.mil>, "Mayila, Agnes" <Agnes.Mayila@shawgrp.com>
Date: 06/14/2011 12:56 PM
Subject: Draft Final Proposed Plan for LHAAP 001-R and LHAAP-003-R

____

Steve and Fay-

Attached please find the Draft Final Proposed Plan for LHAAP 001-R and LHAAP-003-R. Thank you.

John C. Elliott, PMP
Project Manager
Federal Services/Project Management
Shaw Environmental & Infrastructure Group
1401 Enclave Parkway, Suite 250
Houston, Texas 77077
281.531.3117 direct
713.201.4638 cell
281.531.3101 fax
john.elliott@shawgrp.com <mailto:sudhakar.matlapudi@shawgrp.com>

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cid:image001.png@01CC04AE.72E14BD0Please consider the environment before printing this e-mail.

<http://www.shawgrp.com/>

From: Fay Duke
To: Lambert, John R SWT; Rose Zeiler
Cc: Stephen Tzhone; Williams, Aaron K SWT
Subject: MEC Removal Action Report
Date: Thursday, September 10, 2009 10:18:44 AM

John indicated that I still owe you a response on the RTC for MEC Removal Action Report and I thought that I was waiting for your response. It took me a bit but I remember that on August 20, Rose (Aaron?) and I spoke about this but can recall if I follow up with an email or not. The responses to the comments are satisfactory. There were a couple of issue on the recordation language.

1. In the enumerated paragraphs "(1) No Digging Restriction . . ." is slightly confusing because it sounds like there is no restriction against digging. It should be changed to "(1) Restriction Against Digging"

2. Are the "circle" area represent the area for IC? The area of the "MMRP site" should be better define. The recordation must include the meets and bounds of the properties.

Please let me know if you should have any questions regarding this matter.

Kathleen Hartnett White, *Chairman*
Larry R. Soward, *Commissioner*
H. S. Buddy Garcia, *Commissioner*
Glenn Shankle, *Executive Director*

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

Protecting Texas by Reducing and Preventing Pollution

July 31, 2007

Ms. Rose Zeiler
Army / BRAC Site Manager
Longhorn Army Ammunition Plant
Post Office Box 220
Ratcliff, AR 72951

Re: Response to Comments to Draft Engineering Evaluation /Cost Analysis (EE/CA)
Longhorn Army Ammunition Plant (LHAAP)

Dear Ms. Zeiler:

The Texas Commission on Environmental Quality (TCEQ) has completed review of the responses to comments (RTC) to the Engineering Evaluation/Cost Analaysis (EE/CA) for the three Military Munitions Response Program (MMRP) sites at Longhorn Army Ammunition Plant (LHAAP). Although the RTC and the proposed revisions would adequately address most of the issues, there are a few remaining areas of concern as indicated in the enclosed review comments provided by the TCEQ munitions specialist contractor.

Many of our comments are related to the adequacy of the munitions explosives of concern (MEC) investigation. We acknowledge that with Army's recommended remedial alternatives of surface clearance of Sites LHAAP-27 and LHAAP-54 and subsurface clearance of the identified open detonation area at Site LHAAP-27 have lessened our concerns over the adequacy of the MEC investigation. The objective of these comments and others are intended to ensure accurate technical reporting of the characterization of these areas.

Finally, we concur with Army's recommended remedial alternatives for the three MMRP sites. However, we recommend that our comments concerning the process and rationale of the MEC investigation be incorporated into the EE/CA. If you have any questions or need additional information, please feel free to contact me at (512) 239-2443.

Sincerely,

Fay Duke, Project Manager
Team 2, Environmental Cleanup Section II
Remediation Division

Enclosure

cc: Mr. Stephen L. Tzhone, U. S. Environmental Protection Agency Region 6, Dallas, TX
Mr. Cliff Murray, U.S. Army Corps of Engineers, Tulsa, OK
Dr. Barry Forsythe, U.S. Fish and Wildlife Service, Dallas, TX
Mr. Paul Bruckwicki, U.S. Fish and Wildlife Service, Karnack, TX

P.O. Box 13087 • Austin, Texas 78711-3087 • 512-239-1000 • Internet address: www.tceq.state.tx.us

From: Fay Duke
To: Elliott, John; tzhone.stephen@epa.gov
Cc: Lambert, John R SWT; Mavila,Agnes; Williams, Aaron K SWT; Zeiler, Rose Ms CIV USA OSA
Subject: Re: Draft Final Proposed Plan for LHAAP 001-R and LHAAP-003-R
Date: Friday, June 24, 2011 6:54:53 PM
Attachments: ATT1721153.png

Rose,

The TCEQ has completed the review of the Revised MC Summary Report and concurs with the revisions.

We have also reviewed the public notice and Draft Final Proposed Plan for LHAAP-001-R and LHAAP-003-R and have one minor comment:

* page 11, it states under the Recommendation Section that the details of the LUCs are presented in the Land Use Control Plan provided as an Appendix to the Draft Final Site Specific Report for the MEC Removal Action...(EODT, 2009). Is this report still in draft form?
* We have no comments on the public notice.

Please let me know if you should any questions regarding these comments.

Fay Duke (MC-136)
Remediation Division, TCEQ
PO Box 13087
Austin, Texas 78711-3087

512-239-2443
512-239-2450 (Fax)

>>> On 6/14/2011 at 12:55 PM, <John.Elliott@shawgrp.com> wrote:

Steve and Fay-

Attached please find the Draft Final Proposed Plan for LHAAP 001-R and LHAAP-003-R. Thank you.

John C. Elliott, PMP

Project Manager

Federal Services/Project Management

Shaw Environmental & Infrastructure Group

1401 Enclave Parkway, Suite 250

Houston, Texas 77077

281.531.3117 direct

713.201.4638 cell

281.531.3101 fax

john.elliott@shawgrp.com <mailto:sudhakar.matlapudi@shawgrp.com>

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cid:image001.png@01CC04AE.72E14BD0Please consider the environment before printing this e-mail.

From: Fay Duke
To: Tzhone.Stephen@epamail.epa.gov; Williams, Aaron K SWT
Cc: Lambert, John R SWT; Rose Ms CIV USA OSA Zeller
Subject: Re: MMRP ROD (UNCLASSIFIED)
Date: Wednesday, September 28, 2011 10:13:37 AM

Aaron,

The TCEQ has completed its review of the revised Draft Final ROD for LHAAP-001-R and LHAAP-003-R and have no comments. Please send me a copy of the final ROD for the TCEQ concurrence.

Thanks, fd

Fay Duke (MC-136)
Remediation Division, TCEQ
PO Box 13087
Austin, Texas 78711-3087

512-239-2443
512-239-2450 (Fax)

>>> On 9/27/2011 at 4:16 PM, <Aaron.K.Williams@usace.army.mil> wrote:

Classification: UNCLASSIFIED
Caveats: NONE

Steve and Fay,

Please see attached revised MMRP ROD to address EPA and TCEQ comments.
Changes from the previous MMRP ROD are highlighted in yellow for your review.
We are proceeding with finalizing the MMRP ROD for signature.

Thanks,

Aaron K. Williams
Environmental Engineer, ARMY/FUDS Section
HTRW Design Center
Tulsa District
U.S. Army Corps of Engineers
918-669-4915

Classification: UNCLASSIFIED
Caveats: NONE

8

Serving You First

Groundwater Treatment Plant

Annual Evaluation Report
Calendar Year 2003

Longhorn Army Ammunition Plant
Site 18/24 & Site 16

Prepared By:
Complete Environmental Service
March 2004

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CHARTS and TABLES

APPENDIX

1.0 Purpose of Report

Complete Environmental Service (CES) operates and maintains the Longhorn Army Ammunition Plant (LHAAP) Groundwater Treatment Plant (GWTP), extraction wells at Site 16, and Interceptor Collection Trenches (ICTs) at Site 18/24. Contractual requirements include an annual evaluation of the performance of the GWTP and extraction systems at Site 18/24 and Site 16.

2.0 Comparison of Actual System Performance to Contractual and Regulatory Requirements

Contractual requirements for operation and maintenance of the groundwater treatment plant and wellfields include the following:

- Comply with all Waste Discharge Requirements and monitoring guidelines contained in the Record of Decision (ROD) for LHAAP;
- Minimize systems downtime through preventative maintenance of treatment systems; extraction systems, piping system, and rapid response to system shutdowns;
- Preparation of the final Operations and Maintenance Plan with maintenance schedule and other final versions of documents required by the contract;
- Engineering services for reporting and updating the Administrative Record; and
- Provide response service.

Each of the above items will be evaluated separately in the following sections.

2.1 Compliance with Waste Discharge Requirements and the Record of Decision

2.1.1 Treatment Effectiveness

The GWTP treatment process has been effective in the removal of volatile organics, metal, and perchlorate from the contaminated groundwater as required by the Record of Decision for LHAAP dated 1996.

The GWTP effluent had no excursions for volatile organic compounds or metals during the year.

None of the GWTP effluent grab samples collected during the year exceeded the effluent limitations of 13 ppb for perchlorate. During the year, several composite samples analyzed for perchlorate exceeded the daily average of 6 ppb, but not the 13 ppb daily maximum. The composite samples contained concentrations ranging from 8.45 to 10.5 ppb.

Three of the effluent composite samples that exceeded the daily average for perchlorate were collected during February 2003 when influent water temperatures to the Fluidized Bed Reactor (FBR) were fifty-two degrees Fahrenheit. Cold water temperatures inhibit the effectiveness of the FBR and the checked for leaks. The project was successful and ICT 13A now pumps a normal eight gallons per minute.

Site 16 Maintenance

- What can be described as routine maintenance consisted mainly of reworking pumps that had failed due to build up of scale on the moving parts of the pumps. This scale also affects the check valves in the discharge lines and occasionally blocks the pump discharge line. Several check valves had to be removed and cleaned. Throughout the quarter, water lines between some pumps and the well house repeatedly had to be cleaned out due to sediment and scale building up and blocking the pipes.

CES has developed a comprehensive database and spare parts inventory for maintenance parts that are practical to keep in stock. Parts that are not available locally or that routinely have to be replaced, such as pumps in the Site 18/24 wellfield, are kept in the spare parts inventory.

2.2 GWTP Operations and Maintenance Plan

An Operations and Maintenance Plan consisting of all written procedures, plans, permits, equipment database, spare parts inventory, etc., is maintained in a hard copy format at the GWTP as well as in a computer database. The database is updated throughout the year and distributed to the COE and Army Staff once per year.

Provided in Table2.2-1 is an abbreviated index to the "*ONSITE REMEDIATION SYSTEM OPERATIONS PLAN FOR GROUNDWATER TREATMENT PLANT AND WELLFIELDS*".

Table 2.2-1 Index of Onsite Remediation System Operations Plan

VOLUME I

- Annual Calendar
- Bacteriological Site Sampling Plan
- TNRCC Water Rules
- Installation Spill Contingency Plan Parts A & B
- Health & Safety Information
  - Onsite Health & Safety Plan
  - Material Safety Data Sheets
- RCRA Training Plan
- Staffing Plan
- Transition Training Plan
- Waste Analysis Plan
- Property Inventory
- Five-Year Review Documents
- Database Management Plan
- Reports
  - Annual Reports
  - Quarterly Reports
  - Quality Control Reports – FBR
  - Various Daily Construction Reports
  - Miscellaneous Meetings
  - Monthly Summary Report
  - Weekly Status Memos
- GWTP Sampling and Analysis Program
- Record of Decision
- Sampling and Analysis Records
  - Weekly Perchlorate
  - BiWeekly
  - Monthly Metals
  - Quarterly Influent
  - Quarterly Effluent
  - Quarterly FBR Samples
  - Quarterly Site 16
  - Semi-Annual Site 16
  - Semi-Annual ICT Wells
  - Semi-Annual Monitoring Wells
  - Special Analysis
  - Chain of Custody
- Harrison Bayou Discharge Calculations
  - Outfall calculation sheets
  - Open channel discharge sheets
- Monitoring Wells
  - Site 18&24 Contaminant Plume Maps
  - Sample Field Measurements & Purge Data
- Quarterly Inspections
- Weekly Flowmeter Inspections
- Chemical Data
  - Chemical Trends at GWTP
  - ICT Information
  - Monitoring Well Trends
- Groundwater Elevations
- Freeze Protection Plan

VOLUME II

- Air Monitoring Plan
- Electrical Callout Procedure
- Equipment Lists and Descriptions
- GWTP English Language Control Strategy
- PLC Operating Programs
- IC Procedure
- INF Pond Discharge Procedure

- Fluidized Bed Reactor
  - FBR Discharge Calculation Chart
  - Monitoring Program for FBR System
  - Nutrient Solution and Pump Settings
  - FBR Bed Sample Collection Procedure
  - FBR Drawings
  - FBR Reports
- Spare Parts Inventory
- Standing Operating Instructions
- Well Maintenance
- Potable Water Log
  - ICT Sump Information
  - PZ Total Depth

4.0 Proposals for Corrective Actions at GWTP and Associated Sites

4.1 Site 18/24

CES recommends the following changes at Site 18/24.

1) Add casings and bumper poles around piezometers PZ-1 through PZ-12 at Site 18/24. These are currently two-inch diameter PVC pipes stubbed up out of the ground at the site. The piezometers are utilized on a monthly basis to obtain groundwater levels. The piezometers are likely to be utilized on a long-term basis for measuring groundwater levels and they need to be protected.

2) Remove and plug monitoring well no. MW-101. The well screen is placed poorly and there is perched water in the well. The water does not correctly represent the plume in the area.

3) Install several monitoring wells on the NE side of Site 18/24. There are not enough monitoring wells to adequately address the extent of the plume past 18WW17.

4.2 Groundwater Treatment Plant

There are no changes at the GWTP that are absolutely necessary. However, CES recommends the following changes that would improve operations and maintenance at the GWTP.

1) Change Magnesium Hydroxide tank to a smaller tank. Currently the tank is an 8,000 gallon tank. The mixer in the tank is not designed correctly and lets the solids in the MgOH settle and plug the pipelines periodically. The tank needs to be reduced to about a 1,500 gallon tank that has a correctly designed mixer to keep solids suspended.
2) Install an automation loop to allow the plant PLC controller to automatically adjust the carbon donor pump based on online ORP measurements.
3) Install an improved air/fuel adjustment on the Cat-Ox. A system is available which will automatically adjust the flame in the Cat-Ox to ensure optimum fuel/air ratios.
4) Provide CatOx temperature readout on computer screen in plant office. Thermocouple wires are already run to the PLC-5 because the plant will not run unless the CatOx is up to temperature. Having the temperature readout will save the GWTP Operator from having to make many trips to the CatOx to monitor operations.

5) Install a chemical feed pump at the caustic tank and a pipeline to TK-630 to provide pH adjustment of TK-630 when required. At times the pH in TK-630 has to be adjusted to meet the chemical feed requirements for the FBR.

4.3 Site 16

There are no changes at Site 16 that are absolutely necessary. However, CES recommends the following changes that might improve overall performance of the extraction well system.

1) Due to the problem with fouling of pumps, pipelines, and checkvalves associated with the extraction wells, it is likely that well screens are beginning to foul. It may be helpful to inspect the well screens utilizing a submersible camera. If the well screens appear fouled, the wells should be cleaned using a surge pump. It may be helpful to perform a pump test prior to cleaning the screens and afterwards to measure improvement.

2) Provide a large air-compressor for the site. The air compressor at the site has difficulty keeping up with the demand for air during the summer.

No major maintenance had to be performed at the site. As usual, the "Hammerhead" pneumatic pumps routinely stop working due to a variety of problems such as scaling, which then inhibits pumping action. The pumps often just stop working for no apparent reason and routinely have to be removed, disassembled, cleaned and readjusted before placing back into service. Checkvalves in the pipelines and the 1.5 inch diameter line that delivers water to the 5,000 gallon holding tank routinely had to be cleaned out due to scale

The pumps require a minimum of four feet of water over the bottom inlet of the pump in order for the pump to actuate and remove water from the well. When groundwater is low, some of the wells as Site 16 do not produce enough water in the wells to actuate the pumps. Long-term operation of Site 16 may justify extraction pumps similar to Site 18/24.

Fluidized Bed Reactor	**Range**					
Carbon Bed Height	10-15 feet					
FIT1-3 Influent Feed Flow	15-50 GPM					
FIT-101 Influent Recycle Flow	200 gpm					
Recycle ORP	(-100 to -225)					
AIT-101 pH	6 to 8					
AIT-101 Temperature	50-80					
PI-103 (Before Pumps)	6 to 8					
PI-101 (After Pumps)	19 to 20					
P-175 Feed to FBR	Oil Level					
	PI-175 PSIG					
P-641/642 Effluent from FBR	Oil Level					
	PI-641/2 PSIG					
PI-106 Gauge on FBR	8-9 psi					

FilterCake Loading Site						
Hazardous Waste Rolloff Container						

Site 16 (Check Site Daily)						
Extraction Pump 1	Counter					
Extraction Pump 2	Counter					
Extraction Pump 3	Counter					
Extraction Pump 4	Counter					
Extraction Pump 5	Counter					
Extraction Pump 6	Counter					
Extraction Pump 7	Counter					
Extraction Pump 8	Counter					
Transfer Pump						
TK-700 Flowmeter	Gallons					

Tank Readings						
TK-140 Equalization Tank	LIT-141 - %					
TK-100 Caustic	LIT-100 - %					
TK-180 Magnesium Hydroxide	LIT-180 - %					
TK-300 Stripper Feed Tank	AE-360 - pH					
TK-630 Effluent Storage	AE-683 - pH					
TK-380 Acid Storage	LIT-380 - %					

Remarks

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MONITORING WELL INSPECTION CHECKLIST

LONGHORN ARMY AMMUNITION PLANT

INSPECTION FREQUENCY REQUIRED: Semi-Annual (Each Sampling Event)
DATE:____________________ **TIME:** ____________________

WELL No.: ________________

This inspection is required in accordance with the LHAAP RCRA Part B Hazardous Waste Permit Number 50195.

Directions: Indicate conditions as acceptable or unacceptable. Explain observations and the date and nature of any repairs or other corrective action.

	ACCEPTABLE	UNACCEPTABLE
OUTER CASING		
INNER CASING		
SLAB		
BUMPER POLES		
PAINT ON OUTER CASING		
WELL NUMBER LEGIBLE		
LOCKING CAP		
INNER CASING COVER CAP		
LOCK OR SEAL		
VEGETATION		
EROSION		
DEBRIS		
FIREANTS		

OBSERVATIONS:____

CORRECTIVE ACTION:____

INSPECTORS NAME AND TITLE:____

SAMPLING AND ANALYSIS PLAN
GROUNDWATER TREATMENT PLANT AND WELL FIELDS
LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS

Prepared for

U.S. Army Corps of Engineers
Tulsa District
1645 South 101st Avenue
Tulsa, Oklahoma

Prepared by

Shaw Environmental, Inc.
3010 Briarpark Suite 400
Houston, Texas 77042

Contract Number W912QR-04-D-0027, Task Order No. DS02
Shaw Project No. 117591

Revision 1
July 2007

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Table B-1 **(Appendix B)** lists container, preservation, and handling requirements for each parameter and Table B-2 **(Appendix B)** lists holding times.

2.4 LHAAP-16 Extraction Well Monitoring

Groundwater from the VEWs is fed directly into an equalization tank prior to treatment. Sampling of the groundwater after equalization but before treatment is performed in accordance with **Section 2.1**. GWTP influent sampling is also performed at the extraction points to identify the contributions of the constituents of concern from individual VEWs.

The groundwater is collected from dedicated sampling valves installed on the line in the LHAAP-16 pumphouse. The dedicated valves are between the pump and the equalization tank. The groundwater pumping is expected to be continuous and therefore the groundwater samples will be taken at approximately the same time each sampling event.

If the pumping is discontinued for any reason (i.e., the pump shuts down due to low water levels), the samples will not be taken until after at least two hours of pumping. Also, sampling will not occur until pH, temperature, and conductivity of water have stabilized. These parameters will be considered to be stabilized within approximately 10 percent over at least two consecutive measurements. The minimum volume of water removed between measurement sets is 20 gallons.

Sample containers will be filled directly from the dedicated sampling valve. A common container will not be used to fill sampling bottles. Sampling equipment and containers will be kept from contact with the floor or other materials that may have had contact with contaminants.

Samples of groundwater from the extraction units obtained for chemical analysis are taken in the following order:

- Field parameters (pH, conductivity, temperature, flow rate, and volume)
- Volatile organics
- Chloride
- Perchlorate

Table B-1 **(Appendix B)** lists container, preservation, and handling requirements for each parameter and Table B-2 **(Appendix B)** lists holding times.

2.5 Monitoring Well Monitoring

Open wells are monitoring wells that will not be fitted with dedicated purging and sampling equipment. They will be purged with a dedicated or disposable bailer or portable purging system. They will be sampled with disposable, Teflon® bailers or stainless steel dedicated bailers. The portable system typically consists of a submersible or purge pump and a discharge pipe. The purge pump will be operated by a portable generator. After purging is completed, the equipment will be removed from the well and cleaned thoroughly. Cleaning is to include decontamination in three separate consecutive cleaning tubs as follows:

1. The equipment will be washed with a phosphate-free detergent and nylon brush in distilled water in the first tub.
2. The equipment will be washed with distilled water and a nylon brush in the second tub.
3. Step two will be repeated.

For the purging pump and associated tubing, water from the above tubs will be pumped through these pieces of equipment and into waste drums prior to cleaning in the subsequent tubs. The bailers will be disposed of in a drum and will be treated as solid waste to be stored on site and the spent cleaning/purge water will be sent to the GWTP. Clean plastic sheeting is to be placed beneath all field sampling equipment in order to alleviate any contamination from the soil. The used sheeting will be disposed of in the same manner as personal protective equipment (PPE). Several monitoring wells have dedicated Well Wizard pumps and sampling equipment (i.e., sampling ports). In these cases, samples are obtained directly from the sampling ports after the required purging is completed and stabilization has been verified. Any non-dedicated equipment will be cleaned as discussed above.

2.5.1 Monitoring Well Inspection

Upon arrival at the wellhead during a sampling event, the Groundwater Monitoring Well Inspection Form **(Figure 2-2)** should be filled out completely for each well. The completed form should be returned to the GWTP office. The inspection forms will be reviewed to determine if the wells need maintenance. Shaw staff will perform routine maintenance of the well. If it is determined that the well needs significant repairs, the information will be reviewed with the CERCLA Army Project Manager to determine whether Shaw should take action to repair/replace the well.

Each groundwater monitoring well will be inspected as often as it is sampled and not less than once a year. The completed inspection forms will be on file at the GWTP office.

2.5.2 Measurement of Static Water Level Elevations in Monitoring Wells & Piezometers

Groundwater-monitoring wells at LHAAP have steel protective covers, which are secured with padlocks.

Before well evacuation and sampling is performed, the depth of the well and the static water level of the well are measured. Measurements are made from the notch in the top of the well

MONITORING WELL INSPECTION CHECKLIST

INSPECTION FREQUENCY REQUIRED: Each Sampling Event

DATE:____________________ **TIME:** ____________________

WELL No.: ________________

This inspection is required in accordance with the LHAAP RCRA Part B Hazardous Waste Permit Number 50195.

Directions: Indicate conditions as acceptable or unacceptable. Explain observations and the date and nature of any repairs or other corrective action.

	ACCEPTABLE	UNACCEPTABLE
OUTER CASING		
INNER CASING		
SLAB		
BUMPER POLES		
PAINT ON OUTER CASING		
WELL NUMBER LEGIBLE		
LOCKING CAP		
INNER CASING COVER CAP		
LOCK OR SEAL		
VEGETATION		
EROSION		
DEBRIS		
FIREANTS		

OBSERVATIONS:____

CORRECTIVE ACTION:____

INSPECTORS NAME AND TITLE:________________________________

Figure 2-2
Groundwater Monitoring Well Inspection Form

Final
Installation-Wide Work Plan
Longhorn Army Ammunition Plant
Karnack, Texas

Prepared for U.S. Army Corps of Engineers – Tulsa District
1645 South 101st East Avenue
Tulsa, Oklahoma 74128

Prepared by Shaw Environmental, Inc.
1401 Enclave Parkway, Suite 250
Houston, Texas 77077

Contract No. W912QR-04-D-0027, Task Order No. DS02
Project No. 117591

Revised
May 2011

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SHAW STANDARD OPERATING PROJECT PROCEDURE
LONGHORN ARMY AMMUNITION PLANT
ATTACHMENT 4
Subject: GROUNDWATER LEVEL MEASUREMENTS

1.0 PURPOSE AND SUMMARY

This Standard Operating Project Procedure (SOPP) establishes guidelines and procedures for use by field personnel in determining the groundwater level in monitoring wells.

Proper recording procedures are necessary to assure the quality and integrity of all groundwater level measurements. Prior to collecting groundwater levels, a strategy should be developed based on the objectives of the investigation.

The measurement of the ground water level in a well is frequently conducted in conjunction with ground water sampling to determine the "free" water surface. This potentiometric surface measurement can be used to establish ground water flow direction and gradients. Total well depth and ground water level measurements are needed to determine the volume of water in the well casing prior to purging the well for sampling purposes.

All ground water level and total depth measurements should be made relative to an established reference point on the well casing and should be documented in the field records. To be useful for establishing ground water gradient, the reference point should be tied in with the NGVD (National Geodetic Vertical Datum) or a local datum.

When measuring wells for water table or potentiometric surface analysis, and if the contaminant history is known for each of the wells, it is advisable to monitor water levels beginning with the least contaminated wells first and progressing to the most contaminated wells last, where practical.

Documents other than those required by the contract and consulted in the preparation of this SOPP are listed under "Cross Reference."

The details within this SOPP should be used in conjunction with the Work Plan which will generally provide the following information:

- Data collection objectives;
- Locations for data collection;
- Types of data to be collected; and
- Specific quality control (QC) procedures required.

2.0 TABLE OF CONTENTS

3.0 RESPONSIBILITY MATRIX

3.1 Site Manager

The Site Manager or Field Team Leader, is responsible for ensuring field activities are completed to meet the project objectives, are conducted in accordance with the project plans and requirements, and all activities are performed according to the respective procedures. The Site Manager is responsible for ensuring all site personnel are trained in the procedures, the procedures are adhered to, and all activities are documented.

3.2 Field Team

All members of the field team (samplers, technicians, field geologists, engineers, etc.) are responsible for understanding and implementing this field procedure as well as ensuring all team members also perform work in accordance with this procedure.

3.3 Site Contractor Quality Control Systems Manager (CQCSM)

The Site CQCSM is responsible for ensuring that this procedure is correctly implemented and that data collected meet the requirements of the Project Work Plan.

4.0 DEFINITIONS

Electronic Water Level Indicator. This instrument consists of a spool of dual wire, a probe attached to the end, and an indicator. When the probe comes in contact with the water, the circuit is closed and a meter light and/or buzzer attached to the spool will signal the contact. Penlight or 9-volt batteries are normally used as a power source. Measurements should be made and recorded to the nearest 0.01 foot.

5.0 TEXT

5.1 Required Records And Forms

1. Field Activity Daily Log (FADL)
2. Instrument operation manual.

5.2 Required Materials, Equipment, Or Supplies

1. Indelible black-ink pens and markers
2. Personal protective clothing and gear
3. Gloves, nitrile
4. Keys for locking well caps
5. Paper towels
6. Radio, two-way, hand held or cellular phone
7. Safety glasses
8. Appropriate equipment and meters for obtaining field measurements as specified in the Work Plan (i.e., water quality)
9. Linear measuring device (e.g., tape measure)
10. Electronic water indicator (appropriate length)
11. Organic vapor analyzer (FID/PID).

The equipment must be capable of recording a measurement to the accuracy required by the Work Plan. Project data quality objectives and site characteristics must be taken into account when determining the groundwater level measurement equipment to use. The total number of wells to be measured, weather, tidal influences, pumping, and construction can all affect water level measurements.

5.3 General Requirements

Operation manuals provide operation and calibration procedures to be followed. Several standard steps should be taken before beginning any depth measurement of groundwater level measurement activity is performed.

1. Verify that all personnel have read and understood the approved site-specific health and safety plan and have the proper training and certifications required under OSHA.

2. Verify the site location by existing maps and surface features. Mark off the boundaries of the work site with flagging or other means to prohibit access to unauthorized personnel.

3. Check to see that all the necessary equipment (including PPE) is available at the site, is in good working condition, and has been properly decontaminated.

4. Check that all monitoring equipment is properly calibrated and operating. Measuring tapes should be checked a minimum of every six months against a surveyor's tape to determine if shrinking or stretching has occurred.

5. Visually inspect the well to ensure that it is undamaged, properly labeled and secured. Any damage or problems with the well head should be noted on the FADL and the site manager notified for repair or replacement of the equipment.

6. Uncap the well and monitor the air space for organic vapors immediately above the open casing with an FID/PID. (Observe if any air is flowing into or out of the casing. In the event such conditions are observed, they should be noted on the

FADL. If air is observed to be entering or flowing out of the casing, the sounder should not be placed inside the well until the air flow stops and pressure equalizes.

5.4 Specific Requirements

The specific procedure for determining groundwater level using an electronic water level indicator is described below.

1. Lower the electronic water level indicator into the well until the water surface is encountered as indicated by an audible (beep) or visual (light) signal.

2. When the water surface is reached, give the tape a short, sharp jerk to ensure that the probe is not responding to condensation along the well casing.

3. Measure the distance from the water surface to the permanent reference point. For aboveground "stickup" completions, the reference point is usually a groove cut into the north side of the casing. If no permanent reference point is available for an aboveground completion, measure from another permanently fixed structure or from ground level. The point of measurement should then be noted on the FADL and the appropriate form on which the water level is recorded. For flush mount completions, such as street boxes, the groundwater level measurement should be referenced to a steel grate placed across the rim of the street box and over the casing. Any aboveground completions without permanent reference points or marks should be brought to the attention of the appropriate supervisory personnel.

4. Collect measurements until two consecutive measurements are identical or within the specified tolerance (usually 0.01 ft). Record all appropriate information on the FADL. At a minimum, the following information must be recorded:

   - project name and number;
   - unique well identification number;
   - date and time of measurement collection;
   - depth to water to the specified tolerance;
   - weather conditions; and any problems encountered.

5. Once the water level measurement is completed, turn the device in the off position and slowly lower the probe to the bottom of the well to sound the depth. Record the depth to the bottom of the well to the nearest 0.01 feet and document the bottom condition (i.e., soft, silty, hard).

6. Cap and relock the well.

7. Perform all equipment decontamination procedures as specified in the field procedures in Attachment 9 of Appendix D. Measuring **equipment must be decontaminated** prior to utilizing for well measurements.

5.5 Records

All information will be recorded on a FADL for the subject site. The FADL entries will be recorded chronologically and the time of the entry recorded first. All FADL continuation pages will be sequentially numbered and the last page recorded for the day will be signed and dated by the recording technician. Records generated as a result of this SOPP will be controlled and maintained in the project record files.

6.0 EXCEPTION PROVISIONS

None.

7.0 CROSS REFERENCE

Annual Book of ASTM Standards, 1987 *Test Method for Determining Subsurface Liquid Levels in a Borehole or Monitoring Well (Observation Well)*, D4750.

EPA, 1996, *Environmental Investigations Standard Operating Procedures and Quality Assurance Manual*, Region 4, Athens, GA.

EPA, 1986, *RCRA Groundwater Monitoring Technical Enforcement Guidance Document*, OSWER-9950.1, U.S. Government Printing Office, Washington, D.C.

U.S. Army Corp of Engineers, 1998, *Monitoring Well Design, Installation, and Documentation at Hazardous, Toxic, and Radioactive Waste Sites*, EM 1110-1-4000.

8.0 TABLES

None

9.0 ATTACHMENTS

None.

Path Forward on LHAAP 2008 5-Year Review Recommendations for LHAAP-12, -16, and -18/24

Site(s)	Issue[1]	Recommendations/ Follow-up Actions[1]	Party Responsible[1,2]	Oversight Agency[1]	Milestone Date[1]	Path Forward/Status
18/24	Perchlorate has occasional effluent results that exceed the discharge limit.	Evaluate means of reducing reporting time for perchlorate analyses for GWTP.	U.S. Army	State/USEPA	12/31/08	Based on efforts by Shaw Chemist, Shaw has found that on-site analysis is impractical. Shaw has arranged for the analytical laboratory to immediately flag any high effluent perchlorate results (results that exceed the discharge criteria) and report them to Shaw on a preliminary basis.
18/24	Vegetation growing in fence line around the site	Cut vegetation in fence line.	U.S. Army	State/USEPA	12/31/08	Shaw's on-site personnel are addressing this issue. Vegetation removal activities were initiated in December 2008 and are expected to be completed by the end of February 2009.
16 & 18/24	No groundwater use restrictions are in place	Address as part of final remedy implementation of each site.	U.S. Army	State/USEPA	To be determined in site-specific RI/FS documents	Groundwater use restrictions will be addressed as part of the final remedy for each site. Final remedies will be determined via the CERCLA RI/FS/PP/ROD process. The LHAAP-16 FS Addendum and the LHAAP-18/24 FS are currently in preparation.
18/24	Metal precipitation process may not be required	Evaluate need for process and associated sampling.	U.S. Army	State/USEPA	12/31/08	Based on review of historical data, influent metal concentrations sometimes exceed discharge criteria. Shaw is now evaluating the basis of the discharge criteria and expects to complete this action by the end of February 2009.
18/24	Contamination at Northwest of Burning Ground	Address as part of final remedy implementation of the site.	U.S. Army	State/USEPA	Per LHAAP-18/24 RI/FS schedule	Contamination northwest of the Burning Ground will be addressed in the LHAAP-18/24 FS. That FS is currently in preparation.
18/24	Eight extraction wells were not installed.	Issue ESD to delete extraction wells from interim remedy	U.S. Army	USEPA	6/30/09	Based on previous discussion between USEPA and U.S. Army, an ESD will be prepared.
16	Need operation and maintenance plan	Prepare O&M Plan for the landfill.	U.S. Army	State/USEPA	12/31/08	Required O&M activities for the LHAAP-16 Landfill were identified in Part VI of the Early Interim Remedial Action Design. Shaw has expanded on that general guidance by preparing a checklist for landfill inspection. Both Part VI of the Early Interim Remedial Action Design and the checklist are attached.
16	Groundwater monitoring (chemical sampling and water levels) not conducted regularly or documented properly	Implement regular groundwater monitoring program.	U.S. Army	State/USEPA	12/31/08	Selected monitoring wells in the shallow, intermediate, and upper deep zones at LHAAP-16 will be sampled on the same semi-annual schedule as the groundwater sampling that is performed at LHAAP-18/24. The next sampling event is scheduled for March 2009.

Site(s)	Issue[1]	Recommendations/ Follow-up Actions[1]	Party Responsible[1,2]	Oversight Agency[1]	Milestone Date[1]	Path Forward/Status
12 & 16	Some minor erosion and unwanted vegetation on landfill caps	Repair erosion and remove small pine trees.	U.S. Army	State/USEPA	12/31/08	The pine trees were sprayed with herbicide in December 2008. The caps will be rechecked for pine trees in April 2009 and sprayed again as needed. Erosion locations will be flagged, repaired with clean fill, and seeded in April 2009.
16 & 18/24	Age and condition of piezometers	Inspect condition of piezometers during monitoring activities and, when applicable, identify for repair, replacement or abandonment	U.S. Army	State/USEPA	12/31/08	Shaw will check the current total depth of the piezometers at LHAAP-16 and -18/24 in February 2009. The current depths will be compared to initial total depths to determine if the piezometers are silted up. Any piezometers that are silted up will no longer be used for groundwater elevation measurements.

Notes:

1. *Text in the second through sixth columns was taken directly from Table 9-1 of the Final Five-Year Review Report (Shaw, 2008).*
2. *The U.S. Army is responsible for implementation of remedial activities at LHAAP. Those activities are typically executed by companies contracted to the U.S. Army. Currently, most contracted functions are performed by Shaw Environmental, Inc.*

LHAAP 12 AND 16 LANDFILLS
LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS

EARLY INTERIM REMEDIAL ACTION DESIGN
PRELIMINARY

JULY 1995

PREPARED BY

U.S. ARMY CORPS OF ENGINEERS
TULSA DISTRICT

PART VI - OPERATIONS AND MAINTENANCE.

1. Inspection and Maintenance. The multilayer cap and cover for the LHAAP 12 and 16 landfills shall be inspected once a month or immediately following a heavy rainfall event for the first 6 months after construction of the cap is complete. Following the 6 month anniversary of construction completion, the cap will be inspected once every 6 months. The cap will be inspected for signs of rodent activities, deep rooted vegetation, erosion, or excessive settlement. Any cracks, tunnels, cavities, depressions, or gullies shall be repaired immediately to as-built conditions. Grasses shall be replaced where lost. Regular maintenance of the cap is limited to mowing the vegetation twice a year or whenever deemed necessary to control the growth of brush and woody vegetation.

2. Annual Report. An annual report shall be developed to describe any deficiencies noted in the cap during inspections and actions taken to correct the deficiencies.

LHAAP-16: Old Landfill
Longhorn Army Ammunition Plant
Karnack, Texas

Sl. No.	Item	Findings/Existing Conditions	Action Needed?	Action Performed (Duration)
1	Condition of Access Road			
2	Site Fencing and Signage			
3	Evidence of Trespassers?			
4	Inspection of Erosion Control Measures			
5	Inspection of Drainage Culverts and Pipes			
6	Drainage Channel/Ditches			
7	Erosion Damage			
8	Status of Cover Vegetation? Bare Spots, Dead Grass, etc.			
9	Presence of Tree Seedlings, Kudzu, etc.?			
10	Height of Vegetation			
11	Inspect Monitoring Wells Surrounding Site			
12	Note Any Changes to Land Use			

Name of Site Inspected:
Weather Conditions:
Signature:

Date of Inspection:
Name/Organization: Shaw Environmental

Section C - Descriptions and Specifications

PERFORMANCE WORK STATEMENT

REVISED

PERFORMANCE WORK STATEMENT (PWS)

Performance-Based Task Order

Remediation of Multiple Sites,
Longhorn Army Ammunition Plant, Karnack, Texas

W912DY-09-D-0059

Worldwide Environmental Remediation Services (WERS)
Unrestricted Business Class

~~October 18, 2011~~
January 18, 2012

3.0 Performance Objectives and Standards

The Contractor shall be required to furnish all plant, supervision, labor, materials and equipment necessary to meet the performance objectives and standards identified in Table 1 below.

Table 1: Firm Fixed Price Performance Objectives Summary

CLIN	*Performance Objective*	*Performance Standards*
0001	Approved Project Management Plan (PMP) and Quality Assurance Surveillance Plan (QASP): • Draft PMP and QASP within 30 calendar days of contract award, • Final PMP within 20 calendar days of receipt of COR comments on the draft.	Government approval through the Contracting Officer's Representative (COR).
0002	Achieve Remedy in Place (RIP) at the following sites by 30 September 2013 LHAAP-03 LHAAP-16 LHAAP-17 LHAAP-37 LHAAP-46 LHAAP-50 LHAAP-58 LHAAP-67 Upon achievement of RIP, perform Remedial Action (Operations) (RA(O)) at the above sites for the duration of the contract or until achievement of Response Complete (RC), whichever comes first. Upon achievement of RC, perform any necessary Long-Term Management (LTM) at the above sites for the duration of the contract or until achievement of Site Close-Out (SC), whichever comes first.	Compliance with FFA and associated schedule Government approval through the COR and Regulatory approval/concurrence as applicable (e.g., RA(O)/LTM exit or ramp down strategy; RA(O)/LTM reports incorporating requirements of the exit or ramp down strategy).

Attachment D: Definitions

Activity-Based Schedule: Activities and milestones defined at the detail level and logically sequenced to support, and manage completion of the performance objectives.

Chemical Warfare Materiel (CWM): An item configured as a munitions containing a chemical substance that is intended to kill, seriously injure, or incapacitate a person through its physiological effects. CWM also includes V- and G- services nerve agent, H-series blister agent, and lewisite in other than munitions configurations. Due to their hazards, prevalence, and military-unique application, Chemical Agent Identification Sets (CAIS) are also considered CWM. CWM does not include riot control agency, chemical herbicides, smoke and flame producing items, or soil, water, debris, or other media contaminated with chemical agent.

Deliverables: Documentation or data that support the completion of milestones or achievement of the performance objectives identified in this PWS.

Discarded Military Munitions (DMM) – Military munitions that have been abandoned without proper disposal or removed from storage in a military magazine or other storage area for the purpose of disposal. The term does not include unexploded ordnance, military munitions that are being held for future use or planned disposal, or military munitions that have been properly disposed of consistent with applicable environmental laws and regulations.

Explosive Ordnance Disposal (EOD) – The detection, identification, on-site evaluation, rendering safe, recovery, and final disposal of unexploded explosive ordnance. It may also include explosive ordnance that has become hazardous by damage or deterioration.

Long-Term Management (LTM): The remedial phase including maintenance, monitoring, record keeping, remedy reviews, etc. initiated after response (removal or remedial) objectives have been met (i.e., after Response Complete). LTM includes development and implementation of an exit or ramp-down strategy for LTM activities at each site.

Milestones: Significant events or activities that occur in the course of the Contractor achieving the performance objectives identified in this PWS.

Military Munitions (MM) – All ammunition products and components produced or used by or for the DoD or the U.S. Armed Services for national defense and security, including MM under the control of the DoD, the U.S. Coast Guard, the U.S. Department of Energy, and National Guard personnel. The term military munitions includes: confined gaseous, liquid, and solid propellants, explosives, pyrotechnics, chemical and riot control agents, smokes, and incendiaries used by DoD components, including bulk explosives and chemical warfare agents, chemical munitions, rockets, guided and ballistic missiles, bombs, warheads, mortar rounds, artillery ammunition, small arms ammunition, grenades, mines, torpedoes, depth charges, cluster munitions and dispensers, demolition charges, and devices and components thereof. MM do not include wholly inert items, improvised explosive devices, and nuclear weapons, nuclear devices, and nuclear components thereof. However, the term does include non-nuclear components of nuclear devices, managed under DOE's nuclear weapons program, after all required sanitization operations under the Atomic Energy Act of 1954, as amended, have been completed.

Munitions Constituents (MC): Any materials originating from unexploded ordnance, DMM, or other military munitions, including explosive and non-explosive materials, and emission, degradation, or breakdown elements of such ordnance or munitions.

AKO Webmail (3A)

Welcome Zeiler, Ros

Inbox **Work Plan for ...** **Longhorn GWTP ...**

Reply Forward Move Print Delete Spam

Quota: 76% of 1024.0MB

rose.zeiler@us.army.mi

Inbox (884)

Trash (3)

Sent (4)

Drafts (1)

Spam

AEC

This email has been blocked from loading remote images.

Subject: **Longhorn GWTP Weekly Summary 03/29/13**

To: "Lanier, Wendy SWT" , "Lambert, John R SWT" , "Williams, Aaron K SWT" , "Zeiler,

Cc: "McDonnell, Gretchen" , "Salameh, Marwan" , "Joshi, Manish" , "Miller, Josh" , "Cou

image001.png (5kB)

Good morning,

The weekly summary for this week is below. We are separately working the r
Wendy and will be responding to that later today. We also initiated completi
applicable week to be able to deliver each weeks on Friday.

Please let me know if you have questions.

Friday (3/22/13)

Discharged 19,176 gallons of treated effluent to Harrison Bayou

Performed daily checks at Site 16

Performed chloride & sulfate analysis on treated effluent from TK-650

Collected velocity readings from Harrison Bayou

Completed Site 16 & Site 12 maps for Adam Wosneski

Mail 892

Calendar

Address Book

Options

Good morning,

The weekly summary for this week is below. We are separately working the materials balance question that came from Wendy and will be responding to that later today. We also initiated completing this weekly through Thursday of the applicable week to be able to deliver each weeks on Friday.

Please let me know if you have questions.

Friday (3/22/13)

Discharged 19,176 gallons of treated effluent to Harrison Bayou

Performed daily checks at Site 16

Performed chloride & sulfate analysis on treated effluent from TK-650

Collected velocity readings from Harrison Bayou

Completed Site 16 & Site 12 maps for Adam Wosneski

Inspected bridges in Site 50 for Gretchen McDonnell & Eva Moore

Installed new locking well caps and locks on 20 piezometers wells at Site 16

Installed new locking well caps and locks on 11 piezometers wells at Site 18/24

AECOM personnel on site: Glenn Hilton & Jason Garrett completing LHAAP-18/24 PSI work

ETTL personnel on site: Billy Ragon, Nathan Bueche, Brandt Meyer, Derek Runnels & Johnathon Hart

AECOM rental equipment: Case 650 Bulldozer

ETTL rental equipment: Skytrack Forklift

Monday (03/25/13)

Operated the GWTP for 10.75 hours: Processed 114,854 gallons from TK-140, discharged 20,858 gallons of treated effluent to Site Harrison Bayou

Collected 3 air samples: 1 - 6 liter summa canister from air stripper discharge line, 1 – 6 liter summa canister 8 hour composite from outside GWTP office, 1 – 6 liter summa canister 24 hour composite from downwind of GWTP

Performed daily checks at Site 16

Performed chloride & sulfate analysis on treated effluent from TK-650

Collected velocity readings from Harrison Bayou

Checked all monitoring wells at Site 18/24 for non-functioning locks and replaced any that were found

Checked all monitoring wells in Site 16 for non-functioning locks and replaced any that were found

Worked on repairing belt filter press waiting on repair parts

Mowed the grass around GWTP

AECOM personnel on site today: Glenn Hilton, Jason Garrett & Ray Castillo

ETTL personnel on site today: Johnathon Hart, Nathan Bueche, Brandt Meyer, Billy Ragon & Derek Runnels

AECOM rental equipment: Case 650 Bulldozer

ETTL rental equipment: Skytrack Forklift

Tuesday (03/26/13)

Discharged 8,550 gallons of treated effluent to Harrison Bayou

Performed daily checks at Site 16

Performed chloride & sulfate analysis on treated effluent from TK-650

Collected velocity readings from Harrison Bayou

Cleared around additional monitoring wells at Site 16 using the bulldozer

Cleaned around additional monitoring wells at Site 16 using weed eater and chainsaw

Repaired a leaking safety shower at truck unloading station

Pumped sludge from clarifier to settling tanks and washed down inside of clarifier

Replaced signs that fell off fence at Landfill 16

Received a truck load of 35% Sodium Hydroxide: 45,000 lbs, approximately 3,750 gallons

AECOM personnel on site: Glenn Hilton, Jason Garrett & Ray Castillo

ETTL personnel on site: Billy Ragon, Nathan Bueche, Brandt Meyer, Derek Runnels, & Johnathon Hart

AECOM rental equipment: Case 650 Bulldozer

ETTL rental equipment: Skytrack Forklift

Wednesday (03/27/13)

Discharged 16,691 gallons of treated effluent to Harrison Bayou

Performed daily checks at Site 16

Performed chloride & sulfate analysis on treated effluent from TK-650

Collected velocity readings from Harrison Bayou

Repaired the FBV-514 dump valve on TK-510A

Mowed grass around Army trailer and behind conexes

Stenciled well I.D.'s on monitoring wells that had been painted in Site 18/24

Repaired high level switches on TK-200A & TK-200C

Cut some trees off of the fence line at Site 18/24

Replaced low level probe on ICT 14D, pump was short cycling

AECOM personnel on site: Glenn Hilton, Jason Garrett & Ray Castillo

ETTL personnel on site: Billy Ragon, Johnathon Hart, Nathan Bueche, Brandt Meyer & Derek Runnels

AECOM rental equipment: Case 650 Bulldozer

ETTL rental equipment: Skytrack Forklift

Thursday (03/28/13)

Operated GWTP for 5.5 hours: Processed 61,118 gallons from TK-140, discharged 12,668 gallons of treated effluent to Harrison Bayou

Performed chloride & sulfate analysis on treated effluent from TK-650

Collected velocity readings in Harrison Bayou

Performed daily checks at Site 16

Cleaned up debris and unnecessary items from inside GWTP

Power washed entire floor area of GWTP

Removed safety shield from around sodium hydroxide feed pump, removed all broken lexane and screws, wire brushed the metal frame and painted with rust inhibitor

Coated rusted conduit around HCL storage tank with rust inhibitor

Met with Matt Munden to get a quote on culvert installation in Harrison Bayou for new monitoring well installation

SWS Environmental delivered another roll-off to Site 18/24 for drilling activities

Parts for belt filter press were received and will be installed tomorrow

Ron Huff on site to work on repairing phone lines to GWTP

AECOM Personnel on site: Glenn Hilton, Jason Garrett

ETTL personnel on site: Billy Ragon, Nathan Bueche, Brandt Meyer, Derek Runnels, Daniel Holland & Johnathon Hart

AECOM rental equipment: Case 650 Bulldozer

ETTL rental equipment: Skytrack Forklift

v/r,

Dave Wacker
AECOM - Environment
112 East Pecan, #400
San Antonio, TX 78205
210.253.7514 office
217.390.3736 mobile

AECOM

From: Wacker, Dave
Sent: Friday, March 22, 2013 8:44 AM
To: 'Lanier, Wendy SWT'; 'Lambert, John R SWT'; 'Williams, Aaron K SWT'; 'Zeiler, Rose Ms CIV USA OSA'; 'Plitnik, Marilyn CIV USA IMCOM AEC'; 'Paul, Robin E CIV US'

Cc: McDonnell, Gretchen; Salameh, Marwan; Joshi, Manish; Miller, Josh; Coulombe, Donald
Subject: Longhorn GWTP Weekly Summary 03/22/13

Hello,

The weekly summary is below. Please let me know if you have questions.

Monday (03/18/13)

- Operated GWTP for 11.5 hours: Processed 107,220 gallons from TK-140, discharged 21,593 gallons of treated effluent to Site Harrison Bayou
- Collected 3 air samples: 1 - 6 liter summa canister from the air stripper discharge line, 1 – 6 liter summa canister 8 hour composite from outside the GWTP office, and 1 – 6 liter summa canister 24 hour composite from downwind of the GWTP
- Performed daily checks at Site 16
- Performed chloride & sulfate analysis on treated effluent from TK-650
- Collected velocity readings from Harrison Bayou
- Mixed a new batch of nutrient for FBR
- Repaired a broken 1" PVC line at the potable water pump house
- Worked on re-aligning the belts on the filter press
- Additional AECOM personnel on site to support drilling and O&M today: Glenn Hilton, Bill Gabehart & Ray Castillo
- ETTL drilling personnel on site today: Jonathon Hart, Cody Longino, Nathan Bueche, Rich Herman & Brandt Meyer
- AECOM rental equipment: Case 650 Bulldozer
- ETTL rental equipment: Skytrack Forklift

Tuesday (03/19/13)

- Discharged 14,703 gallons of treated effluent to Harrison Bayou
- Performed daily checks at Site 16
- Performed chloride & sulfate analysis on treated effluent from TK-650 & INF Pond water
- Collected velocity readings in Harrison Bayou
- Repaired a broken ½" nipple on ICT 14D
- Lowered High level probe 1 ft. in ICT 8 to allow it to pump more water to GWTP
- Power washed, painted and re-numbered multiple monitoring wells at Site 18/24
- Re-aligned the belts on the filter press

- Washed down floor of the GWTP containment area and also performed housekeeping in GWTP offices and general areas
- Painted metal enclosures around the polymer system in GWTP
- AECOM personnel on site: Glenn Hilton, Bill Gabehart & Ray Castillo
- ETTL personnel on site: Billy Ragon, Nathan Bueche, Brandt Meyer, Derek Runnels, Tommy Cook, Mark Callem & Johnathon Hart
- AECOM rental equipment: Case 650 Bulldozer
- ETTL rental equipment: Skytrack Forklift
- Telephone repairman (Ron Huff) was on site this evening to work on repairing main phone lines to GWTP

Wednesday (03/20/13)

- Discharged 15,440 gallons of treated effluent to Harrison Bayou
- Performed daily checks at Site 16
- Performed chloride & sulfate analysis on treated effluent from TK-650 & INF pond water
- Collected velocity readings in Harrison Bayou
- Removed fallen dead tree from fence line at Landfill 12
- Repaired broken barbed wire fence at Landfill 12 where the tree fell
- Removed brush and small trees from around all phone pedestals leading to GWTP to provide access for the telephone repairman to work on damaged (burned) phone lines
- Removed all cleaned and washed empty acetic acid drums from inside the containment wall to the storage area located behind equipment Connex
- AECOM personnel on site: Glenn Hilton, Jason Garrett & Ray Castillo
- ETTL personnel on site: Billy Ragon, Johnathon Hart, Nathan Bueche, Brandt Meyer & Derek Runnels
- AECOM rental equipment: Case 650 Bulldozer
- ETTL rental equipment: Skytrack Forklift
- Telephone repairman (Ron Huff) was on site this evening continuing to work on repairing the main phone lines to GWTP

Thursday (03/21/13)

- Operated GWTP for 7.75 hours: Processed 85,038 gallons from TK-140, discharged 17,148 gallons of treated effluent to Harrison Bayou
- Performed chloride & sulfate analysis on treated effluent from TK-650 & INF pond water

- Collected velocity readings in Harrison Bayou
- Performed daily checks at Site 16
- Ray W. operated bulldozer to repair roads leading into new well sites; 18CPT17 & 18 CPT18 as well as assisted with repairing new well sites at Glenn Hilton's request
- Provided temporary plastic bag covers for telephone pedestals to prevent rain from entering them
- Performed weed removal from around GWTP and GWTP office using powered equipment
- Installed "Buried Cable" signs at all junction boxes where GWTP PLC cable is buried and where the GWTP PLC cable was buried at Site 16
- Repaired phone line connections to conference phone inside Army trailer
- Updated the Site 16 map; provided marking to indicate power line poles, tanks, etc. as requested by Adam Wosneski
- AECOM personnel on site: Glenn Hilton, Jason Garrett & Ray Castillo
- World Environmental personnel on site supporting audit prep: Mike Ishee & Christal Whaley
- ETTL personnel on site: Billy Ragon, Nathan Bueche, Brandt Meyer, Derek Runnels & Johnathon Hart
- AECOM rental equipment: Case 650 Bulldozer
- ETTL rental equipment: Skytrack Forklift

v/r,

Dave Wacker
AECOM - Environment
112 East Pecan, #400
San Antonio, TX 78205
210.253.7514 office
217.390.3736 mobile

AECOM

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FINAL
PROPOSED PLAN
FOR
LHAAP-16

ISSUED BY: U.S. ARMY

Longhorn Army Ammunition Plant
Karnack, Texas

September 2010

INTRODUCTION

The purpose of this Proposed Plan is to present for public review the Preferred Remedial Alternative for LHAAP-16, also known as the Old Landfill. LHAAP-16 is a capped landfill of approximately 20 acres in size and is located in the south-central part of the Longhorn Army Ammunition Plant (LHAAP) in central-east Texas. This plan includes summaries of other potential remedial alternatives evaluated for implementation at the site. The primary purpose of the Proposed Plan is to facilitate public involvement in the remedy selection process. The Proposed Plan provides the public with basic background information about LHAAP-16, identifies the preferred final remedy for potential threats posed by the chemical contamination at the site, explains the rationale for the preference, and describes other remedial options that were considered. The preferred alternative for LHAAP-16 is Alternative 7: maintenance of existing landfill cap; land use controls (LUCs); in situ enhanced bioremediation; passive biobarriers; and monitored natural attenuation (MNA).

The U.S. Army is issuing this Proposed Plan for public review, comment, and participation to fulfill part of its public participation responsibilities under Sections 117(a) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980 as amended by the Superfund Amendments and Reauthorization Act of 1986, and under Section 300.430(f)(2) of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). The CERCLA prescribes a step-wise progression of activities to respond to risk posed by contaminated sites **(Figure 1)**.

The preparation and review of a Proposed Plan is a distinct step required by CERCLA. This Proposed Plan summarizes information that can be found in greater detail in the Remedial Investigation (RI) Report, the Feasibility Study (FS) Report, the Addendum to the FS Report (which includes the Natural Attenuation Evaluation Report), the Baseline Human Health Risk Assessment (BHHRA), the Installation-Wide Baseline Ecological Risk Assessment (BERA), and other supporting documents that are contained in the Administrative Record for LHAAP-16 that is publicly available in the Marshall Public Library. The project management team, including the U.S. Army, U.S. Environmental Protection

Dates to remember: October 10, 2010, to November 8, 2010
MARK YOUR CALENDER

PUBLIC COMMENT PERIOD:
October 10, 2010, to November 8, 2010
The U.S. Army will accept written comments on the Proposed Plan during the public comment period.

PUBLIC MEETING: The U.S. Army will hold a public meeting to explain the Proposed Plan for LHAAP-16. Oral and written comments will be accepted at the meeting. The meeting will be held on October 19, 2010, from 7:00 p.m. to 9.00 p.m. at the Caddo Lake State Park Group Recreation Hall Center.

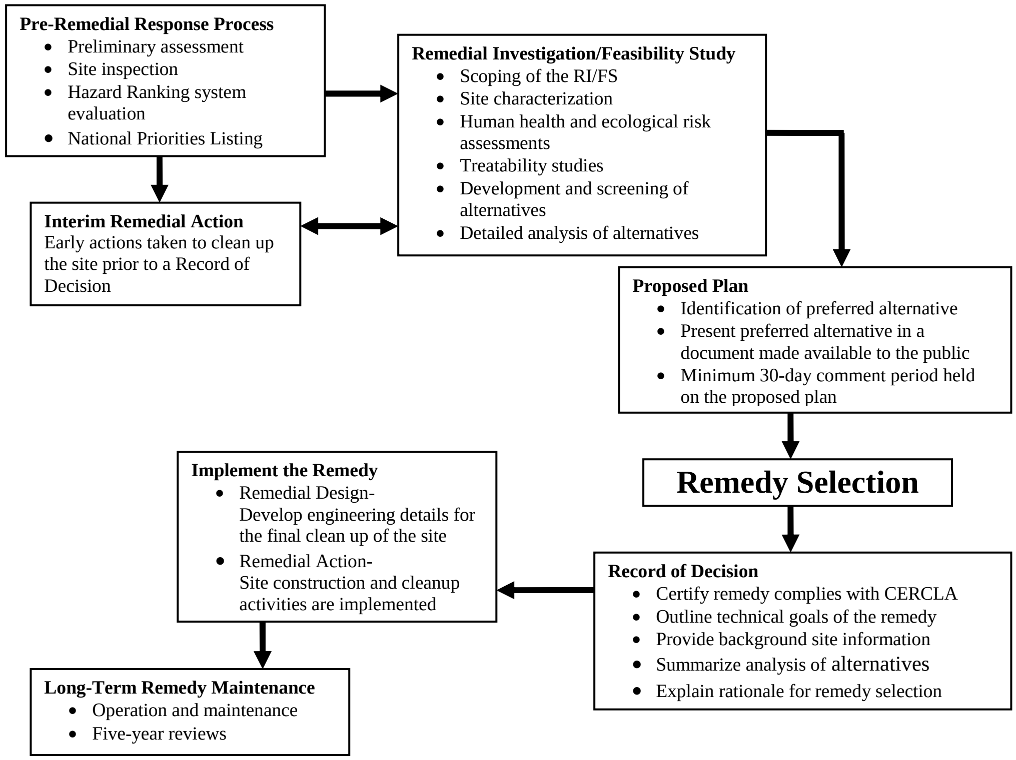
For more information, see the Administrative Record at the following location:

Marshall Public Library
300 S. Alamo
Marshall, Texas 75670

Business Hours:
Monday – Thursday (10:00 a.m. – 8:00 p.m.)

For further information on LHAAP-16, please contact:
Dr. Rose M. Zeiler
Site Manager
Longhorn Army Ammunition Plant
P.O. Box 220
Ratcliff, Arkansas 72951
Phone No.: 903-679-3192
Direct No.: 479-635-0110
E-mail address: rose.zeiler@us.army.mil

Figure 1. CERCLA Remedial Response Process for Site Cleanup



Agency (USEPA), and the Texas Commission on Environmental Quality (TCEQ), encourages the public to review these documents and to review and comment on the alternatives presented in this Proposed Plan.

The U.S. Army is acting in partnership with USEPA Region 6 and TCEQ. As the lead agency for environmental response actions at LHAAP-16, the U.S. Army is charged with planning and implementing remedial actions at LHAAP. The regulatory agencies assist the U.S. Army by providing technical support, project review, project comment, and oversight in accordance with CERCLA and the NCP as well as the Federal Facility Agreement (FFA). The FFA is discussed further in the next section.

The proposed plan summarizes the site characteristics, scope and role of response action, and summary of site risks. This is followed by a presentation of the remedial action objectives (RAOs) and summary of remedial alternatives for LHAAP-16. Finally, an evaluation of alternatives and a summary of the preferred alternative are presented.

SITE BACKGROUND

LHAAP is located in central-east Texas in the northeastern corner of Harrison County **(Figure 2)**. The installation occupies approximately 1,400 of its former 8,416 acres between State Highway 43 at Karnack, Texas, and the western shore of Caddo Lake. The nearest cities are Marshall, Texas, approximately 14 miles to the southwest, and Shreveport, Louisiana, approximately 40 miles to the southeast. Caddo Lake, a large freshwater lake situated on the Texas-Louisiana border, bounds LHAAP to the north and east.

The U.S Army has transferred nearly 7,000 acres to the U.S. Fish and Wildlife Service

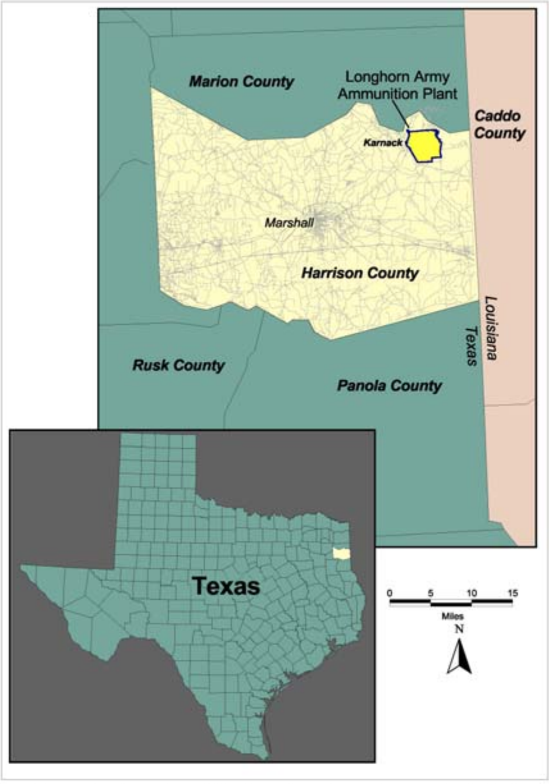


Figure 2 Location of the Longhorn Army Ammunition Plant, Harrison County, Texas

(USFWS) for management as the Caddo Lake National Wildlife Refuge. The property transfer process is continuing as response is completed at individual sites. The local restoration advisory board has been kept informed of previous investigations at this site through regularly held quarterly meetings. Additionally, the administrative record is updated at least twice per year and is available at the local public library.

Due to releases of chemicals from operations at the facility, LHAAP was placed on the Superfund National Priorities List on August 9, 1990. Activities to remediate contamination associated with the National Priorities List listing of LHAAP began in 1990. The U.S. Army, the USEPA, and the Texas Water Commission (currently known as the TCEQ) have entered into a CERCLA Section 120 FFA since that time for remedial activities at LHAAP. Referred to as the Old Landfill, LHAAP-16 was specifically identified in the FFA as an area "having threatened releases of hazardous substances or pollutants or contaminants." The FFA became effective December 30, 1991. LHAAP operated until 1997 when it was placed on inactive status and classified by the U.S. Army Armament, Munitions, and Chemical Command as excess property.

LHAAP-16, a capped landfill, is located in the south-central portion of LHAAP and covers an area of approximately 20 acres **(Figure 3)**. Harrison Bayou runs along the northeastern edge of LHAAP-16. The landfill was established in the 1940s and was used for the disposal of solid and industrial wastes until the 1980s when disposal activities were terminated.

The USEPA has established containment as the presumptive remedy under CERCLA for municipal landfills (USEPA, 1993) and for military landfills (USEPA, 1996). The construction of a landfill cap over the site was completed in 1998 as part of an interim remedial action (IRA). The IRA is consistent with the USEPA presumptive remedy guidance. The capped area is fenced.

A groundwater extraction system was voluntarily installed by the Army in 1996 and 1997 as a treatability study to prevent the groundwater plume from migrating to Harrison Bayou. Groundwater is extracted at LHAAP-16 and pumped to the existing groundwater treatment plant at LHAAP-18/24.

Between 1980 and 2009, numerous investigations were conducted to determine if the releases of potential contamination from landfill operations had affected the environmental media.

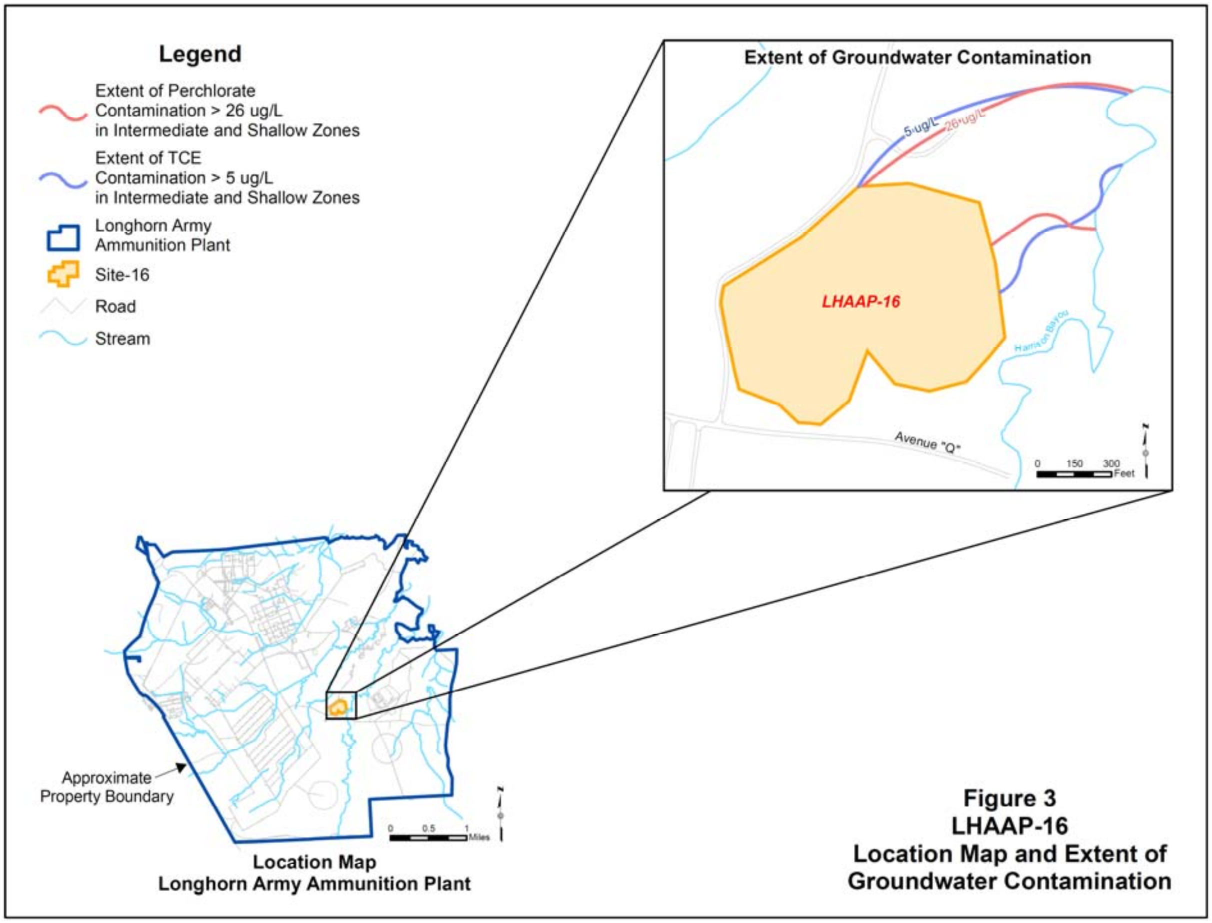


Figure 3
LHAAP-16
Location Map and Extent of Groundwater Contamination

These investigations included Pre-Phase I investigations in 1980, 1982 and 1987; Phase I through III RIs conducted in 1993, 1995 to 1996, and 1997 to 1998 (Jacobs, 2000); quarterly Harrison Bayou surface water sampling initiated in 1995; the groundwater treatability study initiated in 1996; and perchlorate investigations conducted by Jacobs in 2000 and 2001. Media investigated included soil, surface water, sediment, and groundwater. Based on the results from the investigations and the completion of the landfill cap, no further investigation was recommended for the soil, sediment and surface water. Multiple constituents were detected in the underlying groundwater. The groundwater contamination was likely caused by historic leaching of contaminants from the landfill waste to the groundwater via rainwater infiltration prior to the capping of the landfill.

The Final BHHRA (Jacobs, 2001) used data from the investigations conducted through 2001. Additional investigations were conducted between 2002 and 2009, after the BHHRA was finalized, to provide additional information regarding LHAAP-16 groundwater contamination identified during previous sampling events. The results of the 2002 perchlorate investigation were presented in the Plant-wide Perchlorate Investigation Report (STEP, 2005). Groundwater monitoring results from sampling conducted during Spring 2003, Spring 2004, and Winter 2004 were presented in the Groundwater Monitoring Report (USACE and ALL Consulting, 2007). Natural attenuation and geochemical evaluation in 2007, installation and sampling of wells near Harrison Bayou in 2007, installation and sampling of wells to address data gaps in 2008, and groundwater sampling for metals, perchlorate, and volatile organic compounds in 2009 are included in the Final Addendum to Final FS (Shaw, 2010). The Addendum to the FS also included the findings of the BERA.

SITE CHARACTERISTICS

Much of LHAAP-16 is relatively flat. The outer edges of the site are forested, and the land becomes steeper near Harrison Bayou. Much of the site was a disposal area and is now capped and covered with grass. Surface drainage from LHAAP-16 flows mostly through small gullies and ditches to Harrison Bayou. Harrison Bayou flows into Caddo Lake to the northeast of the site. The lake is a source of drinking water for several neighboring communities in Louisiana.

The subsurface at the site is composed of medium plastic sandy silt, fine sands, and clay. The clay layers tend to separate the groundwater into shallow, intermediate, upper deep and deep zones. While flow is primarily horizontal in these zones, vertical interaction between the shallow and intermediate zones is evidenced by pumping test results as well as the presence of contamination in both zones. Such interconnection is consistent with soil layers formed in fluvial depositional environments. The groundwater flow direction is northeast toward Harrison Bayou in the shallow, intermediate and deep zones, while flow direction is southeast toward Harrison Bayou in the upper deep groundwater zone. Overall, the groundwater flow is toward Caddo Lake.

Groundwater flow between the landfill and Harrison Bayou is also influenced by the presence of an extraction well system consisting of four wells in the shallow groundwater zone and four wells in the intermediate groundwater zone. The wells were installed in 1996 and 1997 as part of a treatability study.

The contaminated media at LHAAP-16 include buried source material (landfill waste under the cap) and the shallow and intermediate groundwater beneath the landfill. Prior to the construction of the cap, the landfill was a known disposal site with contaminated groundwater beneath it and potential to contaminate nearby surface water by surface runoff or groundwater discharge. To mitigate the risk to human and ecological receptors, the U.S. Army and USEPA determined that an early interim action was warranted to address the contamination present at LHAAP-16.

The early interim action included placement of a multilayer cap at the LHAAP-16 landfill. That cap prevents rainfall from infiltrating and leaching contaminants from principal threat wastes within the landfill. However, groundwater with elevated levels of contamination appears still to be migrating from beneath the landfill.

The major chemicals of concern (COCs) for LHAAP-16 identified in the FS are volatile organic compounds (VOCs), including trichloroethene (TCE), cis-1,2-dichloroethene (DCE), vinyl chloride and perchlorate in the shallow and intermediate groundwater. The approximate extent of VOC and perchlorate contamination in the shallow and intermediate zones is shown in **Figure 3**. Data collected from the upper deep groundwater zone indicate that no groundwater contamination has been detected since 1997. Data also confirm that VOCs have not migrated down to the deep zone.

Four metals (arsenic, chromium, manganese, and nickel) had sporadic elevated detections and were retained as COCs. While the occurrence of these chemicals does not appear to be associated with widespread contamination from the landfill, further monitoring is warranted.

SCOPE AND ROLE OF THE PROPOSED ACTION

The scope and role of the action discussed in this proposed plan includes all remedial actions planned for this site. In 1995, the U.S. Army and USEPA signed a Record of Decision (ROD) establishing an early interim remedial action for LHAAP-16 to mitigate potential risks posed by buried source material at the site (U.S. Army and EPA, 1995). The interim RAO stated in the ROD was to provide long-term protection by minimizing vertical infiltration of water into the landfill and to reduce the possibility of contaminant transport into surface water bodies. The IRA included the construction of a landfill cap. The cap construction began in 1996 and was completed in 1998.

A multilayer cap and cover system was constructed using a double barrier consisting of a sodium bentonite geocomposite liner and a geosynthetic membrane liner. Placement of a multilayer cap isolated the wastes in the LHAAP-16 landfill. In addition, the U.S. Army implemented land use controls by properly maintaining and routinely inspecting the landfill cap and cover system to protect the remedy and monitor the effectiveness of the cap. A groundwater extraction system was installed as a treatability study to prevent the groundwater plume from migrating to Harrison Bayou.

The potential exists for the landfill waste material to pose an unacceptable risk to human health should the existing cap be allowed to deteriorate. The potential also exists for groundwater contaminants to pose an unacceptable human health risk and to discharge to the nearby surface water body, which could ultimately affect Caddo Lake, should the extraction system prove ineffective in preventing the plume migration.

The groundwater at LHAAP is not currently being used as drinking water and may not be used in the future based on its reasonably anticipated use as a national wildlife refuge. When establishing the RAOs for this response action, the U.S. Army has considered the NCP’s expectation to return useable groundwater to its potential beneficial use wherever practicable. The U.S. Army has also considered the State of Texas designation of all groundwater as potential drinking water, unless otherwise classified, consistent with Texas Administrative Code, Title 30, §335.563 (h)(1). The Army intends to return the groundwater in the contaminated shallow and intermediate zones at LHAAP-16 to its potential beneficial uses, which is considered to be the attainment of Safe Drinking Water Act maximum contaminant levels (MCLs) to the extent practicable, and consistent with Code of Federal Regulations, Title 40, §300.430(e)(2)(i)(B&C). If an MCL is not available for a chemical, the promulgated TCEQ medium-specific concentration for groundwater that could be used for residential purposes will be used. If a return to potential beneficial uses is not practicable, the NCP expectation is to prevent further migration of the plume, prevent exposure to contaminated groundwater, and evaluate further risk reduction.

The preferred final remedial action at LHAAP-16 will address the protection of the existing landfill cap, prevent potential exposure risks associated with the contaminated groundwater, and demonstrate through groundwater and surface water monitoring activities that the nearby surface water body, Harrison Bayou, is protected from exceedances of cleanup levels. Land use controls (LUCs) may be terminated when there is no further threat of releases of contaminated groundwater into surface water and when the groundwater contaminants are reduced to cleanup levels.

SUMMARY OF SITE RISKS

The construction of the cap under the IRA eliminated the direct exposure pathway to source area waste material, prevented contaminant transport to surface water via surface runoff, and reduced leaching of contaminants to the groundwater, resulting in an overall reduction of risk to human and ecological receptors.

The reasonably anticipated future use of this site is nonresidential as part of the Caddo Lake National Wildlife Refuge. This anticipated future use is based on a Memorandum of Agreement (U.S. Army, 2004) between the USFWS and the Army which documents the transfer process of the LHAAP acreage to USFWS to become the Caddo Lake National Wildlife Refuge. Presently the Caddo Lake National Wildlife Refuge occupies nearly 7,000 acres of the former installation. The property must be kept as a National Wildlife Refuge unless there is an act of Congress which removes the parcel or the land is exchanged in accordance with the National Wildlife Refuge System Administration Act of 1966 and the National Wildlife Refuge System Act Amendments of 1974.

As part of the RI/FS, a baseline human health risk assessment and a baseline ecological risk assessment were conducted for LHAAP-16 to determine current and future effects of contaminants on human health and the environment to support technical review and risk management decisions.

Human Health Risks

The baseline risk assessment estimates the risk that the site poses if no action is taken. It provides the basis for taking action and identifies the contaminants and exposure pathways that need to be addressed by the remedial action. The applicable receptor scenario for future use as a national wildlife refuge is a hypothetical future maintenance worker. For carcinogens, risks are generally expressed as the incremental probability of an individual developing cancer over a lifetime as a result of exposure to the carcinogen and are expressed in scientific notation (e.g., 1×10^{-6}). USEPA's acceptable risk range for site-related exposures is 1×10^{-4} to 1×10^{-6}, i.e., one-in-ten thousand to one-in-one million. The potential for non-cancer effects is expressed by a ratio of the exposure to the toxicity. An individual chemical ratio less than 1 indicates that toxic non-cancer effects from that chemical are unlikely. A non-cancer hazard index (HI) is calculated when the ratios for the individual chemicals are summed. An HI greater than 1 indicates that site-related exposures may present a risk to human health. Thus, an HI of less than 1 is acceptable since it indicates toxic non-cancer effects are unlikely.

Using data presented in the RI, the cancer risk and the non-cancer HI were calculated based on hypothetical future maintenance worker exposure to the site environmental media (e.g., soil, groundwater, and Harrison Bayou surface water and sediment) under an industrial scenario. The human health risk assessment did not include contaminant concentrations in the waste material within the landfill because the exposure pathway to the waste material has been eliminated. The baseline human health risk assessment indicated that the cancer risk for the hypothetical maintenance worker was at the lower end of or below the target risk range for surface soil (1.3×10^{-6}), surface/subsurface soil (8.1×10^{-6}) and Harrison Bayou sediment (1.0×10^{-6}). The non-carcinogenic risk estimates were below 1 for surface soil, surface/subsurface soil, Harrison Bayou surface water, sediment and fish ingestion. The carcinogenic risk estimates were driven almost entirely by arsenic. A soil background evaluation indicated that when inorganic constituents that were detected on-site below background levels (including arsenic) were eliminated as constituents of interest from the soil risk estimates, all soil risk estimates were well below the cancer risk and non-cancer hazard thresholds of 1×10^{-6} and 1.0, respectively. However, the groundwater was determined to pose an unacceptable cancer risk of 1.4×10^{-1} and a hazard index of 1,230 to the hypothetical future maintenance worker. Groundwater analytical results obtained from post risk assessment groundwater samples do not alter the conclusion that groundwater poses risk.

The primary COCs in groundwater contributing to cancer risk and non-cancer hazard are TCE, cis-1,2-DCE, and vinyl chloride. The primary contributor to the cancer risk is vinyl chloride. The primary contributors to the non-cancer hazard are cis-1,2 DCE and TCE. Perchlorate concentrations in the groundwater at the site exceed the recommended screening level, therefore, perchlorate is identified as a COC.

MCLs are proposed as groundwater cleanup levels for the COCs. Perchlorate does not have an MCL, but perchlorate concentrations in the groundwater at LHAAP-16 exceed the TCEQ promulgated perchlorate groundwater medium-specific concentration for residential use. Perchlorate was detected at a maximum concentration of 5,990 micrograms per liter (µg/L) which exceeds the groundwater medium-specific concentration of 26 µg/L for residential use. The maximum detected concentration of TCE was 70,600 µg/L which exceeds the MCL of 5 µg/L, a federal and state drinking water standard. The maximum concentrations of cis-1,2-DCE and vinyl chloride were observed at 275,000 and 11,000 µg/L, which exceed the MCLs of 70 µg/L and 2 µg/L, respectively.

The State of Texas requires that a notification be filed with Harrison County per Texas Administrative Code §335.566, stating that the site is suitable for nonresidential use, because the risk evaluation exposure to surface soil was based on the reasonably anticipated future use of the site as a part of a national wildlife refuge. Additionally, limited monitoring in the form of Five-Year Reviews will serve to document that the use of the site remains consistent with the industrial/recreational exposure scenario evaluated in the risk assessment.

Ecological Risks

The ecological risk for site LHAAP-16 was addressed in the installation-wide BERA (Shaw, 2007b). For the BERA, the entire installation was divided into three large sub-areas (i.e., the Industrial Sub-Area, Waste Sub-Area, and Low Impact Sub-Area) for the terrestrial evaluation. The individual sites at LHAAP were grouped into one of these sub-areas, which were delineated based on commonalities of historic use, habitat type, and spatial proximity to each other. The conclusions regarding the potential for chemicals detected at individual sites to adversely affect the environment must be made in the context of the overall conclusions of the sub-area in which the site falls. Site LHAAP-16 lies within the Waste Sub-Area.

The BERA evaluated potential ecological risk to a number of endpoint receptors, as well as terrestrial plant and invertebrate communities. Endpoint receptors were evaluated using a food chain model that estimated a daily dose intake, which was subsequently compared with toxicity reference values to generate a hazard quotient. Terrestrial communities were evaluated through comparisons of detected concentrations to conservative benchmarks. Multiple lines of evidence (e.g., spatial distribution of concentrations, etc.) were also considered. After evaluating all lines of evidence, the BERA concluded that there were potential ecological concerns in the Waste Sub-Area associated with barium, 2,4-dinitrotoluene (DNT), 2,6-DNT, 2,4,6-trinitrotoluene, and dioxin (Shaw, 2007b). The BERA evaluated eleven soil samples collected during the RI from outside the landfill. Results indicated that the ecological preliminary remediation goal was exceeded by barium in only one sample in surface soil but not in total soil. Removal or treatment of barium-impacted soil at LHAAP-16 would not appreciably lower the 95 percentile upper confidence limit for the barium exposure point concentration in the Waste Sub-Area (Shaw, 2010). Therefore, it was concluded that barium within the Waste Sub-Area will be addressed at LHAAP-17, another site within the Waste Sub-Area. Trinitrotoluene and DNT were below detection limits; therefore, these explosive compounds do not contribute to ecological risk at the Waste Sub-Area. Based on detected congeners, dioxins and furans in the soil at the LHAAP-16 do not exceed ecological criteria (Shaw, 2007b). In summary, no action is needed at LHAAP-16 for the protection of ecological receptors.

It is the current judgment of the U.S. Army that the preferred alternative identified in this Proposed Plan, or one of the other active measures considered in the Proposed Plan, is necessary to protect the public health or welfare or the environment from actual or threatened releases of hazardous substances into the environment.

REMEDIAL ACTION OBJECTIVES

Within the FS (Jacobs, 2002), interim RAOs were established for LHAAP-16. The interim RAOs did not address ecological risk or the extent of groundwater remediation at the site. The final RAOs for LHAAP-16 were developed within the Addendum to the FS (Shaw, 2010), which incorporated the findings of the BERA and addressed the aquifer as a potential source of drinking water. The final RAOs largely focus on goals to protect human health, since the need to address ecological risk is only to ensure that ecological receptors do not come in contact with landfill wastes that are currently covered by the cap at LHAAP-16. The final RAOs also focus on protecting the surface water adjacent to LHAAP-16.

The Army recognizes USEPA's policy to return all groundwater to potential beneficial uses, based on the non-binding programmatic expectation in the NCP. The final RAOs for LHAAP-16, which address contamination associated with the media at the site and take into account the future uses of LHAAP streams, land, and groundwater, are:

- Protection of human health and the environment by preventing exposure to landfill contents.
- Protection of human health and the environment by reducing leaching and migration of landfill hazardous substances into the groundwater.
- Protection of human health by preventing human exposure to groundwater contaminated with COCs.
- Protection of human health and the environment by preventing groundwater contaminated with COCs from migrating into nearby surface water.
- Return groundwater in the shallow and intermediate zones to its potential beneficial use as drinking water, wherever practicable, within a reasonable time period given the particular site circumstances.

SUMMARY OF REMEDIAL ALTERNATIVES

The FS (Jacobs, 2002) identified and screened remedial technologies and associated process options that may be appropriate for satisfying the interim RAOs for LHAAP-16 with respect to effectiveness, implementability, and cost. Within the Addendum to the FS (Shaw, 2010), the interim RAOs were replaced with final RAOs and additional remedial alternatives were developed to meet the final RAOs. The following remedial alternatives were developed from the retained remedial technologies carried forward after the initial screening:

- Alternative 1 – No Further Action
- Alternative 2 – Cap, Enhanced Groundwater Extraction, and LUCs
- Alternative 3a – Cap, Monitored Natural Attenuation (MNA), and LUCs
- Alternative 3b – Cap, Hot spot Extraction, MNA, and LUCs
- Alternative 4 – Cap, Passive Groundwater Treatment, and LUCs
- Alternative 5a – Landfill Hot Spot Removal, Passive Groundwater Treatment, and LUCs
- Alternative 5b – Complete Landfill Removal, Passive Groundwater Treatment, and LUCs
- Alternative 6 – Landfill Source Treatment (in situ), MNA, and LUCs
- Alternative 7 – Cap, MNA, LUCs, In Situ Enhanced Bioremediation, Passive Biobarriers.

Common Elements. LUCs are common to all alternatives, MNA is common to Alternatives 3, 6, and 7 and inspection/long-term monitoring (LTM) is common to Alternatives 2 through 7. These elements are described below.

Land Use Controls

Because contamination would be left in place at LHAAP-16 for Alternatives 1, 2, 3, 4, 6, and 7 and because contamination would be present for the duration of remedial activities in Alternatives 5, LUCs would be a common component of all alternatives. The LUCs include groundwater use restriction, and protection and maintenance of the existing landfill cap. The LUCs would prevent human exposure to landfill contents and residual groundwater contamination that may present an unacceptable risk to human health, and would ensure that there is no withdrawal or use of groundwater beneath the site for anything other than environmental monitoring and testing. LUCs would support the RAOs.

The U.S. Army would be responsible for implementation, maintenance, inspection, reporting, and enforcement of the LUCs. The details of the LUCs implementation and maintenance actions are provided in the remedial design of the LHAAP-16 cap

(Final Project Work Plans, Interim Remedial Action, Landfills 12 & 16 Caps Report, June 1996). The Final FS for LHAAP-16 further expands on the description of the LUCs (Shaw 2010). Access controls would include land use and groundwater use restrictions. The groundwater restriction LUCs would be maintained until there is no further threat of releases of contaminated groundwater into the surface water and the groundwater can be used without restrictions. In addition, the Texas Department of Licensing and Regulation responsible for notifying well drillers of groundwater restrictions would be notified and the LUCs recorded in the Harrison County Courthouse would include a map showing the areas of groundwater restriction at the site.

In order to transfer LHAAP-16, an Environmental Condition of Property (ECOP) document would be prepared and attached to the letter of transfer. The ECOP will include land use and groundwater use restrictions as part of the Environmental Protection Provisions. The property would be transferred subject to the land use controls that are identified in the ECOP. These restrictions would prohibit or restrict property uses that may result in damage to the existing remedy (landfill cap) or exposure to the contaminated groundwater (e.g., drilling restrictions, drinking water well restrictions).

Monitored Natural Attenuation

MNA is common to Alternatives 3, 6, and 7. MNA is a passive remedial action that relies on natural biological, chemical, and physical processes to reduce the mass and concentration of groundwater COCs under favorable conditions. A preliminary natural attenuation evaluation indicates that MNA is a feasible remedy for certain portions of the site but not as a sole remedy due to migration concerns for the shallow groundwater zone at LHAAP-16 (Shaw, 2010). Natural attenuation would reduce contaminant concentrations to groundwater cleanup levels. The LUCs would remain in effect until there is no further threat of releases of contaminated groundwater into the surface water and the contaminants in groundwater have been reduced to cleanup levels.

Inspection and Long-Term Monitoring

Alternatives 2 through 7 include inspection and long-term groundwater monitoring activities. The long-term reliability of the LHAAP-16 landfill cap to control infiltration, contaminant runoff, and contaminant exposure depends on adequate long-term inspection and maintenance. Further groundwater and surface water monitoring would be used to evaluate contaminant migration, ensure that the COCs in the groundwater plumes continue to degrade or remain stable, and verify that contaminant levels in Harrison Bayou do not exceed the cleanup levels. The eventual groundwater concentration goal is to reduce COC concentrations to below groundwater cleanup levels. The LUCs, cap maintenance, and long-term monitoring would be continued as required to demonstrate effectiveness of the remedy, compliance with applicable or relevant and appropriate requirements (ARARs), to-be-considered requirements, and RAOs, and to support CERCLA Five-Year Reviews. The Five-Year Reviews may indicate the need for components of the alternatives to be maintained, modified, or replaced.

Although the U.S. Army may later pass these procedural responsibilities to the transferee by property transfer agreement, the U.S. Army shall retain ultimate responsibility for remedy integrity.

Alternative 1 – No Further Action.
A No Further Action alternative is required by the NCP to provide a comparative baseline against which the action alternatives can be evaluated. At LHAAP-16, an interim remedy (landfill cap) has already been implemented and maintenance of that remedy is a legal requirement per the 1995 ROD. Therefore, the comparative baseline is considered to be “No Further Action.” Under this alternative the existing landfill cap would be left in place and the landfill waste material, surface water, and groundwater would be left “as is,” without implementing additional containment, removal, treatment, or other mitigating actions. The existing landfill cap would be maintained to hydraulically isolate the landfill, and land use controls would be implemented to protect the existing remedy (landfill cap). The existing groundwater extraction process and media monitoring would be discontinued. No other actions, including monitoring, would be implemented to reduce existing or potential future exposure to human and ecological receptors.

Estimated Capital Cost: $0

Estimated Operation and Maintenance (O&M) Present Worth Cost: $630,000

Estimated Duration: 30 years

Estimated Total Present Worth Cost: $630,000

Alternative 2 – Maintenance of Existing Landfill Cap, Enhanced Groundwater Extraction and Land Use Controls.

The goals of this alternative are to protect the industrial worker by protecting the existing remedy (landfill cap), preventing exposure to landfill waste and contaminated groundwater and to prevent further degradation of Harrison Bayou water quality through groundwater extraction. In addition to maintenance of the cap (similar to Alternative 1), Alternative 2 includes enhanced groundwater extraction and LUCs. The existing groundwater extraction system would be enhanced to increase reliability of the extraction wells and related equipment to treat contaminated groundwater from the shallow and intermediate groundwater plumes before it discharges to Harrison Bayou preventing surface water from exceeding water quality standards in Harrison Bayou. Because the landfill source term would remain in place and groundwater upgradient of the groundwater extraction system would remain contaminated, LUCs would be maintained to protect the existing remedy (landfill cap) and prevent human exposure to landfill waste and residual groundwater contamination within untreated areas.

Estimated Capital Present Worth Cost: $760,000

Estimated O&M Present Worth Cost: $9,050,000

Estimated Duration: 30 years

Estimated Total Present Worth Cost: $9,820,000

Alternative 3a – Maintenance of Existing Landfill Cap, Monitored Natural Attenuation and Land Use Controls.

Alternative 3b – Maintenance of Existing Landfill Cap, Hot spot Extraction, Monitored Natural Attenuation and Land Use Controls.

The goals of this alternative are to protect the industrial worker by protecting the existing remedy (landfill cap), preventing exposure to landfill waste and contaminated groundwater, and to prevent further degradation of Harrison Bayou water quality by natural attenuation of contaminated groundwater. Alternative 3a includes maintenance of the existing cap to hydraulically isolate the landfill, discontinued use of the existing groundwater extraction system, and monitored natural attenuation to assure the protection of human health and the environment by documenting that the contaminated shallow and intermediate groundwater zones remain localized with minimal migration and that contaminant concentrations are being reduced to groundwater cleanup levels before discharging to Harrison Bayou. Because the landfill source term would remain in place and groundwater contamination would remain until natural biological and chemical processes degrade the contaminants in the groundwater to cleanup levels, LUCs would be maintained to protect the existing remedy (landfill cap) and prevent human exposure to landfill waste and residual groundwater contamination that may present an unacceptable risk to human health.

Alternative 3b is identical to Alternative 3a except an extraction well network would be operated in the groundwater hot spot for approximately 5 years to reduce contaminant mass followed by MNA throughout the rest of the O & M period.

Estimated Capital Present Worth Cost:
(a) $620,000
(b) $1,290,000

Estimated O&M Present Worth Cost:
(a) $2,100,000
(b) $2,140,000

Estimated Duration: 30 years

Estimated Total Present Worth Cost:
(a) $2,710,000
(b) $3,430,000

Alternative 4 – Maintenance of Existing Landfill Cap, Passive Groundwater Treatment and Land Use Controls.

The goals of this alternative are to protect the industrial worker by protecting the existing remedy (landfill cap), preventing exposure to landfill waste and contaminated groundwater and to prevent further degradation of Harrison Bayou water quality through groundwater treatment. Alternative 4 includes maintenance of the existing cap, discontinued use of the groundwater extraction system and installing an in situ permeable reactive barrier across the heart of the shallow groundwater plume that is discharging to Harrison Bayou. The permeable reactive barrier would consist of a gravel-filled groundwater collection trench with a reactive media bed located at the downslope discharge point of the collection trench. The highly permeable gravel in the trench would channel the shallow groundwater to the reactive media contained in a buried treatment vessel. The collection trench would be sized to intercept only that part of the shallow groundwater plume with the highest contaminant concentrations, likely having the greatest impact on contaminant levels in Harrison Bayou. Installation of the trench would create a preferential flow path. The actual size and location of the trench would be determined during design. The collection trench would be placed upgradient to Harrison Bayou near the discharge location.

A perforated pipe would be buried at the bottom of the collection trench to convey the collected groundwater to a non-perforated connector pipe and subsequently to the reactive media treatment vessel. The treatment vessel would be filled with the reactive media and sized to ensure the requisite residence time for the contaminants to be treated. The treatment vessel would discharge to a buried drain field, allowing the treated groundwater to drain into the soil down-slope of the treatment vessel. The placement of the reactive media in a treatment vessel instead of the entire collection trench reduces the overall media cost and facilitates the replacement of the media when it is expended. The contaminants to be treated by this reactive media are trichloroethene and perchlorate. The treatment process would be anaerobic biological degradation that uses a combination of gravel and various organic media. The organic media would serve as a carbon source for the anaerobic microbes.

Maintenance of the existing cap would hydraulically isolate the landfill, and LUCs would be continued to protect the existing remedy (landfill cap) and to prevent human exposure to the landfill waste and residual groundwater contamination that may present an unacceptable risk to human health. Because the landfill source term would remain in place and groundwater upgradient of the in situ permeable reactive barrier would remain contaminated, land use would be restricted to industrial use for as long as the residual contamination remains a threat.

Estimated Capital Present Worth Cost: $2,540,000

Estimated O&M Present Worth Cost: $2,020,000

Estimated Duration: 30 years

Estimated Total Present Worth Cost: $4,560,000

Alternative 5a – Landfill Hot Spot Removal, Passive Groundwater Treatment, Off-Site Disposal and Land Use Controls.

Alternative 5b – Complete Landfill Removal, Passive Groundwater Treatment, Off-Site Disposal and Land Use Controls.

The goals of Alternative 5a are to protect the industrial worker by preventing exposure to the remaining landfill waste and contaminated groundwater, and meet cleanup levels in Harrison Bayou through source removal and in situ groundwater treatment. This alternative includes removal of the landfill hot spots, repairing the cap, discontinued use of the existing groundwater extraction system, and installing an in situ permeable reactive barrier across the portion of the shallow groundwater plume with the highest contaminant concentrations, reducing the contaminant mass discharging to Harrison Bayou. This permeable reactive barrier would operate identically to the barrier proposed in Alternative 4.

Hot spot locations would be confirmed by excavating trenches at various locations across the landfill biased by the results of the soil gas survey conducted during the RI (Jacobs, 2000). The excavated waste would be field screened and the results used to define the location and nature of hot spot material to focus the excavation efforts and detail the waste handling and treatment process.

Alternative 5a also includes maintenance of the existing cap to hydraulically isolate the landfill, and LUCs to protect the existing remedy (landfill cap) and to prevent human exposure to the remainder of the landfill waste and residual groundwater contamination that may present an unacceptable risk to human health.

Alternative 5b is identical to 5a in all respects except that all of the landfill wastes would be removed. Because this alternative does not leave any waste in place, there are no long-term cap maintenance and landfill LUC requirements. However, groundwater

LUCs would remain in effect until groundwater cleanup levels are met.

Estimated Capital Present Worth Cost:
(a) $3,080,000
(b) $106,110,000

Estimated O&M Present Worth Cost:
(a) $9,990,000
(b) $9,490,000

Estimated Duration: 30 years

Estimated Total Present Worth Cost:
(a) $13,070,000
(b) $115,610,000

Alternative 6 – Landfill Source In Situ Treatment, Monitored Natural Attenuation and Land Use Controls.

The goals of this alternative are to protect the industrial worker by protecting the existing remedy (landfill cap), preventing exposure to landfill waste and contaminated groundwater and to prevent further degradation of Harrison Bayou water quality through landfill source treatment and natural attenuation of contaminated groundwater. This alternative includes in situ treatment of the landfill hot spots, repairing the landfill cap, discontinuing use of the existing groundwater extraction system, and monitoring for natural attenuation. Alternative 6 also includes maintenance of the existing cap to hydraulically isolate the landfill, and LUCs to protect the existing remedy (landfill cap). In situ treatment of landfill hot spots by soil vapor extraction would reduce contaminant concentrations in target areas. The target areas have the highest concentrations and in situ treatment would rapidly reduce these highest concentrations. The contaminants in the groundwater beneath and downgradient of the landfill would decrease over time from natural degradation and chemical processes. The combination of source term treatment and the natural degradation of groundwater contaminants would ensure that Harrison Bayou is not further degraded. LUCs would also be maintained to prevent human exposure to landfill waste and contaminated groundwater.

Estimated Capital Present Worth Cost:
$2,750,000

Estimated O&M Present Worth Cost:
$3,650,000

Estimated Duration: 30 years

Estimated Total Present Worth Cost:
$6,400,000

Alternative 7 – Cap, Land Use Controls, In Situ Enhanced Bioremediation, Passive Biobarriers, and Monitored Natural Attenuation.

The goals of this alternative are to protect human health by implementation of LUCs prohibiting unauthorized use of the cap and groundwater, reduce contaminant concentrations in the groundwater plume and prevent discharge of contamination to Harrison Bayou. To achieve these goals, this alternative utilizes continued maintenance of the existing cap, groundwater use restrictions, installation of a biobarrier in the shallow groundwater zone adjacent to the landfill, in situ enhanced bioremediation in the shallow and intermediate groundwater zones, installation of a second biobarrier in the shallow groundwater zone near Harrison Bayou, and MNA of the shallow and intermediate groundwater zones.

In situ bioremediation would be implemented in the most contaminated portion of the shallow and intermediate groundwater zones in conjunction with phased shut down of the existing groundwater extraction system. Bioremediation would involve the injection of a carbon substrate and a bioaugmentation culture. Because contaminant concentrations in wells near the landfill consistently exceed groundwater cleanup levels, this alternative would include installation of a passive biobarrier near the fence line of the landfill to degrade contaminants in groundwater. Because concentrations in wells near Harrison Bayou also currently exceed groundwater cleanup levels this alternative would include installation of a second passive biobarrier near Harrison Bayou to further degrade contaminants. A row of injection points perpendicular to groundwater flow direction would be installed close to Harrison Bayou. The biobarrier would consist of emulsified oil that will enable ambient microorganisms to create favorable conditions and a bioaugmentation culture (e.g., SDC-9) to ensure that a microbial species is present that is able to completely degrade TCE to ethene. The emulsified oil is a slow-release carbon source with an enhanced subsurface longevity; it would be injected to provide a long-lasting source of fermentable carbon to stimulate the biological reduction of perchlorate and TCE and its daughter products. Following the reductions in contaminant concentrations caused by the in situ bioremediation and the passive biobarriers, natural attenuation would further reduce the concentrations of contaminants in the groundwater so that surface water in Harrison Bayou does not exceed cleanup levels. A monitoring program would be implemented within this alternative to confirm the effectiveness of the various technologies. LUCs would be maintained to protect the existing remedy (landfill cap) and to prevent human exposure to landfill waste and residual groundwater contamination.

Estimated Capital Present Cost: $390,000

Estimated O&M Present Worth Cost: $1,590,000

Estimated Duration: 30 years

Estimated Total Present Worth Cost: $1,980,000

EVALUATION OF ALTERNATIVES

Nine criteria identified in the NCP, §300.430(e)(9)(iii), are used to evaluate the different remediation alternatives individually and against each other in order to select a remedy. This section profiles the relative performance of each alternative against the nine criteria, noting how it compares to the other options under consideration. The nine evaluation criteria are discussed below. The “Detailed Analysis of Alternatives” can be found in the FS for the site (Jacobs, 2002) and the Addendum to the FS (Shaw, 2010).

1. Overall Protection of Human Health and the Environment

Alternative 1, the No Further Action alternative, does not protect human health or the environment because no remedial activities would be conducted and no LUCs (except for cap maintenance) would be maintained. Therefore, LHAAP-16 contamination would present unacceptable risks to human health and the environment through ingestion of groundwater. The other six alternatives, collectively referred to as the action alternatives, would provide engineering controls, treatment, containment, or removal and disposal of the waste material to levels protective of human health and Harrison Bayou.

The six action alternatives would provide access and use restrictions, capping of buried wastes (the entire landfill excavation option of Alternative 5 excepted), and long-term media monitoring. The landfill cap and LUCs would prevent exposure to landfill wastes and contaminated groundwater.

Alternatives 2, 3, 4, 6, and 7 would maintain Harrison Bayou water quality through a variety of means. Alternative 2 maintains the current actions of capping and groundwater extraction to contain the plume and prevent it further impacting Harrison Bayou. Alternatives 3, 4, and 7 are similar to Alternative 2 in that they all maintain the cap, but they all discontinue the groundwater extraction system (Alternative 3b after an estimated 5 years). Alternative 4 uses an in situ permeable reactive barrier installed parallel to Harrison Bayou, and Alternatives 3, 6, and 7 use MNA to assure protection of Harrison Bayou. Alternative 6 couples vapor extraction of the landfill hot spots with groundwater natural attenuation. Alternative 7 utilizes in situ bioremediation of target areas and passive biobarriers in conjunction with groundwater natural attenuation.

Alternative 5a is the second most aggressive of all the alternatives in that it removes the landfill hot spots (conventional excavation, off-site disposal) and installs a permeable reactive barrier to treat groundwater before it discharges to Harrison Bayou. Alternative 5b, the most aggressive alternative, removes all of the landfill waste and uses the same reactive barrier as in Alternative 5a. All alternatives are protective, though Alternative 5b is most reliable in the long term because it has less reliance on long-term LUCs.

2. Compliance with ARARs

Except for Alternative 1, which does not comply with the chemical-specific ARARs, all of the action alternatives meet the required chemical-, location-, and action-specific ARARs. None of the alternatives require a waiver.

3. Long-Term Effectiveness and Permanence

The no further action alternative would not be effective in the long term, because the baseline risk assessment indicates that the current groundwater conditions are not protective of human health and the environment, and no remedial activities would be conducted to address groundwater under this alternative.

All alternatives except Alternative 5b rely on LUCs and source isolation (i.e., capping) to isolate the residual waste from potential receptors. With the exception of the complete landfill excavation option for Alternative 5b, all action alternatives would leave waste on site. Because Alternative 5b removes the entire landfill source term, it is the most reliable in long-term protection of future human receptors. Alternatives 5a and 6 are the next most reliable in the long term because of their removal and in situ treatment, respectively, of the hot spot wastes. The long-term cap maintenance and LUCs offered by Alternatives 2, 3, 4, 5a, 6, and 7 restricting access to the contaminated media would adequately maintain residual risks below acceptable levels. If cap maintenance and monitoring programs are maintained and the owner of LHAAP-16 maintains the LUCs, the cap and LUC programs can reliably maintain residual risks at acceptable levels.

The permeable reactive barriers used in Alternatives 5a and 5b to meet drinking water standards in Harrison Bayou may be effective and relatively reliable with long-term maintenance and monitoring. To control discharges to Harrison Bayou, Alternatives 2 and 3b extract and treat contaminants in groundwater.

Alternative 2 requires long-term groundwater extraction, which has proven to be moderately effective. The extraction system has had reliability problems as with any mechanical system that must operate over the long term. Alternative 3b extracts groundwater for a shorter amount of time.

The other action alternatives rely on passive treatment options (i.e., in situ permeable reactive barrier, in situ bioremediation, passive biobarriers, MNA) to protect Harrison Bayou. The in situ permeable reactive barriers used in Alternatives 4, 5a, and 5b and in situ bioremediation and passive biobarriers used in Alternative 7, require regular monitoring and replacement of the reactive media to ensure long-term effectiveness. Long-term maintenance of these barriers could prove to be problematic because of potential fouling of the treatment media and changing geochemistry that could reduce their effectiveness. Collection trenches at LHAAP-16 would be difficult to design to effectively intercept the contaminated groundwater and drain passively. Permeable barriers and biobarriers were selected to be the representative process option because of their flexibility in being used to address VOC and perchlorate removal.

If operating effectively, the in situ groundwater treatment process of Alternatives 4 and 5 and in situ enhanced bioremediation and passive biobarriers of Alternative 7 more reliably meet the surface water objective of preventing discharge of contaminants into Harrison Bayou than the natural attenuation option in Alternatives 3 and 6. Results of the MNA evaluation for LHAAP-16 indicated that natural attenuation is a feasible remedy for certain portions of the site but not as a sole remedy due to migration concerns for the shallow groundwater zone. Alternatives 3 and 6 have a planned contingent action of using the enhanced extraction and treatment system of Alternative 2 if natural attenuation is not occurring at a sufficient level to control future discharges to Harrison Bayou.

Alternative 7 utilizes in situ bioremediation and passive biobarriers to further degrade the contaminants in groundwater in conjunction with MNA. Based on the results of the ESTCP semi-passive biobarrier technology demonstration (ESTCP, 2005; ESTCP, 2007) and the preliminary MNA evaluation, the groundwater contaminants at LHAAP-16 have been shown to be amenable to degradation by biological processes prior to discharge to Harrison Bayou.

In summary, all of the action alternatives, including their contingent actions, would effectively meet the RAOs. The reliability of the permeable treatment barrier of Alternatives 4 and 5 is less certain than that of the extraction system of Alternative 2 and 3b, but it may be more effective than the natural attenuation component of Alternatives 3a, 6, and 7. The biological processes utilized in Alternative 7 have been shown to be effective and reliable at LHAAP-16. The current source action, a cap, is limiting releases from the landfill material to the groundwater. However, the removal of the hot spots in Alternative 5a (if they can be found), or treatment of those same hot spots as in Alternative 6, can enhance the reliability of the cap. LUCs to prevent access to the landfill material are considered effective. There is no information to suggest that the hot spots identified as the probable source of migration of contaminants to groundwater would also have the greatest risk if accessed, so these alternatives are not considered more reliable. However, full removal of the waste, Alternative 5b, would be the most reliable.

4. Reduction of Toxicity, Mobility, or Volume through Treatment

The no further action alternative does not include treatment and would not result in a reduction of toxicity, mobility, or volume of contaminants.

Alternatives 2, 3, 4, and 7 would not address the landfill source other than providing containment through capping. Alternative 3a, through its complete reliance on groundwater natural attenuation, provides the least reduction in contaminant volume and toxicity. The natural biological and chemical processes, over time, would gradually reduce the toxicity of VOCs in groundwater and the overall volume of contaminated groundwater. Alternative 4, with its permeable reactive barrier, would reduce the toxicity and volume of the shallow groundwater that passes through it. Although the groundwater upgradient of the reactive barrier is unaffected by the reactive media (until it passes through it), the reactive barrier provides a greater reduction in toxicity and volume than Alternative 3a. Alternatives 2 and 3b actively remove contaminated groundwater from the heart of the plume and treat it ex situ in the LHAAP treatment plant. The processes in the treatment plant would reduce the toxicity and volume of the extracted groundwater. Much of the contamination in the groundwater plume would be reduced over time, offering greater reductions in toxicity and volume than that in Alternative 3a.

Alternative 7 includes in situ bioremediation in the vicinity of shallow wells and upgradient of the wells with the highest levels of chlorinated ethenes. The process would reduce the toxicity and volume. The passive biobarriers provide further reduction of toxicity, mobility, and volume of the groundwater that passes through them. MNA in conjunction with in situ bioremediation would enhance reduction of toxicity and volume. Alternative 7 includes treatment of groundwater within the plume itself. Alternatives 3a/3b, 6, and 7 include a natural attenuation component together with dilution, dispersion, and other natural processes that have the capability of ultimately reducing the contaminants to satisfy the chemical-specific ARARs.

Alternative 6 includes the in situ treatment of the landfill. The extracted VOCs, the majority of the source term at LHAAP-16, would be destroyed in a thermal oxidation unit. Although the contaminants in groundwater would be treated only through natural degradation processes, the overall reduction in toxicity and volume is greater than other alternatives.

Alternative 5 removes source material from the site, but the base action does not include treatment of that material. The permeable barrier does provide some reduction of toxicity of contaminants through treatment. If the excavated material is RCRA-characteristic, treatment of that material to meet LDRs would satisfy the NCP preference for treatment.

5. Short-Term Effectiveness

The no further action alternative would not involve any action; therefore, there would be no increase in short-term risks and no short-term environmental effects.

Through LUCs and engineered controls (e.g., physical barriers, administrative controls, and dust suppression), the six action alternatives would be protective of the community during implementation. Alternative 3a would be the most protective in the short term because there is no construction or off-site transportation. Alternative 5b and, to a lesser extent, Alternative 5a would pose the greatest potential exposure and transportation risks to the public due to the extensive waste excavation and transportation activities. Local and site traffic would be similar for all other alternatives.

The cap maintenance activities at the landfill would require the same health and safety measures for all alternatives except for Alternative 5b. Alternative 5b and to a lesser extent Alternative 5a require extensive handling of the landfill waste and thus pose the greatest risk to remediation workers. Alternative 6 presents lower risks to remediation workers than Alternative 5a because of the less intrusive waste operations of the vapor extraction operations. Appropriate mitigative measures would be applied during construction and transportation to attain appropriate worker and public health exposure requirements in all action alternatives. By planning the construction, excavation, and transportation activities in accordance with industry and OSHA codes and requirements, risks from contaminant exposure and construction operations would be controlled to acceptable levels. All of the remaining alternatives pose similar risks to the remediation worker with Alternative 3a being the safest alternative to implement.

The short-term disturbance of on-property vegetation and wildlife habitat would be greatest under Alternatives 5a and 5b, primarily because of the waste excavation activities and the installation of the long groundwater collection trench. There would be short-term impacts on the vegetation and wildlife habitats in the vicinity of the permeable reactive barrier under alternative 4 and in situ bioremediation injection points and passive biobarriers under alternative 7, though less than that for the longer barriers in Alternatives 5a and 5b. The vapor extraction operations in Alternative 6 would lightly impact vegetation on the landfill. The remaining alternatives would have little to no short-term impacts above those related to minor maintenance activities. For earthwork and construction activities, sediment deposition into Harrison Bayou would be controlled. Erosion control measures would include surface grading; placement of rip rap and silt fences; covering surfaces with straw, mulch, riprap, or geotextile fabrics; and/or using riprap in areas with high water velocity. Following completion of all construction and excavation, disturbed areas would be regraded with clean backfill and revegetated with native grasses.

The approximate construction time for the action alternatives ranges from 6 months in Alternative 2 to 36 months in Alternative 7. Because the source term is effectively controlled in all of the alternatives (with appropriate cap maintenance), the length of time required before groundwater containment systems are no longer needed are comparable, outside the 30-year present worth period. Additional source actions (Alternatives 5 and 6) are likely to lessen the time required to control the groundwater.

The MNA evaluation for LHAAP-16 demonstrated that natural attenuation is occurring in some areas at the site. The attenuation of contaminants was observed at the source and side-downgradient of the plume. However, the shallow groundwater zone plume is still migrating along the groundwater flow direction toward Harrison Bayou. The intermediate groundwater zone plume is more stable with less migration along the flow direction. Thus, natural attenuation is a feasible remedy for certain portions of the site but not as a sole remedy due to migration concerns for the shallow zone. MNA is proposed for Alternative 7 in conjunction with in situ bioremediation to enhance reductive dechlorination within the plume and a passive biobarrier to prevent the discharge of contaminants into surface water. Natural attenuation would be evaluated after two years of quarterly monitoring and a re-application of bio-amendments (i.e., additional in situ bioremediation) would be implemented if deemed necessary.

Detailed evaluation of natural attenuation processes would be required to determine whether the Harrison Bayou remediation levels can be met in the near future or whether a contingent action is needed under Alternatives 3 and 6.

6. Implementability

Under the no further action alternative, no new remedial action would be taken. Therefore, there would be no difficulties or uncertainties with implementation.

Overall, all of the action alternatives are technically feasible to implement. Although Alternatives 5a, 5b, and 6 would require more time, equipment, and activity than the other alternatives, the components of most alternatives use technologies that have been straightforward to implement at other sites with contaminants and conditions similar to those found at LHAAP-16. These technologies would be implemented using conventional equipment and construction methods. The excavation of the landfill wastes under Alternatives 5a and 5b would be moderately difficult because of the inherent difficulties associated with excavating debris from a landfill with an uncertain disposal history. Given the uncertain nature of the wastes in the landfill, the potential for delays in excavation exist should anomalous items or debris be encountered. Likewise, coordination issues between excavation, waste characterization sampling, and disposal could slow the process. Although the media in the reactive barrier in Alternatives 4, 5a, and 5b is expected to treat VOCs and perchlorate, the specific conditions at LHAAP-16 (low gradient, high VOCs, low perchlorate levels) have not been tested. There are negative interactions with other site contaminants that could reduce the media's performance. Based on the ESTCP semi-passive biobarriers technology demonstrations, groundwater contaminants at LHAAP-16 are amenable to degradation by biological processes under Alternative 7. All components of Alternative 7 are readily implementable. Alternative 5b, and to a lesser extent Alternative 5a, would be the most technically difficult to implement.

Alternative 6 would be more technically implementable than Alternatives 5a and 5b, though there may be some challenges associated with the installation of the vapor extraction 'system in the landfill wastes. Also, the uncertainties associated with the flow of soil gas through the variable and heterogeneous buried waste would also contribute to difficulties in implementability and performance. The robustness of the process, however, would ensure that adequate volumes of soil vapor would be removed. Alternative 6 also has uncertainty associated with the implementation and operation of a permeable barrier.

There are few technical challenges to the implementation of Alternative 4 other than those associated with the installation of the permeable reactive barrier. Although Alternative 3a does not require the installation of any engineered components, the uncertainty in the long-term effectiveness of natural attenuation with the source term still in place may cause future delays should a contingent action need to be implemented. The groundwater extraction system and water treatment plant used in Alternatives 2 and 3b are currently operating and proven in their operation and effectiveness and make these alternatives the most technically implementable.

Administratively, all alternatives are implementable. Virtually all services and materials required for the implementation of the action alternatives would be standard for the construction industry and would be readily available. However, considerable testing and development may be needed to produce an effective design for in situ treatment of VOCs and perchlorate in groundwater. Alternative 5 is the least administratively implementable because of the off-site waste transportation and disposal activities. Various Department of Transportation regulations (e.g., 49 CFR 172, 173, and 177) apply to the transportation of wastes such as those expected from the landfill, and the waste acceptance criteria of the off-site disposal facility must be complied with. In the event that a portion of the wastes must be treated before disposal (Alternative 5 contingent action), the waste acceptance criteria of the treatment facility must also be met. Alternatives 4 and 5 would also require personnel with specialized experience in reactive barrier treatability testing, installation, and operation. The vapor extraction activities in Alternative 6 would require personnel with specialized experience in vapor extraction installation and operation. Alternative 7 would require expertise in engineering design and implementation of the in situ bioremediation and the passive biobarrier component of the alternative. Alternative 2 and Alternative 3 are the most administratively implementable.

7. Cost

Cost estimates are used in the CERCLA FS process to eliminate those remedial alternatives that are significantly more expensive than competing alternatives without offering commensurate increases in performance or overall protection of human health or the environment. The cost estimates developed are preliminary estimates with an intended accuracy range of +50 to –30 percent. Final costs will depend on actual labor and material costs, actual site conditions, productivity, competitive market conditions, final scope, final schedule, final engineering design, and other variables.

The cost estimates include capital costs (including fixed-price remedial construction) and long-term O&M costs (post-remediation). Present worth costs were developed for each alternative assuming a discount rate of 2.7 percent. The estimates for all alternatives utilize a 30-year project life for costing purposes, although the timeframe to achieve RAOs is expected to be longer. The costs of Alternatives 1 through 6 have been updated from the costs presented in the Final FS (Jacobs, 2002) to January 2008 using the Engineering News Record construction cost index, and the costs of 5-year reviews have been added to all alternatives. Also, the cost of Alternative 1 has been updated to reflect the ongoing cap maintenance/inspection activities and the implementation of LUCs under the Interim ROD for LHAAP-16.

The progression of present worth costs from the least expensive alternative to the most expensive alternative is as follows: Alternative 1, Alternative 7, Alternative 3a, Alternative 3b, Alternative 4, Alternative 6, Alternative 2, Alternative 5a, and Alternative 5b. Lowest costs are associated with Alternative 1 because no further remedial activities would be conducted. Alternative 7 has the lowest present worth and capital costs of the action alternatives. Alternatives 3a, 3b, and 4 are next in costs (all $5,000,000 or below). While Alternatives 3a and 3b rely heavily on a passive treatment component (MNA), Alternative 7 utilizes active technologies (in situ bioremediation and biobarriers) prior to MNA; those active technologies lead to much lower monitoring costs in the future, thus giving Alternative 7 a lower total present value cost. The large O&M cost for groundwater treatment (Alternative 2) and the higher capital and O&M cost of in situ vapor extraction (Alternative 6) make these alternatives roughly twice as expensive as Alternatives 3a, 3b, and 4. However, if other sites require use of the LHAAP groundwater treatment plant, the cost of Alternative 2 will be comparable to Alternative 3.

Alternatives 5a (present worth of $13 million) and 5b (present worth of $116 million) are considerably more expensive because of the combination of high capital costs and high O&M costs. The contingent action costs do not change the order of costs.

8. State/Support Agency Acceptance

The USEPA and TCEQ have reviewed the Proposed Plan. Comments received from the USEPA and TCEQ have been incorporated. Both agencies concur with the preferred alternative.

9. Community Acceptance

Community acceptance of the preferred alternative will be evaluated after the public comment period ends. Public comments will be described and addressed in the ROD for the site.

SUMMARY OF THE PREFERRED ALTERNATIVE

Alternative 7, capping, LUCs, in situ enhanced bioremediation in a target area, passive biobarriers, and MNA, is the preferred alternative for LHAAP-16 and is consistent with the intended future use of the site as a national wildlife refuge. The approximate locations of the active components of the remedy are presented on **Figure 4**; MNA will be implemented for areas outside the influence of the active remedies. This alternative is recommended because it will be protective of human health due to the implementation of LUCs prohibiting unauthorized use of the cap and groundwater, thereby eliminating the potential contaminant exposure pathway for human receptors. Further, this alternative will satisfy the RAOs for LHAAP-16 and will reduce the COC concentrations in groundwater and control discharge of contamination to Harrison Bayou. Groundwater and surface water monitoring will be conducted to confirm that COC concentrations in the groundwater plume are declining through natural processes and that Harrison Bayou is protected from exceedances of the cleanup levels. The passive biobarriers component of this alternative will provide additional protection of Harrison Bayou. Monitoring will continue until it is demonstrated that there is no further threat of releases of contaminated groundwater into the surface water and the groundwater can be used without restriction.

Based on a preliminary natural attenuation evaluation, groundwater cleanup levels are expected to be met through natural attenuation in approximately 280 years or longer (Shaw 2010). The time frame will be reevaluated after additional sampling is conducted following shut down of the extraction system and implementation of in situ bioremediation and the passive

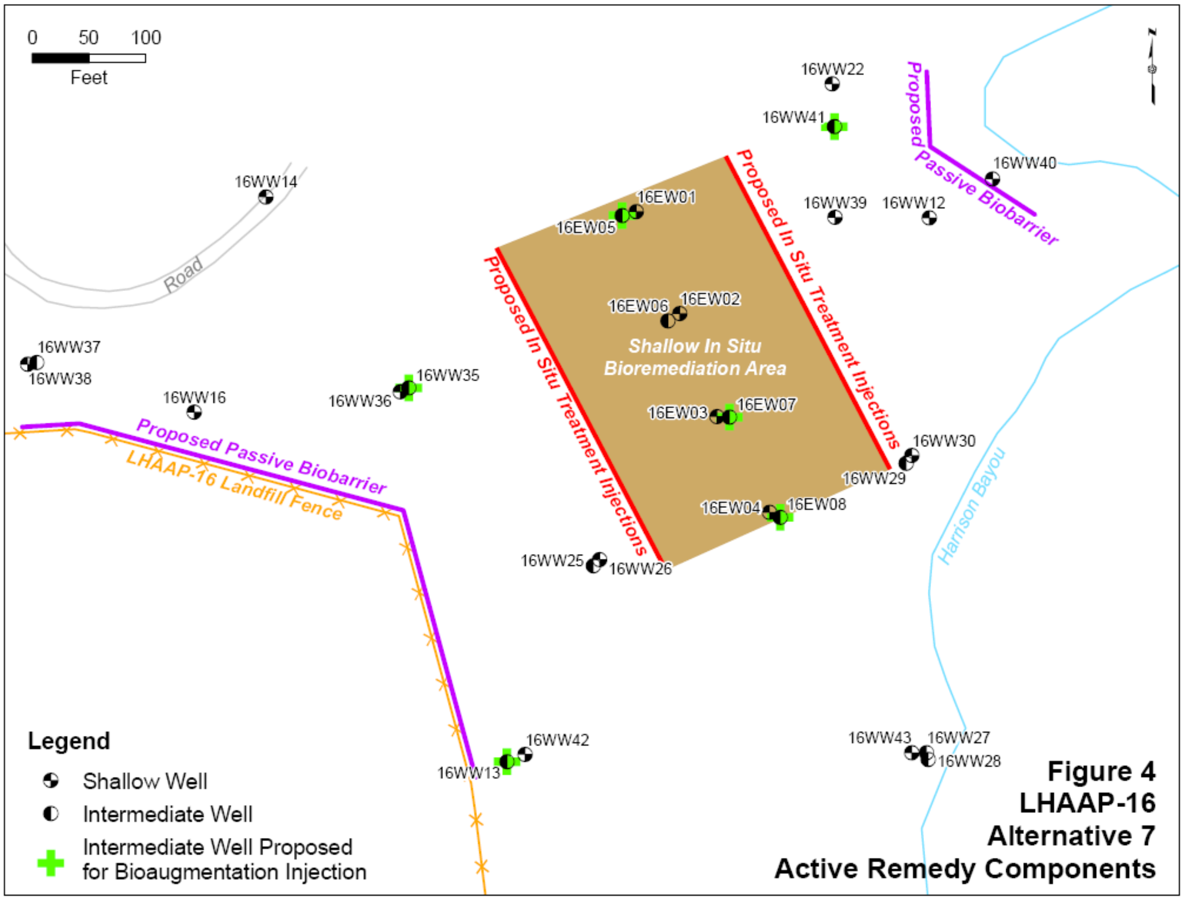


Figure 4
LHAAP-16
Alternative 7
Active Remedy Components

biobarriers. Natural attenuation will be evaluated after two years of quarterly monitoring. If proper conditions of natural attenuation are established, monitoring will continue at a reduced frequency. Otherwise, re-application of bio-amendments (i.e., additional in situ bioremediation) will be implemented.

Maintenance of the LUCs and continued environmental monitoring will be required while the landfill waste materials remain on site and the groundwater COC concentrations exceed their respective cleanup levels. The effectiveness of LUCs, cap maintenance, and long-term monitoring will be evaluated during five-year CERCLA reviews and inspections of any physical mechanisms in place at LHAAP-16. The Five-Year Reviews may indicate the need for components of this alternative to be modified based on existing and expected future surface water and groundwater conditions.

Alternative 7 is readily implementable and no significant short-term risks to worker health and safety or to the community would be expected. The present worth cost of Alternative 7 is lower than the other remedial alternatives except for Alternative 1, the No Further Action alternative.

Based on the information currently available, the U.S. Army believes that the preferred alternative meets the threshold criteria and provides the best balance of tradeoffs among the other alternatives with respect to the CERCLA §121(b) criteria used to evaluate remedial alternatives. The preferred alternative will 1) be protective of human health and the environment; 2) comply with ARARs; 3) be cost-effective; 4) utilize permanent solution; and 5) utilizes treatment as a principal element.

The Army intends to present details of the groundwater and surface water monitoring plan, and the MNA remedy implementation in a remedial design for LHAAP-16.

The remedy selected in the ROD may change from the preferred alternative presented here, based on public comment.

Notification of nonresidential use will accompany all transfer documents and will be recorded in the County Courthouse. Five-Year Reviews will be performed to document that the remedy remains protective of human health and the environment.

COMMUNITY PARTICIPATION

The U.S. Army, USEPA, and TCEQ provide information regarding LHAAP-16 through public meetings, the Administrative Record file for the facility, and announcements published in the Shreveport Times and Marshall News Messenger newspapers.

The dates for the public comment period, the date, location, and time of the public meeting, and the locations of the Administrative Record files are provided on the front page of this Proposed Plan.

Any significant changes to the Proposed Plan, as presented in this document, will be identified and explained in the ROD.

Primary Reference Documents for LHAAP-16

Environmental Security Technology Certification Program (ESTCP), 2005, *DATA ANALYSIS WHITE PAPER FOR: Remediation of Perchlorate through Semi-Passive Bioremediation at the Longhorn Army Ammunitions Plant,* ESTCP Project 200219, Revision 1.0, May.

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U.S. Environmental Protection Agency (USEPA), 1993, *Presumptive Remedy for CERCLA Municipal Landfill Sites, EPA/540/F-93/035.*

USEPA, 1996, *Application of CERCLA Presumptive Remedy to Military Landfill Sites, EPA/540F-96/020.*

GLOSSARY OF TERMS

Administrative Record — The body of reports, official correspondence, and other documents that establish the official record of the analysis, cleanup, and final closure of a CERCLA site.

ARARs — Applicable or relevant and appropriate requirements. Refers to the federal and state requirements that a selected remedy will attain.

Attenuation — The process by which a compound is reduced in concentration over time, through absorption, adsorption, degradation, dilution, and/or transformation.

Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) — This law authorizes the Federal Government to respond directly to releases (or threatened releases) of hazardous substances that may be a danger to public health, welfare, or the environment. The U.S. Army currently has the lead responsibility for these activities at LHAAP.

Environmental Media — Major environmental categories of substances that surround or contact humans, animals, plants, and other organisms (e.g. surface water, ground water, soil or air) and through which chemicals or pollutants move.

Exposure — Contact of an organism with a chemical or physical agent. Exposure is quantified as the amount of the agent available at the exchange boundaries of the organism (e.g., skin, lung, digestive tract, etc.) and available for absorption.

Groundwater — Underground water that fills pores in soil or openings in rocks to the point of saturation.

Hazard Index — The hazard index is the sum of the hazard quotients for all chemicals to which an individual is exposed. A hazard index value of 1.0 or less indicates that no adverse non-cancer human health effects are expected to occur. Each hazard quotient is a comparison of an estimated chemical intake (dose) with a reference dose level below which adverse health effects are unlikely. Each hazard quotient is expressed as the ratio of the estimated intake (numerator) to the reference dose (denominator). The value is used to evaluate the potential for non-cancer health effects, such as organ damage, from chemical exposures.

Maximum Contaminant Level (MCL) — The maximum contaminant level is the maximum permissible level of a contaminant in a public water system. MCLs are defined in the Code of Federal Regulation (40 CFR 141, National Primary Drinking Water Regulations, which implement portions of the Safe Drinking Water Act). The TCEQ has adopted MCLs as the regulatory cleanup levels for both industrial and residential uses. Any detected compound in the groundwater samples with a MCL was evaluated by comparing it to its associated MCL.

Proposed Plan — A report for public comment highlighting the key factors that form the basis for the selection of the preferred remediation alternative.

Remedial Action — The actual construction or implementation phase of a Superfund site cleanup that follows remedial design.

Risk Assessment — An analysis of the potential adverse health effects (current and future) caused by hazardous substances at a site in the absence of any actions to control or mitigate these releases (i.e., under an assumption of no action). The assessment contributes to decisions regarding appropriate response alternatives.

Superfund — The common name used for CERCLA; also referred to as the Trust Fund. The Superfund Program was established to help fund cleanup of hazardous waste sites. It also allows legal action to force those responsible for sites to clean them up.

ACRONYMS

µg/L	micrograms per liter
ARARs	applicable or relevant and appropriate requirements
BERA	Baseline Ecological Risk Assessment
BHHRA	baseline human health risk assessment
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COC	chemical of concern
DCE	dichloroethene
DNT	dinitrotoluene
ECOP	environmental condition of property
FFA	Federal Facility Agreement
FS	feasibility study
HI	hazard index
IRA	interim remedial action
LHAAP	Longhorn Army Ammunition Plant
LUC	land use control
MCL	maximum contaminant level
MNA	monitored natural attenuation
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
O&M	operation and maintenance
RAO	remedial action objective
RI	remedial investigation
ROD	record of decision
TCE	trichloroethene
TCEQ	Texas Commission on Environmental Quality
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
VOC	volatile organic compound

USE THIS SPACE TO WRITE YOUR COMMENTS

Your input on the Proposed Plan for LHAAP-16 is important to the U.S. Army. Comments provided by the public are valuable in helping the U.S. Army select a final remedy for these sites.

You may use the space below to write your comments, then fold and mail to Dr. Rose M. Zeiler, P.O. Box 220, Ratcliff, Arkansas 72951. Comments must be postmarked by November 8, 2010. If you have questions about the comment period, please contact Dr. Rose M. Zeiler at (479) 635-0110. Those with electronic communications capabilities may submit their comments to the U.S. Army via Internet at the following e-mail address: rose.zeiler@us.army.mil

FINAL
PROPOSED PLAN
FOR LHAAP-17
BURNING GROUND NO. 2/FLASHING AREA
GROUP 2

ISSUED BY: U.S. ARMY

Longhorn Army Ammunition Plant
Karnack, Texas

May 2010

INTRODUCTION

The purpose of this Proposed Plan is to present for public review the remedial alternatives for LHAAP-17. This Proposed Plan identifies the Preferred Remedial Alternative for LHAAP-17, site of the former Burning Ground No.2/ Flashing Area, at Longhorn Army Ammunition Plant (LHAAP). This plan includes summaries of other potential remedial alternatives evaluated for implementation at the site. The primary purpose of the Proposed Plan is to facilitate public involvement in the remedy selection process. The Proposed Plan provides the public with basic background information about LHAAP-17, identifies the preferred final remedy for the potential threats posed by the chemical contamination at the site, explains the rationale for the preference, and describes other remedial options considered. The preferred alternative for LHAAP-17 is Alternative 4 (excavation and off-site disposal of soil; groundwater extractions, monitored natural attenuation [MNA] and land use controls [LUCs] for groundwater). The extracted groundwater would be conveyed to the existing groundwater treatment plant for treatment.

The U.S. Army is issuing this Proposed Plan for public review, comment, and participation to fulfill part of its public participation responsibilities under Section 117(a) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980 as amended by the Superfund Amendments and Reauthorization Act of 1986, and under Section 300.430(f)(2) of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). CERCLA prescribes a step-wise progression of activities to respond to risk posed by contaminated sites **(Figure 1)**.

Dates to remember: June 10 to July 10, 2010
MARK YOUR CALENDER

PUBLIC COMMENT PERIOD:
June 10, 2010 to July 10, 2010
The U.S. Army will accept written comments on the Proposed Plan during the public comment period.

PUBLIC MEETING: The U.S. Army will hold a public meeting to explain the Proposed Plan for LHAAP-17. Oral and written comments will be accepted at the meeting. The meeting will be held on June 29, 2010 from 6:00 p.m. to 8:00 p.m. at Karnack Community Center.

For more information, see the Administrative Record at the following location:

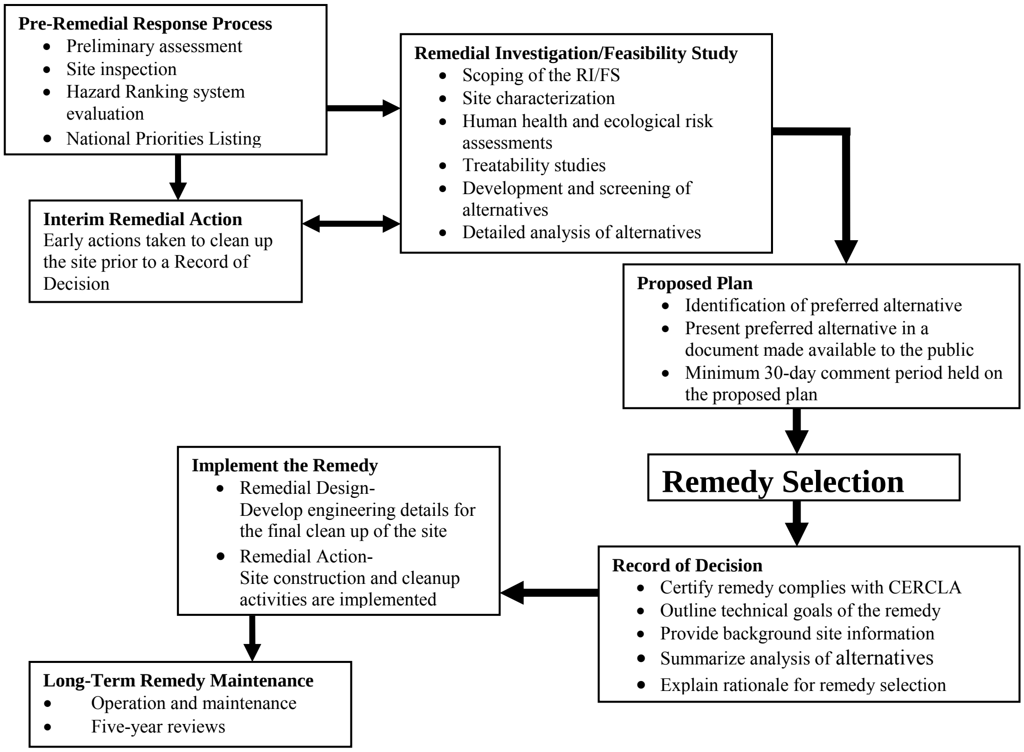
Marshall Public Library
300 S. Alamo
Marshall, Texas 75670

Business Hours:
Monday – Thursday (10:00 a.m. – 8:00 p.m.)
Friday – Saturday (10:00 a.m. – 5:00 p.m.

For further information on LHAAP-17, please contact:
Dr. Rose M. Zeiler
Site Manager
Longhorn Army Ammunition Plant
P.O. Box 220
Ratcliff, Arkansas, 72951
Direct No.: (479) 635-0110
E-mail address: rose.zeiler@us.army.mil

The preparation and review of a Proposed Plan is a distinct step required by CERCLA. This Proposed Plan summarizes information that can be found in greater detail in the Remedial Investigation (RI) Report, the Data Gaps Investigation, the Feasibility Study (FS) Report (including the Natural Attenuation Evaluation Report and the Additional Investigation Data Summary Report), the Installation-Wide Baseline Ecological Risk Assessment (BERA), and other supporting documents that are contained in the LHAAP-17 Administrative Record that is publically available in the Marshall Public Library. The project management team, including the U.S. Army, U.S. Environmental Protection Agency

Figure 1. CERCLA Remedial Response Process for Site Cleanup



(USEPA), and the Texas Commission on Environmental Quality (TCEQ) encourages the public to review these documents and to comment on the alternatives presented in this Proposed Plan.

The U.S. Army is acting in partnership with USEPA Region 6 and TCEQ. As the lead agency for environmental response actions at LHAAP, the U.S. Army is charged with planning and implementing remedial actions at LHAAP. The regulatory agencies assist the U.S. Army by providing technical support, project review, project comment, and oversight in accordance with the CERCLA and the NCP as well as the Federal Facility Agreement (FFA).

The Proposed Plan summarizes site characteristics, scope and role of the response action, and site risks. This is followed by a presentation of the remedial action objectives (RAOs) and a summary of remedial alternatives for LHAAP-17. Finally, an evaluation of alternatives and a summary of the preferred alternative are presented.

SITE BACKGROUND

LHAAP is located in central-east Texas in the northeastern corner of Harrison County **(Figure 2)**. The installation occupies approximately 1,400 of its former 8,416 acres between State Highway 43 at Karnack, Texas, and the western shore of Caddo Lake. The nearest cities are Marshall, Texas, approximately 14 miles to the southwest, and Shreveport, Louisiana, approximately 40 miles to the southeast. Caddo Lake, a large freshwater lake situated on the Texas-Louisiana border, bounds LHAAP to the north and east.

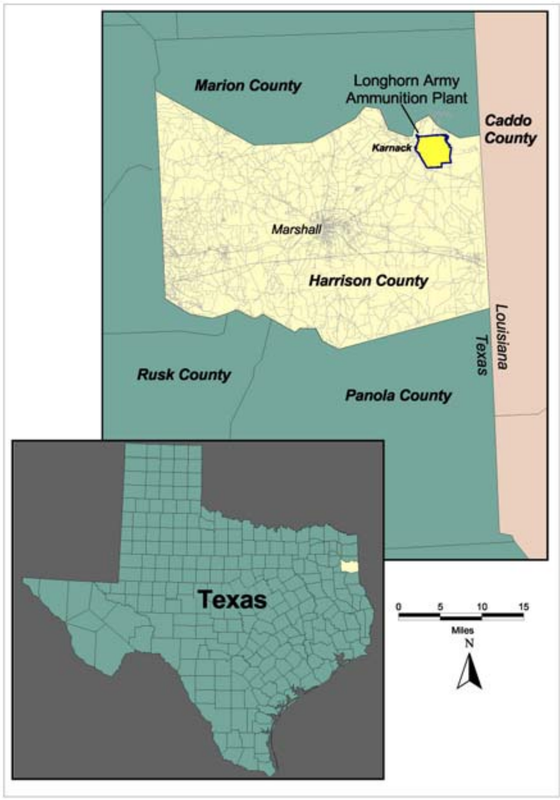


Figure 2 Location of the Longhorn Army Ammunition Plant, Harrison County, Texas

The U.S Army has transferred nearly 7,000 acres to the U.S. Fish and Wildlife Service (USFWS) for management as the Caddo Lake National Wildlife Refuge.

The property transfer process is continuing as responses are completed at individual sites. The local restoration advisory board has been kept informed of previous investigations at this site through regularly held quarterly meetings. Additionally, the administrative record is updated at least twice per year and is available at the Marshall Public Library.

Due to releases of chemicals from facility operations, LHAAP was placed on the Superfund National Priorities List (NPL) on August 9, 1990. Activities to remediate contamination associated with the listing of LHAAP as a Superfund site began in 1990. After being listed on the NPL, the U.S. Army, the USEPA, and the Texas Water Commission (currently known as the TCEQ) entered into a CERCLA Section 120 FFA for remedial activities at LHAAP. The FFA became effective December 30, 1991. LHAAP operated until 1997 when it was placed on inactive status and classified by the U.S. Army Armament, Munitions, and Chemical Command as excess property.

LHAAP-17 was originally listed as an NPL site in the FFA due to threatened releases of hazardous substances, pollutants or contaminants. The shallow and intermediate groundwater zones and the soil at LHAAP-17 are contaminated.

LHAAP-17, known as the Burning Ground No. 2/Flashing Area, is located in the southeastern portion of LHAAP **(Figure 3)**. The site covers approximately 3.9 acres. The site was used as a burning ground from 1959 through 1980. In 1959, the materials removed from the TNT Production Area (LHAAP-29) and the TNT Waste Disposal Plant (LHAAP-32) during demolition were burned and/or flashed at LHAAP-17. Bulk trinitro-toluene (TNT), photo flash powder, and reject material from Universal Match Corporation operations were burned at LHAAP-17. The site was used as a flashing area to decontaminate recoverable metal byproducts until 1980, when it became inactive.

Between 1982 and 2009, numerous investigations were conducted to identify potential contamination at LHAAP-17. Media investigated included soil, groundwater, surface water, and sediment. These investigations included a Pre-RI investigation in 1982 and 1987; Phase I, Phase II, and Phase III RIs conducted in 1993, 1995, and 1998; and investigations by the U.S. Army in 1998. The results of these investigations are summarized in the Final Remedial Investigation Report –

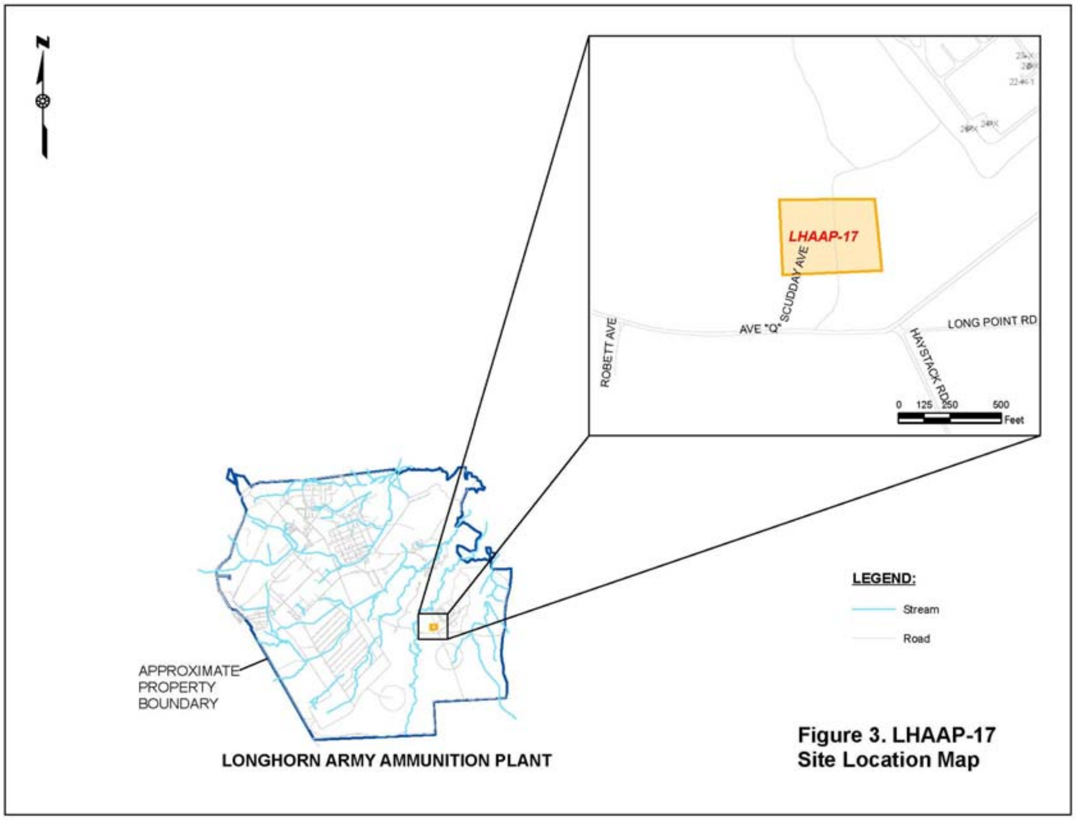


Figure 3. LHAAP-17 Site Location Map

Group 2 Sites (Group 2 RI) (Jacobs, 2001). The Final Baseline Human Health and Screening Ecological Risk Assessment for the Group 2 Sites (BHHRA) (Jacobs, 2002) was performed using the data presented in the Group 2 RI. The BHHRA identified explosives and dioxins as chemicals of concern (COCs) for soil and perchlorate, explosives, and chlorinated solvents as COCs for groundwater at LHAAP-17. The screening ecological risk assessment concluded that a site-wide baseline ecological risk assessment should be conducted.

Additional investigations were conducted after the BHHRA was completed. In 2002, a site-wide perchlorate investigation was conducted and reported in the Final Project Report – Plant-Wide Perchlorate Investigation (STEP, 2005). In 2003-2004, an Environmental Site Assessment Phase I and II was conducted (Plexus, 2005). In 2003 and early 2004, a perchlorate treatability study was conducted at LHAAP-17 and documented in the Treatability Demonstration Study (PEC, 2004).

Between 2004 and 2009, several follow-up investigations were performed to further delineate the extent of contamination identified during previous sampling events. These include the data gaps investigation in 2004 (Shaw, 2007a), the BERA in 2006 (Shaw, 2007b), sampling for attenuation evaluation in 2007, additional sampling and new wells in 2008, and additional sampling in 2009, which are reported in the Final FS (Shaw, 2010).

SITE CHARACTERISTICS

The surface features at LHAAP-17 include two 185-feet by 305-feet cleared areas, separated by a gravel access road. The site is covered with grass and scattered brush and has been graded above the surrounding terrain. The topography is relatively flat. Surface drainage flows to ditches along the eastern and western boundaries of the site and then to Harrison Bayou. Harrison Bayou is located to the west of LHAAP-17 flowing approximately 1,200 feet northwest of the site towards Caddo Lake. The lake is a source of drinking water for several neighboring communities in Louisiana.

Groundwater at the site was encountered at 18 to 35 feet below ground surface (bgs) in the shallow groundwater zone, approximately 55 feet bgs in the intermediate zone, and about 152 feet bgs in the deep groundwater zone. The predominant groundwater flow in the shallow and intermediate zones at the site is generally to the northwest towards Harrison Bayou, but historical groundwater flow direction has varied to the west or to the north.

Contamination was found in the soil and groundwater (shallow and intermediate zones). However, no principal threat source material was identified at LHAAP-17.

The COCs for LHAAP-17 identified in the FS for the various media are:

- Soil COCs are explosives (2,4,6-TNT, 2,4-dinitrotoluene [DNT], 2,6-DNT), dioxin (2,3,7,8- tetrachlorodibenzo-p-dioxin [TCDD] toxicity equivalent quotient [TEQ]), perchlorate (potential soil COC based on groundwater concentrations), and barium.
- Shallow groundwater COCs are perchlorate and volatile organic compounds (VOCs) (1,2-dichloroethane [DCA], 1,1-dichloroethene [DCE], cis-1,2-DCE, trichloroethene [TCE] and vinyl chloride [VC]).
- Intermediate groundwater COCs are TCE and its daughter products (DCE and VC).

There are approximately 8,000 cubic yards of contaminated soil proposed to be removed for ecological and human health risk mitigation (see **Figure 4** for approximate areas). The maximum 2,4,6-TNT in the soil is 10,000 milligram per kilogram (mg/kg). Other explosives, 2,4-DNT and 2,6-DNT, have maximum concentrations of 4,000 mg/kg and an estimated concentration of 840 mg/kg, respectively. Additionally, perchlorate has been detected in the soil at a maximum concentration of 7.11 mg/kg. The concentrations of 2,3,7,8-TCDD TEQ and barium affecting ecological receptors are 1.9×10^{-4} mg/kg and 20,500 mg/kg, respectively.

The shallow groundwater zone has approximately 4,500,000 gallons of contaminated groundwater, and the intermediate zone has approximately 55,000 gallons; their areal extent is shown on **Figure 5**. The shallow groundwater perchlorate plume has the largest extent with detected concentrations at160,000 micrograms per liter (μg/L), but the intermediate zone does not have a perchlorate plume. The maximum TCE concentration in the shallow groundwater is 6,090 μg/L and in the intermediate zone is 10.8 μg/L. Other VOCs detected in the shallow groundwater are 1,2-DCA at an estimated concentration of 35.8 J μg/L and 1,1-DCE at 70 μg/L. Other COCs identified for the shallow and intermediate groundwater zones are degradation daughter products of VOCs that have not been detected above their MCLs.

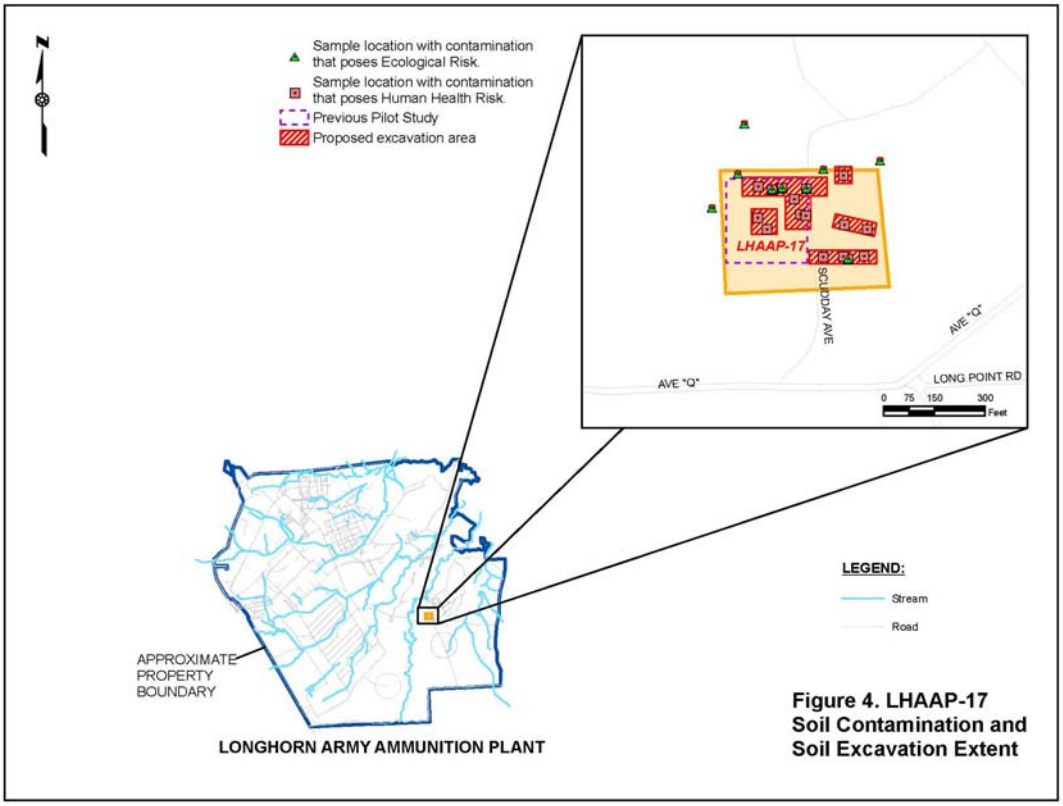


Figure 4. LHAAP-17 Soil Contamination and Soil Excavation Extent

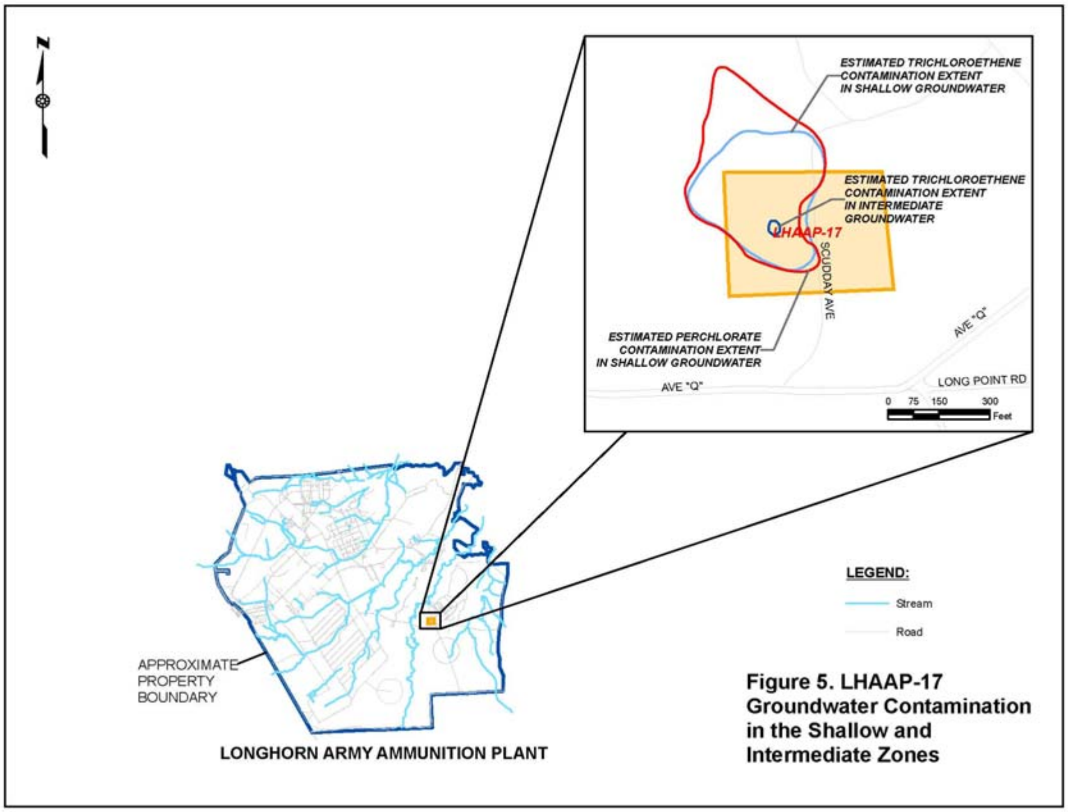


Figure 5. LHAAP-17 Groundwater Contamination in the Shallow and Intermediate Zones

SCOPE AND ROLE OF THE PROPOSED ACTION

The scope and role of the action discussed in this Proposed Plan includes all the remedial actions for this site. The recommended remedial action at LHAAP-17 will prevent potential risks associated with exposure to contaminated soil and groundwater in both the shallow and intermediate zones. Groundwater at Longhorn is not currently being used as drinking water, nor may be used in the future based on its reasonably anticipated use as a national wildlife refuge. However, when establishing the RAOs for this response action, the U.S. Army has considered the NCP's expectation to return useable groundwater to its potential beneficial use wherever practicable. The U.S. Army has also considered the State of Texas designation of all groundwater as potential drinking water, unless otherwise classified, consistent with Texas Administrative Code (TAC), Title 30, §335.563 (h)(1). The Army intends to return the contaminated shallow and intermediate groundwater zones at LHAAP-17 to its potential beneficial uses, which is considered to be the attainment of Safe Drinking Water Act maximum contaminant levels (MCLs) to the extent practicable, and consistent with Code of Federal Regulations, Title 40, §300.430(e)(2)(i)(B&C). If an MCL is not available for a chemical, the promulgated TCEQ medium-specific concentration (MSC) for groundwater that could be used for industrial purposes will be used (TCEQ, 2006). If return to potential beneficial uses is not practicable, the NCP expectation is to prevent further migration of the plume, prevent exposure to contaminated groundwater, and evaluate further risk reduction.

The remedial action will include groundwater monitoring to demonstrate that the plume is not migrating and to verify that contaminant levels are being reduced. Land use controls (LUCs) that restrict groundwater use may be terminated when groundwater contaminant levels are reduced to the cleanup levels.

The removal of source soils will positively impact groundwater by eliminating the potential for the leaching of contaminants from the soil into groundwater and will remove the contamination that poses a risk to ecological receptors.

SUMMARY OF SITE RISKS

The reasonably anticipated future use of this site is nonresidential use as part of the Caddo Lake National Wildlife Refuge. This anticipated future use is based on a Memorandum of Agreement (U.S. Army, 2004) between the USFWS and the U.S. Army which documents the transfer process of the LHAAP acreage to USFWS to become the Caddo Lake National Wildlife Refuge. Presently the Caddo Lake National Wildlife Refuge occupies nearly 7,000 acres of the former installation. The property must be kept as a national wildlife refuge unless there is an act of Congress which removes the parcel or the land is exchanged in accordance with the National Wildlife Refuge System Administration Act of 1966 and the National Wildlife Refuge System Act Amendments of 1974.

As part of the RI/FS, a baseline human health risk assessment and screening ecological risk assessment were conducted for LHAAP-17 to determine current and future effects of contaminants on human health and the environment to support technical review and risk management decisions.

Human Health Risks

Using data presented in the RI, the baseline risk assessment estimates the risk that the site poses if no action were taken. It provides the basis for taking action and identifies the contaminants and exposure pathways that need to be addressed by the remedial action. The applicable receptor scenario for future use as a national wildlife refuge is a hypothetical future maintenance worker. For carcinogens, risks are generally expressed as the incremental probability of an individual developing cancer over a lifetime as a result of exposure to the carcinogen and are expressed in scientific notation (e.g. 1×10^{-6}). USEPA's acceptable risk range for site-related exposures is 1×10^{-4} to 1×10^{-6}, i.e., one-in-ten thousand to one-in-one million. The potential for non-cancer effects is expressed by a ratio of the exposure to the toxicity. An individual chemical ratio less than 1 indicates that toxic non-cancer effects from that chemical are unlikely. A non-cancer hazard index (HI) is calculated when all the ratios for the individual chemicals are summed. An HI greater than 1 indicates that site-related exposures may present a risk to human health. Thus, an HI of less than 1 is acceptable since it indicates toxic non-cancer effects are unlikely.

The cancer risk and the non-cancer HI were calculated based on a hypothetical future maintenance worker exposure to the site environmental media (e.g., soil and groundwater) under an industrial scenario. The human health risk assessment concluded that chemicals in soil pose an unacceptable cancer risk (1.4×10^{-3}) and non-cancer hazard (HI of 37) to a hypothetical future maintenance worker under the industrial scenario. The groundwater was also determined to pose an unacceptable cancer risk (1.6×10^{-3}) and a non-cancer hazard (HI of 3,500) to a hypothetical future maintenance worker. The risk and HI values are based on the industrial exposure scenario that includes drinking the water or using the water for hand washing or showering. Soil contaminants retained as COCs in the FS contributing to human health cancer risk are 2,4-DNT, 2,4,6-TNT and 2,6-DNT, and to non-cancer hazard are 2,4-DNT and 2,4,6-TNT.

The potential soil-to-groundwater pathway was evaluated for the emerging contaminant perchlorate (found in groundwater) and the explosives posing risks or hazards in soil. The concentrations of these chemicals were compared to their TCEQ soil MSCs for industrial use based on groundwater protection (GWP-Ind), which is more stringent than the MSCs for industrial use based on inhalation, ingestion, and dermal contact. Because the GWP-Ind is more stringent, they are the proposed soil cleanup levels for human health. Those cleanup levels are:

• 2,4,6-TNT	5.1 mg/kg
• 2,4-DNT	0.042 mg/kg
• 2,6-DNT	0.042 mg/kg
• Perchlorate	7.2 mg/kg

Since these soil cleanup levels apply to the soil-to-groundwater pathway and not direct human contact, they would apply to the soil interval from the surface down to where groundwater is encountered.

Groundwater contaminants retained as COCs in the FS contributing to human health cancer risk are TCE, 1,1- DCE, and 1,2-DCE, and to non-cancer hazard are perchlorate, TCE, 1,2-DCE, and 1,1-DCE. TCE degrades to cis-1,2-DCE and vinyl chloride, which are also considered COCs. The MCLs are proposed as the cleanup levels for groundwater for the following:

• TCE	5 µg/L
• 1,1-DCE	7 µg/L
• 1,2-DCE	5 µg/L
• cis-1,2-DCE	70 µg/L
• Vinyl Chloride	2 µg/L

For perchlorate, the TCEQ groundwater MSC for industrial use (GW-Ind) of 72 µg/L is also a proposed cleanup level since an MCL has not been promulgated. Detected concentrations of COCs exceed the proposed cleanup level in the shallow zone. Currently only TCE has been detected above its proposed cleanup level in the intermediate zone.

Ecological Risks

The ecological risk for LHAAP-17 was addressed in the installation-wide BERA (Shaw, 2007b). For the BERA, the entire installation was divided into three large sub-areas (i.e., the Industrial Sub-Area, Waste Sub-Area, and Low Impact Sub-Area) for the terrestrial evaluation. The individual sites at LHAAP were grouped into one of these sub-areas, which were delineated based on commonalities of historic use, habitat type, and spatial proximity to each other. The conclusions regarding the potential for chemicals detected at individual sites to adversely affect the environment were made in the context of the overall conclusions of the sub-area in which the site falls. Site LHAAP-17 lies within the Waste Sub-Area.

For the Waste Sub-Area, the BERA concluded that unacceptable ecological risk was present (Shaw, 2007b) associated with barium, 2,4-DNT, 2,6-DNT, 2,4,6-TNT, and dioxin (reported as 2,3,7,8-TCDD TEQ]. Detected concentrations of these chemicals exceeded the Waste Sub-Area ecological preliminary remediation goal (EcoPRGs) and are targeted for excavation. Some of the areas are co-located with excavation for human health. For ecological receptors, the depth of excavation varies since they are based on the different ecological receptors (deer mouse from 0 to 0.5 feet and the short-tailed shrew from 0 to 3 feet).

Proposed soil cleanup levels for the ecological receptors are as follows:

• 2,4,6-TNT	4.7 mg/kg (0 to 3 feet)
• 2,4-DNT	12 mg/kg (0 to 3 feet)
• 2,6-DNT	6.8 mg/kg (0 to 3 feet) 2.7 mg/kg (0 to 0.5 feet)
• 2,3,7,8-TCDD TEQ	4×10^{-6} mg/kg (0 to 3 feet)
• Barium	222 mg/kg (0 to 0.5 feet) 520 mg/kg (0 to 3 feet)

It is the current judgment of the U.S. Army that the preferred alternative identified in this Proposed Plan, or one of the other active measures considered in the Proposed Plan, is necessary to protect the public health or welfare or the environment from actual or threatened releases of hazardous substances into the environment.

REMEDIAL ACTION OBJECTIVES

The Army recognizes USEPA's policy to return all groundwater to potential beneficial uses, based upon the non-binding programmatic expectation in the NCP.

The RAOs for LHAAP-17, which address contamination associated with the media at the site and take into account the future uses of LHAAP streams, land, and groundwater are:

- Protect human health for the hypothetical future maintenance worker by preventing exposure to contaminants in the soil and groundwater

- Prevent migration of contaminants to groundwater from potential sources in the soil
- Protect ecological receptors by preventing exposure to the contaminated soil
- Return groundwater to its potential beneficial use as drinking water, where practicable, within a reasonable time period given the particular site circumstances.

SUMMARY OF REMEDIAL ALTERNATIVES

The FS identified and screened remedial technologies and associated process options that may be appropriate for satisfying the RAOs for LHAAP-17 with respect to effectiveness, implementability, and cost. The following remedial alternatives were developed from the retained remedial technologies carried forward after the initial screening:

- Alternative 1 – No Action
- Alternative 2 – Excavation and Off-site Disposal for Soil; Monitored Natural Attenuation (MNA) and LUCs for Groundwater
- Alternative 3 – Excavation and Off-site Disposal for Soil; In Situ Bioremediation, MNA and LUCs for Groundwater
- Alternative 4 – Excavation and Off-site Disposal for Soil; Groundwater Extraction, MNA and LUCs for Groundwater

Common Elements. Four elements, LUCs, MNA, inspection and long-term monitoring (LTM), and soil excavation and off-site disposal, are common to Alternatives 2, 3, and 4. These elements are described below.

Land Use Controls (LUCs). The LUCs would be implemented to support the RAOs. The U.S. Army would be responsible for implementation, maintenance, inspection, reporting, and enforcement of the LUCs. The Army intends to provide details of the LUC implementation actions in a remedial design (RD) document. Until cleanup levels are met in the groundwater for Alternatives 2, 3, and 4, the LUCs would prevent human exposure to residual groundwater contamination presenting an unacceptable risk to human health by ensuring there is no withdrawal or use of groundwater beneath the sites for anything other than treatment, environmental monitoring, or testing. The groundwater restriction LUCs would be maintained until the concentrations of contaminants in groundwater have been reduced to cleanup levels. In addition, the Texas Department of Licensing and Regulation responsible for notifying well drillers of groundwater restrictions would be notified and a notification of LUCs with the Harrison County Courthouse would include a map showing the areas of groundwater restriction at the site.

In order to transfer this property (LHAAP-17), an Environmental Condition of Property (ECOP) document would be prepared and attached to the letter of transfer. The ECOP would include LUCs for groundwater as part of the Environmental Protection Provisions. The property would be transferred subject to the LUCs identified in the ECOP. These restrictions would prohibit or restrict property uses that may result in exposure to the contaminated groundwater (e.g., drilling restrictions, residential/ agricultural land use restrictions, drinking water well restrictions).

Monitored Natural Attenuation (MNA). MNA is a passive remedial action that relies on natural biological, chemical, and physical processes to reduce the mass and concentration of groundwater COCs under favorable conditions. MNA would assure the protection of human health and the environment by documenting that the contaminated groundwater remains localized with minimal migration and that contaminant concentrations are being reduced to cleanup levels. Monitoring activities would occur on a quarterly basis for the first two years and MNA effectiveness would be evaluated.

Inspection and Long-term Monitoring (LTM). Alternatives 2, 3, and 4 include inspection and long-term groundwater monitoring activities. Monitoring would be continued as required to demonstrate effectiveness of the remedies, to demonstrate compliance with applicable or relevant and appropriate requirements (ARARs), to-be-considered requirements, and RAOs, and to support CERCLA Five-Year Reviews. After the initial MNA monitoring period of 2 years, semiannual monitoring would be continued for 3 years. Then sampling frequency would be reduced to annually until the next CERCLA Five-Year Review. Future sampling frequencies would be evaluated in the CERCLA Five-Year Review.

Groundwater LUCs would remain in effect until cleanup levels are met.

Although the U.S. Army may later pass these procedural responsibilities to the transferee by property transfer agreement, the U.S. Army would retain ultimate responsibility for remedy integrity.

Excavation and Off-site Disposal of Contaminated Soil. Soil contamination would be excavated at LHAAP-17 under Alternatives 2, 3, and 4, and disposed off site. This action would eliminate ecological risk from direct contact as well as human health risk associated with both direct contact and the soil-to-groundwater pathway.

If soil is found that contains perchlorate that exceeds the TCEQ groundwater protection level of 7.2 mg/kg, it will be included with the remediation of the other soil. In 2004, a perchlorate study was performed by PLANTECO to identify suitable carbon sources for cleanup of perchlorate contaminated soil at LHAAP-17 (PEC, 2004); although the study reported to have reduced the perchlorate concentrations, final sampling results are not available. Thus, additional sampling will be conducted as part of the RD to determine the perchlorate concentrations and evaluate any potential impact to the groundwater.

Alternative 1 – No Action. As required by the NCP, the no action alternative provides a comparative baseline against which the action alternatives can be evaluated. Under this alternative, the groundwater would be left “as is” without implementing any additional containment, removal, treatment, or other mitigating actions. No other actions would be implemented to prevent potential human exposure to contaminated groundwater or to demonstrate that nearby surface water bodies are protected from groundwater impacts.

Estimated Capital Present Worth Cost: $0

Estimated Operation and Maintenance (O&M) Present Worth Cost: $0

Estimated Duration: -

Estimated Total Present Worth Cost: $0

Alternative 2 – Excavation and Off-site Disposal for Soil; MNA and LUCs for Groundwater

Alternative 2 would include excavation of the contaminated soil from LHAAP-17. MNA in both the shallow and intermediate zones would ensure that groundwater contamination remains localized and degrades over time. It is estimated to take approximately 120 years for TCE to attenuate to MCLs. Perchlorate is estimated to attenuate within this time frame, or approximately 15 years. Groundwater monitoring would continue until cleanup levels are met. LUCs would be implemented to prevent exposure to the contaminated groundwater until cleanup levels are achieved.

Estimated Capital Present Worth Cost: $1,440,000

Estimated O&M Present Worth Cost: $460,000

Cost Estimate Duration: 30 years

Estimated Total Present Worth Cost: $1,900,000

Alternative 3 – Excavation and Off-site Disposal of Soil; In Situ Bioremediation; MNA and LUCs for Groundwater

As with Alternative 2, contaminated soil would be removed. Groundwater contamination would be reduced in the groundwater via in situ bioremediation in the shallow zone. It is expected the in situ bioremediation would primarily reduce the perchlorate concentrations. This would make conditions favorable for MNA of TCE. MNA would be implemented in the shallow zone (after in situ bioremediation) and in the intermediate zone. The in situ bioremediation is expected to reduce the TCE concentration to its MCL in less than 120 years and perchlorate in less than 15 years. LUCS would be implemented to prevent exposure to the contaminated groundwater until cleanup levels are achieved.

Estimated Capital Present Worth Cost: $2,030,000

Estimated O&M Present Worth Cost: $590,000

Estimated Duration: 30 years

Cost Estimate Total Present Worth Cost: $2,620,000

Alternative 4 – Excavation and Off-site Disposal of Soil; Groundwater extraction; MNA and LUCs for Groundwater

As with Alternatives 2 and 3, contaminated soil would be removed. Groundwater contamination would be reduced throughout the shallow zone groundwater contaminant plume via groundwater extraction until perchlorate levels are reduced to 20,000 µg/L to make conditions favorable for MNA of TCE. If the trigger value of 20,000 µg/L of perchlorate has not been reached by the end of the estimated 1.5-year pumping period, pumping may cease, pending lead agency and regulatory approval to initiate a contingency action of in situ bioremediation followed by MNA (see Alternative 3 description for basic elements). If perchlorate levels are successfully reduced to 20,000 µg/L or below after the estimated 1.5-year pumping period, then two years of MNA sampling will be implemented. If MNA is not shown to be supported after 2 years of sampling, a contingency remedy of in situ bioremediation will be initiated. As in Alternatives 2 and 3, this alternative utilizes MNA to treat the intermediate zone. Perchlorate is expected to attenuate to its cleanup level in 15 years without pumping. The pump and treat step is expected to actively reduce the perchlorate concentrations, thus making conditions more favorable for TCE attenuation. TCE should attenuate to MCLs in less time than 120 years. Additionally, 1,2-DCA is estimated to attenuate to its MCL in 10 years. Similar to Alternative 3, LUCs would be implemented to prevent exposure to the contaminated groundwater until cleanup levels are achieved.

Estimated Capital Present Worth Cost: $1,570,000

Estimated O&M Present Worth Cost: $520,000

Estimated Duration: 30 years

Cost Estimate Total Present Worth Cost: $2,090,000

EVALUATION OF ALTERNATIVES

Nine criteria identified in the NCP, §300.430(e)(9)(iii), are used to evaluate the different remediation alternatives individually and against each other in order to select a remedy. This section profiles the relative performance of each alternative against the nine criteria, noting how it compares to the other alternatives under consideration. The nine evaluation criteria are discussed below. The "Detailed Analysis of Alternatives" can be found in the FS for LHAAP-17 (Shaw, 2010).

1. Overall Protection of Human Health and the Environment

The four alternatives provide varying levels of human health protection. Alternative 1, no action, does not achieve the RAOs and provides the least protection of all the alternatives; it provides no reduction in risks to human health or the environment because no measures would be implemented to eliminate the pathway for human exposure to soil or to the groundwater contamination and potential groundwater impacts to Harrison Bayou would not be addressed. Additionally, the soil pathway for ecological receptors would not be addressed.

Alternatives 2, 3, and 4 all satisfy the RAOs for LHAAP-17. They would remove the contaminated soil, restore the groundwater to cleanup levels and provide access and use restrictions for residual contamination. Alternatives 2, 3, and 4 would rely on LUCs to prevent access to the groundwater until cleanup levels are achieved by MNA. Alternatives 3 and 4 provide a level of overall protection similar to Alternative 2, but achieve cleanup levels for the shallow groundwater zone in a shorter time.

2. Compliance with ARARs

Alternative 1 does not comply with chemical-specific ARARs because no remedial action or measures would be implemented. Alternatives 2, 3, and 4 do comply with all chemical-specific ARARs for soil because the contaminated soil above the chemical-specific ARAR will be removed, and all chemical-specific groundwater ARARs because they will return the contaminated groundwater at LHAAP-17 to its potential beneficial use wherever practicable, in compliance with Safe Drinking Water Act MCLs as relevant and appropriate.

Location-specific and action-specific ARARs would not apply to Alternative 1 since no remedial activities would be conducted. Alternatives 2, 3, and 4 would comply with all location-specific and action-specific ARARs.

3. Long-Term Effectiveness and Permanence

Alternative 1 would be the least effective and permanent in the long term because no contaminant removal or treatment would take place and no measures would be implemented to control exposure risks posed by contaminated site soil and groundwater.

Alternative 2 would provide a moderate degree of long-term effectiveness by removing the source soils and providing restoration of the groundwater by MNA. LUCs would be required for groundwater for the protection of human health exposure.

Alternatives 3 and 4 would also provide a moderate degree of long-term effectiveness by removing the source soils and provide better long-term effectiveness by achieving cleanup levels in the shallow zone in a shorter time as compared to Alternative 2. Alternatives 3 and 4 would significantly reduce initial groundwater contaminant concentrations and thereafter rely on MNA and LUCs until the cleanup levels are achieved.

4. Reduction of Toxicity, Mobility, or Volume through Treatment

Alternative 1 does not employ treatment and would not result in a reduction of toxicity, mobility, or volume of contaminants.

Natural attenuation and in situ bioremediation or pumping/treatment coupled with excavation would permanently reduce the mass and concentration of contaminants and, therefore, the toxicity, mobility, and volume of the contaminants. MNA is a passive remedial action and in situ bioremediation is an active treatment process.

Alternatives 2, 3, and 4 would generate daughter products that may temporarily increase toxicity or mobility of the contaminant plume, with in situ bioremediation working in a shorter time frame and pumping and treatment working to reduce concentrations initially. The alternatives include monitoring so TCE daughter products would be quantified, documented and evaluated. Daughter product concentrations would be reduced under these alternatives to levels below their cleanup levels to return groundwater to its potential beneficial use as drinking water wherever practicable.

For Alternative 3, achievement of cleanup levels in groundwater would be expedited by implementing in situ bioremediation in areas of highest contaminant concentrations. Monitoring for contaminants would be performed to assess the effectiveness of the treatment. It is also anticipated that COCs would remain in the plume outside the treated areas and continue to attenuate to cleanup levels over time.

Achievement of cleanup goals would also be expedited for Alternative 4 by implementing pumping and treatment of the contaminated groundwater to reduce perchlorate concentrations throughout the plume.

The soil excavation in Alternatives 2, 3, and 4 would reduce mobility because perchlorate would be removed from the site and placed in a permitted disposal facility. Toxicity and volume would not be reduced by the excavation portion of the alternatives as the form and quantity of the perchlorate would not be altered.

5. Short-Term Effectiveness

Alternative 1 would not involve any remedial measures; therefore, no short-term risk to workers, the community or the environment would exist. The activities associated with Alternatives 2, 3, and 4 would be protective to the surrounding community from short-term risks except for minimal potential short-term risks during transport (possible accident when soil is transported off site) of perchlorate and explosive contaminated soil.

Alternatives 2, 3, and 4 would involve potential short-term risks to workers associated with exposure to contaminated groundwater from monitoring and/or operation of drilling/construction equipment.

Alternative 3 would have short-term risks to remediation workers associated with exposure while performing in situ bioremediation activities, including handling of additives/materials.

Alternatives 2, 3, and 4 include LUCs as elements of their remedies and would provide almost immediate protection from the contaminated groundwater by prohibiting installation of potable water wells through relatively quick LUC implementation. The time period to achieve groundwater cleanup levels is the most significant difference between Alternative 1 versus Alternatives 2, 3, and 4. Alternatives 3 and 4 are expected to take less time to achieve RAOs.

Alternative 4 would have short-term risks to the workers associated with exposure during increased operations at the LHAAP groundwater treatment system, which include chemical handling (caustic acids) and operation of a high-temperature catalytic oxidizer. The implementation of Alternatives 3 and 4 would require more time than Alternative 2.

6. Implementability

Under Alternative 1, no remedial action would be taken. Therefore, no difficulties or uncertainties would be associated with its implementation. For Alternatives 2, 3, and 4, soil excavation would require extensive coordination between excavation, sampling, transportation and disposal. For groundwater, Alternatives 3 and 4 are technically implementable, although less so than Alternative 2 because of the uncertainties associated with hydrogeologic conditions. Those conditions may impact the ability of in situ bioremediation or groundwater extraction to lower perchlorate concentrations quickly to levels that would be more amenable to MNA of TCE.

Alternative 3 would involve the use of in situ bioremediation, which requires specialized expertise to design and construct the in situ bioremediation treatment elements. A groundwater treatment system currently exists at the LHAAP and is easily accessible to the site; therefore, groundwater extraction for Alternative 4 technically would be readily implementable.

Administratively, all of the alternatives are implementable.

7. Cost

Cost estimates are used in the CERCLA FS process to eliminate those remedial alternatives that would be significantly more expensive than competing alternatives without offering commensurate increases in performance or overall protection of human health or the environment. The cost estimates developed are preliminary estimates with an intended accuracy range of +50 to –30 percent. Final costs will depend on actual labor and material costs, actual site conditions, productivity, competitive market conditions, final scope, final schedule, final engineering design, and other variables.

The cost estimates include capital costs (including fixed-price remedial construction) and long-term O&M costs (post-remediation). Overall present worth costs are developed for each alternative assuming a discount rate of 2.8 percent. The duration used for the estimates is a 30-year period.

The progression of present worth costs from the least expensive alternative to the most expensive alternative is as follows: Alternative 1, Alternative 2, Alternative 4, and Alternative 3. No costs are associated with Alternative 1 because no remedial activities would be conducted.

Alternative 2 has the lowest present worth and capital costs of the active remedial alternatives as no active remediation of groundwater would be implemented.

Alternative 3 has the highest present worth and capital costs primarily due to the activities associated with the injection phase of in situ bioremediation. The presence of the existing groundwater treatment system at LHAAP greatly reduces the costs associated with groundwater extraction in Alternative 4.

8. State/Support Agency Acceptance

The USEPA and TCEQ have reviewed the Proposed Plan. Comments received from the USEPA and TCEQ during the Proposed Plan development have been incorporated. Both agencies concur with the preferred alternative.

9. Community Acceptance

Community acceptance of the preferred alternative will be evaluated after the public comment period ends and will be described in the record of decision (ROD) for the site.

SUMMARY OF THE PREFERRED ALTERNATIVE

Alternative 4 (excavation and off-site disposal of soil; groundwater extraction, MNA, and LUCs for groundwater) is the preferred alternative for LHAAP-17 and is consistent with the intended future use of the site as a national wildlife refuge. This alternative would satisfy the RAOs for the site through the following:

- Contaminated soil removal with off-site disposal to protect the hypothetical future maintenance worker and ecological receptors and eliminate the soil-to-groundwater pathway
- Extraction and treatment of groundwater until the trigger level of 20,000 µg/L of perchlorate is reached in order to expedite MNA
- MNA to assure protection of human health and the environment by documenting that the contaminated groundwater remains localized with minimal migration and that contaminate concentrations are being reduced to MCLs
- LUCs that would ensure protection of human health by preventing exposure to groundwater until cleanup levels are met.

If the 20,000 µg/L of perchlorate level is not reached after approximately 1.5 years, a contingency remedy, such as in situ bioremediation described in Alternative 3 may be implemented to reduce the perchlorate levels more quickly so the conditions become amenable for TCE to attenuate naturally. The monitoring and reporting associated with MNA would continue until the cleanup levels are achieved.

By extracting contaminated groundwater, Alternative 4 intends to lower the highest concentrations of perchlorate in groundwater to levels more amenable to natural attenuation. The extracted contaminated groundwater would be conveyed to the existing on-site groundwater treatment plant for treatment. The groundwater plume is contaminated with both perchlorate and TCE, and high concentrations of perchlorate tend to inhibit degradation of the TCE, so removal of much of the perchlorate by extraction is expected to accelerate the TCE degradation by MNA. The performance of natural attenuation would be evaluated after two years of monitoring using data from the eight quarters and from the historical sampling events of the prior ten years. The performance objectives for groundwater remediation will be included in the RD. If it is found that the performance objectives are not met, a contingency remedy such as in situ bioremediation (see Alternative 3 description for basic elements) would be implemented. The decision regarding use of the contingency remedy to address the groundwater contamination would be considered after two years of MNA and would be implemented, if required, after approval of the RD.

The selected alternative offers a high degree of long-term effectiveness, can be easily and immediately implemented, and costs less than the other most comparable alternative, Alternative 3.

Based on information currently available, the U.S. Army believes the preferred alternative meets the threshold criteria and provides the best balance of tradeoffs among the other alternatives with respect to the CERCLA §121(b) criteria used to evaluate remedial alternatives. The preferred alternative will 1) be protective of human health and the environment; 2) comply with ARARs; 3) be cost-effective; 4) utilize a permanent solution; and 5) utilize an active treatment as a principal element. The selected remedy addresses the statutory preference for treatment to the maximum extent possible. No source materials constituting principle threats will be addressed within the scope of this action.

The Army intends to present details of the soil excavation plan, groundwater extraction plan, LUCs implementation plan, groundwater monitoring plan, and MNA remedy implementation in the RD for LHAAP-17.

The remedy selected in the ROD may change from the preferred alternative presented here, based on public comment.

Notification that the site is suitable for nonresidential use will accompany all transfer documents and will be recorded in the Harrison County Courthouse. Five-Year Reviews will be performed to document that the remedy remains protective of human health and the environment.

COMMUNITY PARTICIPATION

The U.S. Army, USEPA, and TCEQ provide information regarding LHAAP-17 through public meetings, the Administrative Record file for the facility, and announcements published in the Shreveport Times and Marshall News Messenger newspapers.

The dates for the public comment period, the date, location, time of the public meeting, and the locations of the Administrative Record files are provided on the front page of this Proposed Plan.

Any significant changes to the Proposed Plan, as presented in this document, will be identified and explained in the ROD.

PRIMARY REFERENCE DOCUMENTS FOR LHAAP-17

Jacobs Engineering Group Inc. (Jacobs), 2001, *Final Remedial Investigation Report for the Group 2 Sites Remedial Investigation (Sites 12, 17, 18/24, 29, and 32) at the Longhorn Army Ammunition Plant, Karnack, Texas,* April.

Jacobs, 2002, *Baseline Human Health and Screening Ecological Risk Assessment for the Group 2 Sites (Sites 12, 17, 18/24, 29, 32, 49, Harrison Bayou and Caddo Lake), Longhorn Army Ammunition Plant, Karnack, Texas,* February.

Planteco Environmental Consultants, LLC (PEC), 2004, *Draft Final In Situ Bioremediation of Perchlorate Contaminated Soils and Groundwater at Site-17 (Burning Ground No. 2), Longhorn Army Ammunition Plant, Karnack, Texas,* March.

Plexus Scientific Corporation (Plexus), 2005, *Final Environmental Site Assessment, Phase I and II Report, Production Areas, Longhorn Army Ammunition Plant, Karnack, Texas, Columbia, Maryland,* February.

Shaw Environmental, Inc. (Shaw), 2007a, *Final Data Gaps Investigation Report, Longhorn Army Ammunition Plant, Karnack, Texas,* April.

Shaw, 2007b, *Installation-Wide Baseline Ecological Risk Assessment, Longhorn Army Ammunition Plant, Karnack, Texas, Volume I: Step 3 Report*, Houston, Texas, November.

Shaw, 2010, *Final Feasibility Study, LHAAP-17, Burning Ground No. 2/Flashing Area, Group 2, Longhorn Army Ammunition Plant, Karnack, Texas,* Houston, Texas, April.

Solutions to Environmental Problems, Inc. (STEP), 2005, *Final Plant-Wide Perchlorate Investigation, Longhorn Army Ammunition Plant, Karnack, Texas, Oak Ridge, Tennessee,* April.

Texas Commission on Environmental Quality (TCEQ), 2006, Updated Examples of Standard No. 2, Appendix II, Medium-Specific Concentrations, March 21, 2006.

U.S. Army, 2004, *Memorandum of Agreement Between the Department of the Army and the Department of the Interior for the Interagency Transfer of Lands at the Longhorn Army Ammunition Plant for the Caddo Lake National Wildlife Refuge, Harrison County, Texas,* Signed by the Department of the Interior on April 27, 2004 and the Army on April 29, 2004.

GLOSSARY OF TERMS

Administrative Record — The body of reports, official correspondence, and other documents that establish the official record of the analysis, cleanup, and final closure of a CERCLA site.

ARARs — Applicable or relevant and appropriate requirements. Refers to the federal and state requirements that a selected remedy will attain.

Attenuation — The process by which a compound is reduced in concentration over time, through absorption, adsorption, degradation, dilution, and/or transformation.

Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) — This law authorizes the Federal Government to respond directly to releases (or threatened releases) of hazardous substances that may be a danger to public health, welfare, or the environment. The U.S. Army currently has the lead responsibility for these activities.

Environmental Media —Major environmental categories that surrounds or contact humans, animals, plants, and other organisms (e.g. surface water, ground water, soil or air) and through which chemicals or pollutants move.

Exposure — Contact of an organism with a chemical or physical agent. Exposure is quantified as the amount of the agent available at the exchange boundaries of the organism (e.g., skin, lung, digestive tract, etc.) and available for absorption.

Groundwater — Underground water that fills pores in soil or openings in rocks to the point of saturation.

Hazard Index — The hazard index is the sum of the hazard quotients for all chemicals to which an individual is exposed. A hazard index value of 1.0 or less indicates that no adverse non-cancer human health effects are expected to occur. Each hazard quotient is a comparison of an estimated chemical intake (dose) with a reference dose level below which adverse health effects are unlikely. Each hazard quotient is expressed as the ratio of the estimated intake (numerator) to the reference dose (denominator). The value is used to evaluate the potential for non-cancer health effects, such as organ damage, from chemical exposures.

Maximum Contaminant Level (MCL) — The maximum contaminant level is based on the National Primary Drinking Water Standard. The TCEQ has adopted MCLs at the regulatory cleanup level for both industrial and residential uses. Any detected compound in the groundwater samples with an MCL was evaluated by comparing it to its associated MCL.

Proposed Plan — A report for public comment highlighting the key factors that form the basis for the selection of the preferred remediation alternative.

Remedial Action — The actual construction or implementation phase of a Superfund site cleanup that follows remedial design.

Risk Assessment — An analysis of the potential adverse health effects (current and future) caused by hazardous substances at a site in the absence of any actions to control or mitigate these releases (i.e., under an assumption of no action). The assessment contributes to decisions regarding appropriate response alternatives.

Superfund — The common name used for CERCLA; also referred to as the Trust Fund. The Superfund Program was established to help fund cleanup of hazardous waste sites. It also allows legal action to force those responsible for sites to clean them up.

ACRONYMS

ARARs	applicable or relevant and appropriate requirements
BERA	Baseline Ecological Risk Assessment
bgs	below ground surface
BHHRA	baseline human health risk assessment
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COC	chemical of concern
DCA	dichloroethane
DCE	dichloroethene
DNT	dinitrotoluene
ECOP	environmental condition of property
EcoPRG	ecological preliminary remediation goal
FFA	Federal Facility Agreement
FS	feasibility study
ft	feet
GW-Ind	groundwater MSC for industrial use
GWP-Ind	soil MSC for industrial use based on groundwater protection
HI	hazard index
LHAAP	Longhorn Army Ammunition Plant
LTM	long-term monitoring
LUC	land use control
MCL	maximum contaminant level
µg/L	micrograms per liter
mg/kg	milligrams per kilogram
MNA	monitored natural attenuation
MSC	medium-specific concentration
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NPL	National Priorities List
O&M	operation and maintenance
RAO	remedial action objective
RD	remedial design
RI	remedial investigation
ROD	record of decision
TAC	Texas Administrative Code
TCDD	tetrachlorodibenzo-p-dioxin
TCE	trichloroethene
TCEQ	Texas Commission on Environmental Quality
TEQ	toxicity equivalent quotient
TNT	trinitrotoluene
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
VC	vinyl chloride
VOC	volatile organic compound

USE THIS SPACE TO WRITE YOUR COMMENTS

Your input on the Proposed Plan for LHAAP-17 is important to the U.S. Army. Comments provided by the public are valuable in helping the U.S. Army select a final remedy for these sites.

You may use the space below to write your comments, then fold and mail to Dr. Rose M. Zeiler, P.O. Box 220, Ratcliff, Arkansas 72951. Comments must be postmarked by July 10, 2010. If you have questions about the comment period, please contact Dr. Rose M. Zeiler directly at (479) 635-0110. Those with electronic communications capabilities may submit their comments to the U.S. Army via Internet at the following e-mail address: rose.zeiler@us.army.mil

FINAL
PROPOSED PLAN FOR SOUTH TEST AREA/BOMB TEST AREA, LHAAP-001-R AND GROUND SIGNAL TEST AREA, LHAAP-003-R

ISSUED BY: U.S. ARMY

Longhorn Army Ammunition Plant
Karnack, Texas

June 2011

THE U.S ARMY ANNOUNCES PROPOSED PLAN FOR LHAAP-001-R and LHAAP-003-R

In this Proposed Plan the U.S. Army documents a removal action of munitions and explosives of concern (MEC) conducted in 2008 under Army's removal authority and presents its proposal for limited groundwater monitoring at the Munitions Response Sites (MRS) LHAAP-001-R, South Test Area/Bomb Test Area and LHAAP-003-R, Ground Signal Test Area at Longhorn Army Ammunition Plant (LHAAP) in addition to the land use controls (LUCs) already in place as a result of the 2008 removal action. Those LUCs were identified in an Action Memorandum signed by the U.S. Army in 2007 and include restrictions against intrusive activities including digging; signage at the perimeter of the sites; and education programs for future refuge visitors, staff, and volunteers (EODT Technology, Inc. [EODT], 2009).

Throughout the proposed plan for these two MRS, the term munitions constituents (MC), refers to the data gap constituent of white phosphorous (WP) and the emerging contaminant perchlorate. The U.S. Army, regulators, and project stakeholders met in 2005 for technical planning meetings and agreed that metals and explosives were addressed with the No Further Action (NFA) Record of Decisions (RODs) signed in 1998 for Installation Restoration Program Sites LHAAP-27 and -54 which are co-located with LHAAP-001-R and LHAAP-003-R, respectively.

The primary purpose of the Proposed Plan is to facilitate public involvement in the remedy selection process. The Proposed Plan provides the public with basic background information about MRS LHAAP-001-R and LHAAP-003-R, documents the 2008 removal action, confirms the LUCs included with the removal action and recommends that limited groundwater monitoring for perchlorate be conducted to verify protection of human health and the environment.

Dates to remember:
MARK YOUR CALENDER

PUBLIC COMMENT PERIOD:
July 13, 2011 to August 13, 2011
The U.S. Army will accept written comments on the Proposed Plan during the public comment period.

PUBLIC MEETING: The U.S. Army will hold a public meeting to explain the Proposed Plan for LHAAP-001-R and LHAAP-003-R. Oral and written comments will be accepted at the meeting. The meeting will be held on July 21, 2011 from 6:00 p.m. to 7:30 p.m. at Karnack Community Center.

For more information, see the Administrative Record at the following location:

Marshall Public Library,
300 S. Alamo
Marshall, Texas 75670
Business Hours: Monday – Thursday (10:00 a.m. – 8:00 p.m.) Friday – Saturday (10:00 a.m. – 5:00 p.m.)

For further information on LHAAP-001-R and LHAAP-003-R, please contact:
Dr. Rose M. Zeiler
Site Manager
Longhorn Army Ammunition Plant
P.O. Box 220
Ratcliff, Arkansas, 72951
Direct No.: 479.635.0110
E-mail address: rose.zeiler@us.army.mil

The U.S. Army is issuing this Proposed Plan for public review, comment, and participation to fulfill part of its public participation responsibilities under Sections 117(a), 113(k)(2)(B), and 121(f)(1)(G) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980 as amended by the Superfund Amendments and Reauthorization Act of 1986, and under Section 300.430(f)(2) of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP). This Proposed Plan summarizes information that can be found in greater detail in the Site Inspection (SI) Report, the Engineering Evaluation/Cost Analysis (EE/CA), the Action Memorandum, the MC Data Summary Report, the Munitions and Explosives of Concern (MEC) Removal Action Report, the Installation-Wide Baseline Ecological Risk Assessment (BERA), and other supporting documents that are contained in the Administrative Record for LHAAP-001-R and LHAAP-003-R. The project management team, including the U.S. Army, U.S. Environmental Protection Agency (USEPA), and the Texas Commission on Environmental Quality (TCEQ), encourages the public to review these documents to gain a more comprehensive understanding of the environmental conditions at LHAAP-001-R and LHAAP-003-R, and also to review and comment on the recommendation for limited groundwater monitoring for perchlorate in association with the LUCs presented in this Proposed Plan.

The U.S. Army, the lead agency for environmental response actions at LHAAP, is acting in partnership with USEPA Region 6 and TCEQ. As the lead agency, the U.S. Army is charged with planning and implementing remedial actions at LHAAP. Regulatory agencies assist the U.S. Army by providing technical support, project review, project comment, and oversight in accordance with the Federal Superfund law and the Longhorn AAP Federal Facilities Agreement.

SITE BACKGROUND

LHAAP is located in central-east Texas in the northeastern corner of Harrison County **(Figure 1)**. The installation occupies nearly 8,416 acres between State Highway 43 at Karnack, Texas, and the western shore of Caddo Lake. The nearest cities are Marshall, Texas, approximately 14 miles to the southwest, and Shreveport, Louisiana, approximately 40 miles to the southeast.

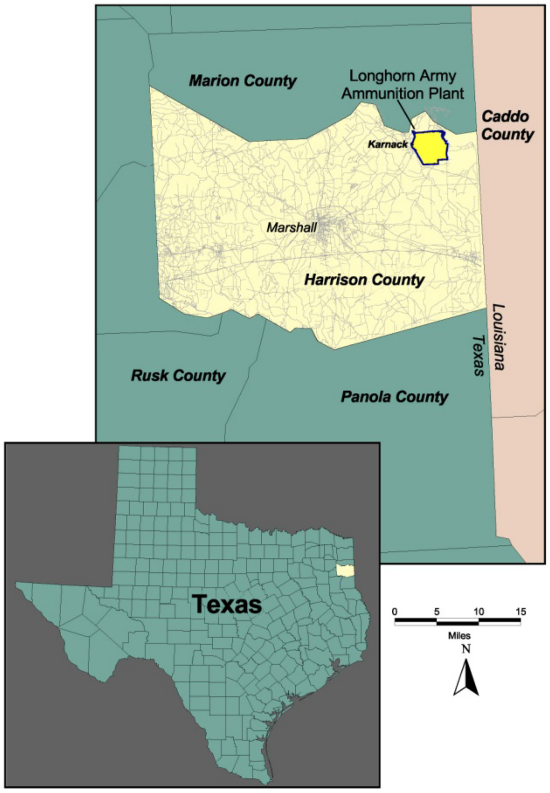


Figure 1 Location of the Longhorn Army Ammunition Plant Harrison County, Texas

Caddo Lake, a large freshwater lake situated on the Texas-Louisiana border, bounds LHAAP to the north and east.

The U.S. Army has transferred approximately 7,000 acres to the U.S. Fish and Wildlife Service (USFWS) for management as the Caddo Lake National Wildlife Refuge. The property transfer process is continuing as restoration is implemented at individual sites.

Due to releases of chemicals from operation and maintenance activities at the former facility, LHAAP was placed on the National Priorities List (NPL) on August 9,

1990. Activities to remediate contamination associated with the listing of LHAAP as a NPL site began in 1990. After being listed on the NPL, the U.S. Army, the USEPA, and the Texas Water Commission (currently known as the TCEQ) entered into a CERCLA Section 120 Federal Facility Agreement (FFA) for remedial activities at LHAAP. The FFA became effective December 30, 1991.

LHAAP operated until 1997 when it was placed on inactive status and classified by the U.S. Army Armament, Munitions, and Chemical Command as excess property.

The two MRS discussed in this Proposed Plan have been identified to have potential environmental concerns.

A site description, site characteristics, and a summary of site risks are provided below separately for each MRS, followed by a recommendation for the sites.

LHAAP-001-R

LHAAP-001-R, known as Site 27, South Test Area/Bomb Test Area is approximately 79 acres located southeast of Avenue P and the magazine area at the end of 70th Street, near the southern boundary of LHAAP (**Figure 2**).

The site was identified in the U.S. Army Closed, Transferring, and Transferred Range/Site Inventory as 6.75 acres in size; however, a 1981 aerial photograph, historical records, a site visit, and a teleconference on 17 May and 18 May 2005 between U.S. Army Corps of Engineers (USACE) and U.S. Army Environmental Center (USAEC) indicated the site should be 79 acres including Demolition Sub Areas 1, 2, and 3.

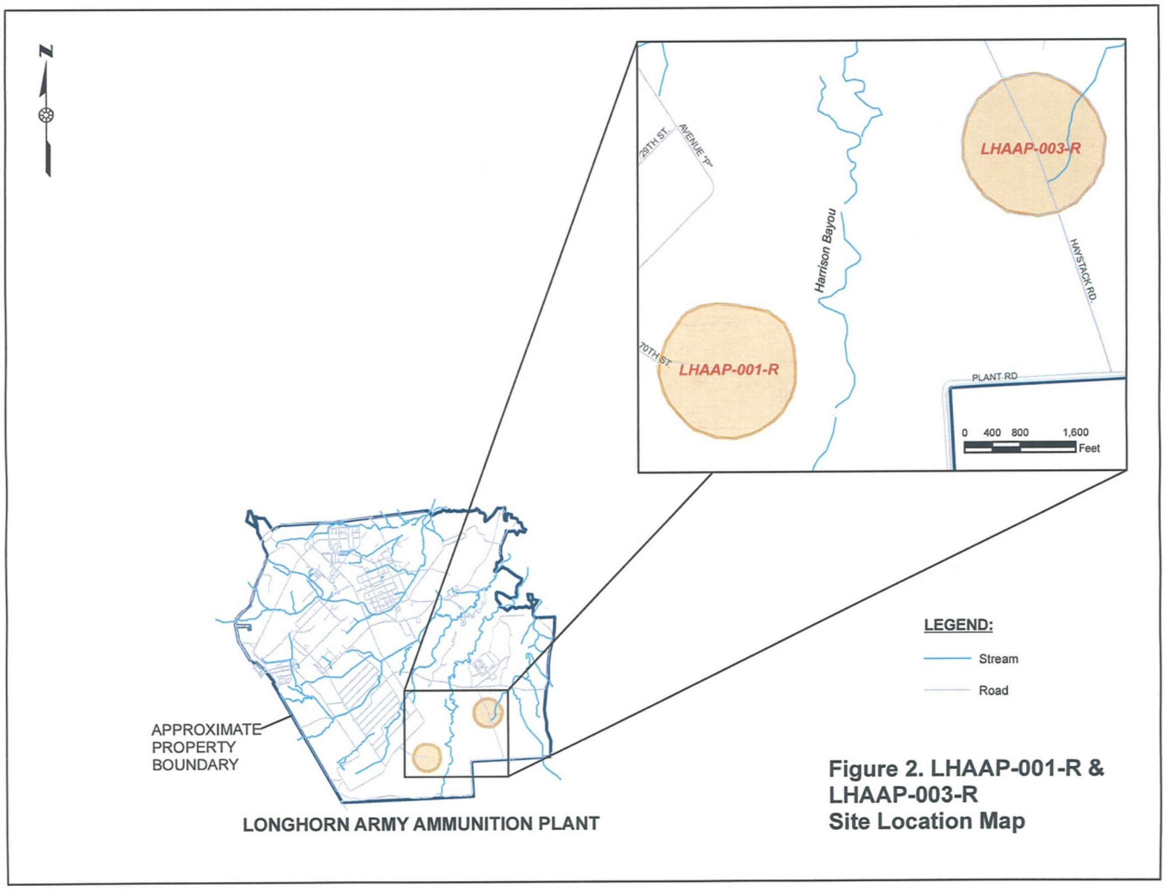


Figure 2. LHAAP-001-R & LHAAP-003-R Site Location Map

The South Test Area/Bomb Test Area is co-located with the Installation Restoration Program (IRP) site LHAAP-27 for which a NFA ROD under CERCLA for Hazardous, Toxic, and Radioactive Waste (HTRW) was signed with regulatory concurrence in January 1998 (USACE, 1998).

The LHAAP-001-R site was constructed in 1954 and used by Universal Match Corporation for testing M120A1 photoflash bombs produced at the facility until about 1956. The bombs were tested by exploding them in the air over an elevated, semi-elliptical earthen test pad. Bombs awaiting testing were stored in three earth-covered concrete bunkers. The bombs tested were 150-pound M120/M120A photoflash bombs filled with photoflash powder and containing a black powder booster charge and a timed nose fuze.

During the late 1950s, illuminating signal devices were also demilitarized within pits excavated in the vicinity of the test pad at the site also known as the suspected Open Burn/Open Detonation (OB/OD) area. During the early 1960s, leaking production items such as XM40E5 "button bombs" may have been demilitarized by detonation in the South Test Area/Bomb Test Area (LHAAP-001-R) or the Ground Signal Test Area (LHAAP-003-R). The XM40E5 was a small (approximately 1- by 1.25-inch) anti-intrusion mine also referred to as a "Gravel" Mine, which exploded on impact. Leaking WP munitions were supposedly disposed of in this area although no primary source documentation concerning this effort was located. Occasional leaking WP munitions were burned at the site as a demilitarization activity. Other sources indicate that possibly 3- to 4- pound canisters of WP were demilitarized in the vicinity of the test pad. The 1984 LHAAP Contamination Survey (Environmental Protection Systems, Inc. [EPS], 1984) stated the area has been relatively inactive since the early 1960s and no disposal or testing activities were carried out in this area.

The South Test Area/Bomb Test Area was identified as a MEC area of concern based on the visual confirmation of MEC. Because of the potential presence of WP and to address the WP data gap, the South Test Area/Bomb Test Area was also identified as a WP area of concern.

LHAAP-001-R SITE CHARACTERISTICS

The surface features at LHAAP-001-R include a deteriorated asphalt and gravel road running from the entrance to the test pad. Concrete bunkers and the site of the demolished former observation building are located alongside the road about halfway between the entrance and the test pad. A circular, 50-foot wide fire lane with a 2,000-foot diameter is centered at the test pad. Since the observation building has been demolished, the site is currently overgrown with brush and small trees. Formerly cleared areas in the vicinity of the test pad and alongside the access road are also overgrown with vegetation. The topography slopes gently to the east and surface water runoff from the hillside flows generally to the southeast and into Harrison Bayou. Groundwater at the site was encountered between 7 and 9 feet below ground surface (bgs). Groundwater is topographically controlled with a general flow direction to the east toward the floodplain of Harrison Bayou.

LHAAP-001-R is co-located with the IRP site LHAAP-27. Between 1982 and 1996 several investigations were conducted in a phased approach to determine the nature and extent of contamination at LHAAP-27. Media investigated included soil, groundwater, surface water and sediment (USACE, 1997).

Perchlorate was identified as an emerging contaminant and perchlorate data for environmental media were collected after the ROD was signed. Twenty six (26) soil samples (13 surface and 13 subsurface soil samples) were collected and analyzed for perchlorate from 13 soil borings across the site. Perchlorate was detected in only one of the 26 soil samples at a concentration well below the TCEQ soil medium-specific concentration (MSC) for industrial use based on the State of Texas groundwater protection (GWP-Ind) value of 7,200 micrograms per liter (µg/L).

During three consecutive quarterly groundwater sampling events (April 2000 through February 2001), sixteen groundwater samples were collected from six existing shallow monitoring wells to determine whether perchlorate was present in the underlying groundwater as a result of past historical activities. The six monitoring wells are located in areas with the highest potential for impact from site activities and in the direction of flow across the site from west to east toward Harrison Bayou. Perchlorate was detected in two of the four wells during the first quarter sampling event, with a maximum concentration below the groundwater MSC for industrial use (GW-Ind) value of 72 µg/L. The initial detections of perchlorate in groundwater were not confirmed in subsequent sampling. During the second and third quarter sampling events, no perchlorate was detected in any of the samples (STEP, 2005).

In October 2009, USEPA collected additional groundwater samples from the existing six monitoring wells to confirm groundwater conditions at the site. Perchlorate was detected in three wells with only one of the three above the GW-Ind value of 72 µg/L at a concentration of 76 µg/L. The USEPA’s perchlorate detection of 76 µg/L was an estimate from a diluted sample. The U.S. Army collected split samples at the same time that the USEPA collected samples from the six monitoring wells. Perchlorate was detected in two wells for the Army split samples, with a maximum concentration below the GW-Ind value of 72 µg/L (Shaw, 2011).

In March 2003, USFWS conducted an investigation at the former LHAAP facility to determine contaminant levels in soil and sediment (USFWS, 2003). Soil samples were collected from five locations within LHAAP-001-R. Soil analytical results indicated that metals and semivolatile organic compounds were detected at low concentrations, but not above screening levels. Perchlorate was not detected above the reporting limit.

Between 2002 and 2004, a MMRP SI was conducted for LHAAP-001-R to determine the presence or absence of MEC and/or MC at the site which may have remained from activities conducted by the Department of Defense (DOD) during operations of the MRS. The SI verified MEC presence at the site (e^2M, 2005).

The SI identified a data gap in earlier soil sampling, in that, although demilitarization activities including open pit burning and explosive detonation were conducted at the site, no analysis for the munitions constituent WP was performed at the site. The SI recommended that further investigation be conducted to address the identified data gap.

In 2007, an EE/CA was conducted to facilitate completion of a non-time critical removal action of MEC at the site (CAPE, 2007a). Field activities conducted during the EE/CA characterized MEC and addressed the WP data gap at the site. Twenty-one (21) MEC and Material Potentially Presenting Explosive Hazard (MPPEH) items were recovered at the surface or within the top 6 inches of the soil. The items were clustered within an area suspected of the use of OB/OD activities. The OB/OD area is approximately 14 acres in size.

Based on the heaviest MPPEH concentrations or historical detonations, soil samples were collected within LHAAP-001-R to determine if evidence of WP existed in areas where MC were most likely to exist. One soil sample was collected near the center of the OB/OD area. A second soil sample was collected in a scarred area identified as the photo flash cartridge disposal area in the historical review. Both areas are near locations where MPPEH items were recovered during the field investigations. In addition, pre- and post-detonation samples were collected in association with explosive demolition of MPPEH recovered during the field activities. Soil samples were collected from 0 to 6-inches bgs. Analytical results indicated that WP and explosives were not identified at concentrations above detection limits in any soil samples at the site. In addition, there was no indication of the presence of WP or explosives in any of the pre- or post-detonation samples.

The EE/CA recommended surface and subsurface removal of MEC items with LUCs to reduce the risk within LHAAP-001-R (CAPE, 2007b). The surface removal was for the entire site, whereas the subsurface removal was for the suspected OB/OD area.

Between August and November 2008, a MEC removal action was conducted and LUCs were developed (EODT, 2009). Surface clearance of approximately 65 acres and subsurface clearance to the depth of detection in the approximately 14-acre OB/OD Area was performed at LHAAP-001-R. A total of 384 MEC/MPPEH items and 14 inert items were located and destroyed and a total of 22,139 pounds of munitions debris (MD) and 1,876 pounds of cultural debris (CD) were removed during the course of surface and subsurface clearance. In addition, LUCs were developed that included restrictions against intrusive activities including digging; signage at the perimeter of the site; and an education program for future refuge visitors, staff, and volunteers (EODT, 2009). The Land Use Control Plan for LHAAP-001-R is Appendix I of the removal action work plan (EODT, 2008).

SUMMARY OF LHAAP-001-R SITE RISKS

The reasonably anticipated future use of this site is industrial/recreational as part of the Caddo Lake National Wildlife Refuge. This anticipated future use is based on a Memorandum of Agreement (MOA) (U.S. Army, 2004) between the USFWS and the U.S. Army. The MOA documents the transfer process of LHAAP acreage to USFWS to become the Caddo Lake National Wildlife Refuge. Presently the Caddo Lake National Wildlife Refuge occupies approximately 7,000 acres of the former installation. The property must be kept as a National Wildlife Refuge unless there is an act of Congress which removes the parcel, or the land is exchanged in accordance with the National Wildlife Refuge System Administration Act of 1966 and the National Wildlife Refuge System Act Amendments of 1974.

Human Health Risks

As part of the EE/CA, a streamlined risk evaluation was conducted for MEC at LHAAP-001-R to address risks to human safety related to the presence of potential explosive hazards. During the EE/CA investigation activities, no WP was identified at detectable concentrations in any soil samples collected and there was no indication of the presence of MC in any pre- or post-detonation samples. Therefore, there is no risk associated with WP.

Additional sampling conducted by the USEPA in 2009 resulted in a detection of perchlorate at a concentration of 76 µg/L, slightly above the GW-Ind of 72 µg/L in one well. The result was an estimate from a diluted sample. The U.S. Army's split sample for the same well indicated that perchlorate was detected at a concentration of 50 µg/L, below the GW-Ind. The U.S. Army result is consistent with previous detected levels for the site and therefore there was no need to evaluate risk associated with perchlorate because there was no exceedance of the GW-Ind.

The risk factors associated with MEC items were categorized into three classes: MEC factors, site characteristics factors, and human factors. MEC factors are related to the type of MEC, the sensitivity, the quantity (density) and the depth. Site characteristic factors include the accessibility and stability of areas where MEC items are located. Human factors are related to the population density and population activities.

During the EE/CA field activities, the MEC items that were recovered at LHAAP-001-R were mostly clustered in the former OB/OD area. Taking all risk factors into consideration, the baseline risk assessment indicated moderate MEC risk to human health for LHAAP-001-R.

The surface MEC removal action located and removed MEC items thereby reducing the risk to the future land user. The subsurface removal action located, excavated and removed MEC or MPPEH items to a depth consistent with the expected future land use and with the significant refuge activities (hunting, fishing, wildlife observation, wildlife photography, wildlife education, and wildlife interpretation), all of which are non-intrusive. The subsurface removal provided an effective solution for reducing risk of exposure by reducing the potential for any direct contact with MEC or MPPEH.

Consistent with the recommendations of the EE/CA and the Action Memorandum (U.S. Army, 2007), LUCs were identified, designed, and implemented for the site to promote ongoing protection of human safety against potential explosive hazards that might remain in the subsurface.

Texas Administrative Code requires that the LUCs identified in the Action Memorandum for the protection of human health and safety be filed in the county records. Additionally, monitoring in the form of Five-Year Reviews will serve to ensure that the LUCs are specified, implemented, monitored, reported on, and enforced. The reviews will also serve to document that the use of the site remains consistent with the industrial/recreational use scenario evaluated in the risk assessment.

Ecological Risk

The ecological risk for LHAAP-001-R was addressed in the installation-wide BERA (Shaw, 2007). For the BERA, the entire installation was divided into three large sub-areas (i.e., the Industrial Sub-

Area, Waste Sub-Area, and Low Impact Sub-Area) for the terrestrial evaluation. The individual sites at LHAAP were grouped into one of these sub-areas, which were delineated based on commonalities of historic use, habitat type, and spatial proximity to each other. Conclusions for individual sites and the potential for detected chemicals to adversely affect the environment were made in the context of the overall conclusions of the sub-area in which the site falls. Site LHAAP-001-R lies within the Low Impact Sub-Area, and the BERA concluded that no unacceptable risk was present in the Low Impact Sub-Area (Shaw, 2007).

Summary results from the BERA (Shaw, 2007) indicated that perchlorate was not selected as a final constituent of potential ecological concern because all estimated receptor ecological effects quotient were less than 1 and there was no evidence of a perchlorate source area. In addition, during the EE/CA, no WP or explosives were identified in any soil samples and there was no indication of the presence of explosives in any pre or post-detonation samples confirming the determination of no risk to the environment for LHAAP-001-R.

LHAAP-003-R

LHAAP-003-R, known as Site 54, the Ground Signal Test Area encompasses approximately 80 acres and is located in the southeastern portion of LHAAP (**Figure 2**).

LHAAP-003-R was used intermittently starting in April 1963 for aerial and on-ground testing and destruction of a variety of devices, including pyrotechnic signal devices, red phosphorus smoke wedges, infrared flares, illuminating 60 and 81 millimeters (mm) mortar shells, illuminating 40 to 155 mm cartridges, button bombs, and various types of explosive simulators. The site was also used intermittently over a 20-year period for testing and burn-out of rocket motors from Nike-Hercules, Pershing, and Sergeant missiles. Around 1970, a Sergeant rocket motor reportedly exploded in an excavated pit near the center of the site, however, later MEC clearance to depth in the area found no rocket motor. Debris was reportedly placed in the resulting crater and backfilled. From late 1988 through 1991, the site was also used for burn-out of rocket motors in Pershing missiles destroyed in accordance with the Intermediate-Range Nuclear Forces Treaty between the U.S. and the former Soviet Union. Occasionally, leaking WP munitions were burned at the site as a demilitarization activity.

The Ground Signal Test Area was identified as a MEC area of concern based on the reported presence of MEC. Because of the potential presence of WP and to address the WP data gap, the Ground Signal Test Area was also identified as a WP area of concern.

LHAAP-003-R SITE CHARACTERISTICS

Surface features at LHAAP-003-R include an asphalt road (Haystack Road) that intersects Long Point Road just east of its intersection with Avenue Q. The site is currently undeveloped and has become overgrown with woody vegetation.

The site is located within the watersheds of Saunders Branch and Harrison Bayou. Both Saunders Branch and Harrison Bayou flow into Caddo Lake. Surface water runoff from the site is towards drainage ditches located alongside the circular dirt road forming the outer margin of the site. The ditches converge to the northeast and the southwest directing surface water to Saunders Branch and Harrison Bayou, respectively.

The depth to groundwater at the site averages about 15 feet bgs with some seasonal fluctuations. The regional groundwater flow direction is to the north-northeast toward Caddo Lake; however, during periods of high precipitation the groundwater flow direction in the southwestern portion of the site diverts to the northwest towards Harrison Bayou.

LHAAP-003-R is co-located with the IRP site LHAAP-54. Between 1982 and 1996 several investigations were conducted in a phased approach to determine the nature and extent of contamination at LHAAP-54. Media investigated included soil, groundwater, surface water and sediment. Based on the results of the investigations and the risk assessment conducted for the site, a NFA ROD under CERCLA for HTRW was signed with regulatory concurrence in January 1998 (USACE, 1998).

Perchlorate was identified as an emerging contaminant and perchlorate data for environmental media was collected after the ROD was signed. Between May 2000 and June 2001, during four quarterly sampling events, twelve groundwater samples were collected from three existing shallow monitoring wells and three geoprobe points to determine whether perchlorate was present in the underlying groundwater as a result of past historical activities (STEP, 2005). The monitoring wells and geoprobe points are located adjacent to the three surface water features that drain the entire Ground Signal Test Area. Because the shallow groundwater flow pattern reflects surface topography, groundwater samples from these wells represent groundwater from the entire site. Perchlorate was detected during the first quarter sampling event at a maximum concentration that was well below the GW-Ind value of 72 µg/L. During the second quarter sampling event, perchlorate was not detected in any of the water samples. Perchlorate was detected during the third quarter sampling event in one well at a concentration that was well below the GW-Ind value and not at all during the fourth quarter event.

In October 2009, USEPA collected additional groundwater samples from the existing four monitoring wells to confirm groundwater conditions at the site. Perchlorate was detected in only one well at a concentration that was well below the GW-Ind value of 72 µg/L. The U.S. Army collected split samples at the same time that the USEPA collected samples from the four monitoring wells. Perchlorate was detected in one well for the U.S. Army split samples at a concentration well below the GW-Ind value of 72 µg/L.

In March 2003, USFWS conducted an investigation at the former LHAAP facility to determine contaminant levels in soil and sediment (USFWS, 2003). Soil samples were collected from two locations within the Ground Signal Test Area. These two locations are along the surface drainage that flows toward Saunders Branch on the east side of the site. Soil analytical results indicated that metals were detected at low concentrations confirming previous findings. Perchlorate was not detected.

Between 2002 and 2004, a MMRP SI was conducted for LHAAP-003-R to determine the presence or absence of MEC and/or MC at the site which may have remained from activities conducted by the DOD during operations of the MRS. The SI verified MEC presence at the site (e^{2}M, 2005). Possible source areas for MEC and MC identified during the SI included: testing areas associated with the various suspected ordnance types; a confirmed mortar impact area on site with numerous unidentified ordnance item shapes on the surface and outside the mortar berm; a site reportedly used for the testing and burn-out of Pershing and Sergeant rocket motors; and areas associated with past demilitarization activities. In addition, a Sergeant rocket motor reportedly exploded at the site around 1970 and debris was reportedly placed in the resulting crater and backfilled. It was also reported that occasionally WP munitions were burned at the site. It appears that most of the items tested at this location were statically fired and observed for adequate illumination and burn time and were not launched by a weapons system.

The SI identified a data gap in earlier soil sampling, in that, although demilitarization activities were conducted at the site and occasionally demolition and burning of WP munitions were performed, no analysis for the munitions constituent WP was performed at the site. The SI recommended that further investigation be conducted to address the identified data gap.

In 2007, an EE/CA was conducted to facilitate completion of a non-time critical removal action of MEC at the site (CAPE, 2007a). Field activities conducted during the EE/CA characterized MEC and addressed the WP data gap at the site. Fourteen (14) MEC and MPPEH items were recovered at the surface or within the top 6 inches of the soil. The items were clustered within the former Mortar Test Area.

Based on the heaviest MPPEH concentrations or historical detonations, soil samples were collected within LHAAP-003-R to determine if evidence of WP existed in areas where MC were most likely to exist. One soil sample was collected within the area identified as the mortar firing range. A second soil sample was collected in a scarred area identified as the Rocket Motor Area in the historical review. In addition, pre- and post-detonation samples were collected in association with explosive demolition of MPPEH recovered during the field activities. Soil samples were collected from 0 to 6-inches bgs. Analytical results indicated that WP and explosives were not identified at concentrations above detection limits in any soil samples at the site. In addition, there was no indication of the presence of WP or explosives in any of the pre- or post-detonation samples.

The EE/CA recommended surface clearance of MEC items with LUCs to reduce the risk within LHAAP-003-R.

Between August and November 2008, MEC removal action was conducted and LUCs were developed (EODT, 2009). Surface clearance was performed at LHAAP-003-R. A total of 12 MEC/MPPEH items and one inert item were located and destroyed and 6,880 pounds of MD and 5,981 pounds of CD were removed during the course of surface clearance. In addition, LUCs were designed that include restrictions against intrusive activities including digging; signage at the perimeter of the site; and education programs for future refuge visitors, staff, and volunteers (EODT, 2009). The Land Use Control Plan for LHAAP-003-R is Appendix I of the removal action work plan (EODT, 2008).

SUMMARY OF LHAAP-003-R SITE RISKS

The reasonably anticipated future use of this site is industrial/recreational as part of the Caddo Lake National Wildlife Refuge. This anticipated future use is based on a MOA (U.S. Army, 2004) between the USFWS and the U.S. Army. The MOA documents the transfer process of LHAAP acreage to USFWS to become the Caddo Lake National Wildlife Refuge. Presently the Caddo Lake National Wildlife Refuge occupies approximately 7,000 acres of the former installation. The property must be kept as a National Wildlife Refuge unless there is an act of Congress which removes the parcel, or the land is exchanged in accordance with the National Wildlife Refuge System Administration Act of 1966 and the National Wildlife Refuge System Act Amendments of 1974.

Human Health Risks

As part of the EE/CA, a streamlined risk evaluation was conducted for MEC at LHAAP-003-R to address risks to human safety related to the presence of potential explosive hazards. During the EE/CA investigation activities, no WP was identified at detectable concentrations in any soil samples collected and there was no indication of the presence of MC in any pre or post-detonation samples. Therefore, there is no risk associated with WP.

The additional groundwater sampling conducted by the USEPA and U.S. Army in 2009 indicated that perchlorate was detected in one well at a concentration well below the GW-Ind, and therefore there was no need to evaluate risk associated with perchlorate.

The risk factors associated with MEC items were categorized into three classes: MEC factors, site characteristics factors, and human factors. MEC factors are related to the type of MEC, the sensitivity, the quantity (density) and the depth. Site characteristic factors include the accessibility and stability of areas where MEC items are located. Human factors are related to the population density and population activities.

During the EE/CA field activities, MEC items that were recovered at LHAAP-003-R were mostly clustered in the former Mortar Test Area. Taking all risk factors into consideration, the baseline risk assessment indicated low MEC risk to human health for LHAAP-003-R. The surface MEC removal action located and removed MEC items thereby reducing the risk to the future land user.

Consistent with the recommendations of the EE/CA and the Action Memorandum (U.S. Army, 2007), LUCs were identified, designed, and implemented for the site to promote ongoing protection of human safety against potential explosive hazards that may remain at the site in the subsurface.

Texas Administrative Code requires that the LUCs identified in the Action Memorandum for the protection of human health and safety be filed in the county. Additionally, monitoring in the form of Five-Year Reviews will serve to confirm that the LUCs are specified, implemented, monitored, reported on, and enforced. The reviews will also serve to document that the use of the site remains consistent with the industrial/recreational use scenario evaluated in the risk assessment.

Ecological Risk

The ecological risk for LHAAP-003-R was addressed in the installation-wide BERA (Shaw, 2007). For the BERA, the entire installation was divided into three large sub-areas (i.e., the Industrial Sub-Area, Waste Sub-Area, and Low Impact Sub-Area) for the terrestrial evaluation. The individual sites at LHAAP were grouped into one of these sub-areas, which were delineated based on commonalities of historic use, habitat type, and spatial proximity to each other. The conclusions for individual sites and the potential for detected chemicals to adversely affect the environment were made in the context of the overall conclusions of the sub-area in which the site falls. Site LHAAP-003-R lies within the Low Impact Sub-Area, and the BERA concluded that no unacceptable risk was present in the Low Impact Sub-Area (Shaw, 2007).

In addition, during the EE/CA, no WP or explosives were identified in any soil samples and there was no indication of the presence of WP or explosives in any pre or post-detonation samples confirming the determination of no risk to the environment for LHAAP-003-R.

RECOMMENDATION

In addition to the LUCs already in place as a result of the 2008 removal action, limited groundwater monitoring for perchlorate is proposed for both LHAAP-001-R and LHAAP-003-R. The purpose of the additional monitoring is to confirm perchlorate levels in groundwater are below the GW-Ind. Furthermore, implementation, maintenance, inspection, reporting and enforcement of the LUCs will continue to promote the ongoing protection of human safety against explosive hazards that may have remained at the sites in the subsurface.

The details of the LUCs are presented in the Land Use Control Plan provided in the Final Work Plan for the MEC Removal Action at the Former Longhorn Army Ammunition Plant, LHAAP-001-R (Site 27) and LHAAP-003-R (Site 54) (EODT, 2008).

Because there are no unacceptable risks and groundwater monitoring and the appropriate LUCs have been implemented, no remediation alternatives or Remedial Action Objectives are required. If after three rounds of groundwater sampling at LHAAP-001-R and one round of groundwater sampling at LHAAP-003-R the results that are evaluated on or before the first five year review indicate detections at levels below the GW-Ind value of 72 µg/L for perchlorate, groundwater monitoring will cease and the wells will be plugged and abandoned.

The LUCs for these two sites include restrictions for intrusive activities including digging, posting unexploded ordnance (UXO) warning signs around the perimeter of the MRS, continuing the existing UXO education programs provided to authorized workers (i.e., USFWS's staff) and refuge visitors, and only allowing future public uses that are consistent with the "big six" activities (i.e., hunting, fishing, wildlife observation, wildlife photography, wildlife education, and wildlife interpretation). The LUCs will accompany all transfer documents and will be recorded in the Harrison County Courthouse. Five-Year Reviews will be performed to document that LUCs remain protective of human health and safety for MRS LHAAP-001-R and LHAAP-003-R.

COMMUNITY PARTICIPATION

The U.S. Army, USEPA, and TCEQ provide information regarding LHAAP-001-R and LHAAP-003-R through public meetings and the Administrative Record file for the facility. The public is encouraged to gain a more comprehensive understanding of the sites.

The dates for the public comment period, the date, location, and time of the public meeting, and the locations of the Administrative Record files are provided on the front page of this Proposed Plan.

Any significant changes to the Proposed Plan, as presented in this document, will be identified and explained in the ROD.

Primary Reference Documents for LHAAP-001-R and LHAAP-003-R

CAPE, 2007a, *Final Engineering Evaluation/Cost Analysis, Longhorn Army Ammunition Plant, Karnack, Texas,* Final, October.

CAPE, 2007b, *Final Engineering Evaluation/Cost Analysis Action Memorandum Revision 1*, *Longhorn Army Ammunition Plant, Karnack, Texas,* Signed by Thomas Lederle, BRAC Division, ACSIM, United States Army, 5 December.

engineering-environmental Management (e^{2}M), 2005, *Final Site Inspection Report, Military Munitions Response Program, Longhorn Army Ammunition Plant, Texas*, Final, June.

Environmental Protection Systems, Inc. (EPS), 1984, *Longhorn Army Ammunition Plant Contamination Survey,* June.

EODT Technology, Inc., (EODT), 2008, *Final Work Plan for the MEC Removal Action at the Former Longhorn Army Ammunition Plant, LHAAP-001-R (Site 27) and LHAAP-003-R (Site 54), Karnack, Texas, July*

EODT Technology, Inc., (EODT), 2009, *Final Site Specific Final Report for the MEC Removal Action at the Former Longhorn Army Ammunition Plant, LHAAP-001-R (Site 27) and LHAAP-003-R (Site 54), Karnack, Texas,* September.

Shaw Environmental, Inc. (Shaw), 2007, *Installation-Wide Baseline Ecological Risk Assessment, Volume 1: Step 3 Report, Longhorn Army Ammunition Plant, Karnack, Texas,* Houston, Texas, November.

Shaw, 2011, *Munitions Constituents Data Summary Report, South Test Area/Bomb Test Area, LHAAP-001-R and Ground Signal Test Area, LHAAP-003-R, Longhorn Army Ammunition Plant, Karnack, Texas*, Houston, Texas, June.

Solutions to Environmental Problems (STEP), 2005, *Plant-wide Perchlorate Investigation, Longhorn Army Ammunition Plant, Karnack, Texas,* April.

U.S. Army, 2004, *Memorandum of Agreement Between the Department of the Army and the Department of the Interior for the Interagency Transfer of Lands at the Longhorn Army Ammunition Plant for the Caddo Lake National Wildlife Refuge, Harrison County, Texas,* signed by the Department of the Interior on April 27, 2004 and the Army on April 29, 2004.

U.S. Army, 2007, *Action Memorandum for Three Munitions Response Sites: South Test Area/Bomb Test Area, Static Test Area, and Ground Signal Test Area, Longhorn Army Ammunition Plant, Karnack, Texas,* August. Signed 5 December 2007 by Thomas E. Lederle.

U.S. Army Corps of Engineers (USACE), Tulsa District, 1997, *Remedial Investigation Report, Group 1 Sites (Sites 11, 1, XX, 27), Longhorn Army Ammunition Plant, Karnack, Texas,* Volumes I and II, May.

(USACE, Tulsa District, 1998, *Record of Decision at Group 1 Sites (Sites 11, 1, XX, 27), Longhorn Army Ammunition Plant, Karnack, Texas*, January.

U.S. Fish and Wildlife Service (USFWS), 2003, *Contaminant Investigation of Northern, Central, and Eastern Portions of Caddo Lake National Wildlife Refuge, Texas,* November.

GLOSSARY OF TERMS

Administrative Record — The body of reports, official correspondence, and other documents that establish the official record of the analysis, cleanup, and final closure of a CERCLA site.

Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) — This law authorizes the Federal Government to respond directly to releases (or threatened releases) of hazardous substances that may be a danger to public health, welfare, or the environment. The U.S. Army currently has the lead responsibility for these activities.

Environmental Media — A major environmental category that surrounds or contacts humans, animals, plants, and other organisms (e.g., surface water, ground water, soil, or air) and through which chemicals or pollutants move.

Exposure — Contact of an organism with a chemical or physical agent. Exposure is quantified as the amount of the agent available at the exchange boundaries of the organism (e.g., skin, lung, digestive tract, etc.) and available for absorption.

Groundwater — Underground water that fills pores in soil or openings in rocks to the point of saturation.

Proposed Plan – A report for public comment highlighting the key factors that form the basis for the selection of the preferred remediation alternative.

Remedial Action — The actual construction or implementation phase of a Superfund site cleanup that follows remedial design.

Risk Assessment - An Analysis of the potential adverse health effects (current and future) caused by hazardous substances at a site in the absence of any actions to control or mitigate these releases (i.e. under no assumption of no action). The assessment contributes to decisions regarding appropriate response alternatives.

ACRONYMS and ABBREVIATIONS

bgs	below ground surface
BERA	Baseline Ecological Risk Assessment
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CD	cultural debris
DOD	Department of Defense
EE/CA	Engineering Evaluation/Cost Analysis
FFA	Federal Facility Agreement
GW-Ind	groundwater MSC for industrial use
GWP-Ind	soil MSC for industrial use based on groundwater protection
HTRW	hazardous, toxic, and radioactive waste
IRP	Installation Restoration Program
LHAAP	Longhorn Army Ammunition Plant
LUC	Land Use Control
MC	munitions constituents
MD	munitions debris
MEC	munitions and explosives of concern
µg/L	micrograms per liter
mm	millimeters
MMRP	Military Munitions Response Program
MOA	Memorandum of Agreement
MPPEH	material potentially presenting explosive hazard
MRS	Munitions Response Sites
MSC	medium-specific concentrations
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NFA	no further action
NPL	National Priorities List
OB/OD	Open Burn/Open Detonation
ROD	Record of Decision
SI	site inspection
TCEQ	Texas Commission on Environmental Quality
USACE	U.S. Army Corps of Engineers
USAEC	U.S. Army Environmental Center
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
UXO	unexploded ordnance
WP	white phosphorus

USE THIS SPACE TO WRITE YOUR COMMENTS

Your input on the Proposed Plan for LHAAP-001-R and LHAAP-003-R is important to the U.S. Army. Comments provided by the public are valuable in helping the U.S. Army select a final remedy for the site.

You may use the space below to write your comments, then fold and mail to Dr. Rose M. Zeiler, P.O. Box 220, Ratcliff, Arkansas 72951. Comments must be postmarked by August 13, 2011. If you have questions about the comment period, please contact Dr. Rose M. Zeiler directly at 479.635.0110. Those with electronic communications capabilities may submit their comments to the U.S. Army via Internet at the following e-mail address: rose.zeiler@us.army.mil

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EPA
United States
Environmental Protection
Agency

RECORD OF DECISION AMENDMENT
NORTH CAVALCADE STREET
SUPERFUND SITE
HOUSTON, TEXAS

AUGUST 2011

SUPERFUND DIVISION
U.S. ENVIRONMENTAL PROTECTION AGENCY
REGION 6
DALLAS, TEXAS

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Abbreviations and Acronyms

ARAR	Applicable or Relevant and Appropriate Requirements
bgs	below ground surface
BHHRA	Baseline Human Health Risk Assessment
cPAH	carcinogenic polycyclic aromatic hydrocarbon
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act (Superfund)
CFR	Code of Federal Regulations
COC	Contaminant/Chemical of Concern
CSM	Conceptual Site Model
DNAPL	Dense Non-Aqueous Phase Liquid
DOT	U.S. Department of Transportation
EPA	U.S. Environmental Protection Agency
FR	Federal Register
FFS	Focused Feasibility Study
ft	feet
gpd	gallons per day
gpm	gallons per minute
HCTRA	Harris County Toll Road Authority
I	(As in "MW-37I") Interbedded Unit
IC	Institutional Control
ISS	In-Situ Stabilization
MCL	maximum contaminant level
NA	Natural Attenuation
µg/L	micrograms per liter
NAPL	Non-Aqueous Phase Liquid
NCP	National Contingency Plan
NPL	National Priorities List
O&F	Operational and Functional
O&M	Operations and Maintenance
OU	Operable Unit
PAH	polycyclic aromatic hydrocarbon
ppb	parts per billion
PRG	Preliminary Remediation Goal

RAO	Remedial Action Objective
RCRA	Resource Conservation and Recovery Act
RD	Remedial Design
RI	Remedial Investigation
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
S	(As in "MW-37S") Shallow Sand
SARA	Superfund Amendments and Reauthorization Act
SDWA	Safe Drinking Water Act
SIM	Selected Ion Monitoring (SW846 Method 8270)
Site	North Cavalcade Street Superfund Site
TAC	Texas Administrative Code
TCEQ	Texas Commission on Environmental Quality
TDLR	Texas Department of Licensing and Regulation
TI	Technical Impracticability
TRRP	Texas Risk Reduction Program
VOC	volatile organic compound

PART 1: DECLARATION FOR THE RECORD OF DECISION AMENDMENT

Site Name and Location

North Cavalcade Street Superfund Site
Houston (Harris County), Texas
EPA ID TXD 980873343

The North Cavalcade Street Superfund Site ("Site") is a 21-acre property and former wood treating site located in Houston, Harris County, Texas, about one mile southwest of the intersection of Loop 610 and U.S. Highway 59. The Site is located within a commercial/industrial corridor, just north of the downtown Houston.

This Record of Decision (ROD) Amendment selects an alternate remedy for the dissolved phase contaminant plumes (ground water) associated with the two Dense Non-Aqueous Phase Liquid (DNAPL) source areas. The plume associated with the shallow sand will also be referred to as Operable Unit 1 (OU1); the plume associated with the interbedded sand unit will be referred to as Operable Unit 3 (OU3). The Amendment will discuss the information developed since the 2009 ROD Amendment and the selection of a remedy supported by that information.

Statement of Basis and Purpose

This decision document amends the remedial actions for the ground water selected in the 1988 ROD and the 2009 ROD Amendment for the North Cavalcade Street Superfund Site, in Houston, Texas (Harris County). The selection of an alternate remedial action through this ROD amendment was chosen in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), 42 USC § 9601 et seq., as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), and, to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), 40 CFR Part 300 et seq., as amended.

This decision was based on the Administrative Record, which has been developed in accordance with Section 113(k) of CERCLA, 42 U.S.C. § 9631(k), and which is available for review at the Houston Central Library (Houston Metropolitan Research Center), 500 McKinney Street, Houston, Texas, and at the Texas Commission of Environmental Quality (TCEQ) offices (Building E, Records Management) in Austin, Texas. The Administrative Record Index (Attachment 2 to the Record of Decision Amendment) identifies each of the items comprising the Administrative Record upon which the selection of the remedial action is based.

The State of Texas has reviewed the remedial alternative for the Site and supports the action to amend the 1988 ROD and the 2009 ROD Amendment.

Assessment of the Site

The response action selected in this Record of Decision Amendment is necessary to protect the public health or welfare or the environment from actual or threatened releases of hazardous substances into the environment.

Description of the Selected Remedy

The Selected Remedy evaluated in this Amendment addresses a fundamental change to the original 1988 and 2009 response actions for the Site for containment of the two ground water contaminant plumes associated with the Site's shallow sand and the interbedded sand unit, as restoration goals will not be achievable throughout the dissolved phase plumes.

The primary source areas, associated with the former wood treatment operation, were addressed in the1988 ROD and the 2009 ROD Amendment when the remedies selected treatment for two zones: the shallow sand and the interbedded unit. The 1988 ROD selected a pump and treat remedy for the shallow sand, which recovered over 8,000 gallons of creosote product. The more recent 2009 Amendment selected In-Situ Stabilization (ISS) to solidify the two Dense Non-Aqueous Phase (DNAPL) creosote source areas in place, but residual DNAPL and some isolated areas of free-phase DNAPL remain, along with the dissolved phase ground water contamination. Natural attenuation of the ground water contaminants and characteristics of both zones act to limit expansion of the dissolved contaminant plume. However, the EPA has concluded that it is technically impracticable to restore the dissolved phase ground water because of the intermittent occurrence of residual and free-phase DNAPL in the shallow aquifers. The ground water plume, associated with the interbedded unit, will not be responsive to existing treatment technologies.

The Selected Remedy revises the following Remedial Action Objectives (RAOs) for ground water that were established in the original 1988 ROD and the 2009 ROD Amendment. The previous RAOs are:

- [1988] Removal and/or treatment of ground water containing concentrations exceeding Maximum Contaminant Levels (MCLs) established under the Federal Safe Drinking Water Act [*removal and/or treatment*];
- [2009] Prevent or minimize source area migration and contribution to the existing dissolved phase plume [*source control*];
- [2009] Prevent or minimize the potential that ground water contaminants from the shallow sand and interbedded unit could impact deeper aquifers [*prevent or minimize further migration of the plume*].
- [2009] Prevent current and future use of the shallow sand and interbedded unit ground water impacted by past site operations with ground water contaminants in excess of the site cleanup goals: 5 ppb for benzene, 0.2 ppb for benzo(a)pyrene, 1500 ppb for naphthalene onsite, and 490 ppb for naphthalene offsite) [*prevent human exposure to contaminated ground water above acceptable risk levels*].
- [2009] Return ground water to its expected beneficial use wherever practicable [*restoration*].

The 2011 Selected Remedy RAOs are as follows:

- Contain two ground water contaminant plumes, associated with the shallow sand (OU1) and the interbedded sand unit (OU3), through natural processes [*containment*];
- Prevent human exposure to contaminated ground water above acceptable risk levels by implementing institutional controls to restrict access to, or use of, contaminated water by restricting the installation of ground water wells within the designated Technical Impracticability (TI) Zone [*prevent exposure to contaminated ground water above acceptable risk levels*];
- Remove Site-related DNAPL accumulations in impacted monitoring wells until the amounts diminish and/or retrieval is no longer practicable [*source removal*];

This ROD Amendment sets forth the Selected Remedy to address remaining ground water contamination associated with the former wood treatment facility at this Site, which was not completely remediated by actions taken under the initial 1988 ROD and the 2009 ROD Amendment.

The Selected Remedy:

- Establishes a containment remedy for the contaminated ground water associated with the shallow sand and the interbedded sand unit at the Site;
- Waives ground water cleanup levels, as Applicable or Relevant and Appropriate (ARARs), for benzene, benzo(a)pyrene, and naphthalene, within a 16-acre Technical Impracticability (TI) Zone, established by this Remedy;
- Provides for long-term monitoring to document the post-construction effectiveness of source stabilization to minimize the flux of contaminants to ground water, as well as to document the continued stability of the two contaminant plumes;
- Provides that DNAPL accumulations in the impacted monitoring wells will be periodically pumped for collection and disposal until the amounts diminish and/or retrieval is no longer practicable;
- Implements Institutional Controls (ICs) to restrict the use, or access to, contaminated ground water above health-based levels to ensure the continued protection of human health and the environment by restricting the installation of water wells within the designated TI Zone.

Significant Change to the Selected Remedy:

- The Selected Remedy contains a revision to the TI Zone boundary (defined in the Proposed Plan), which reduces the area over which the waiver of cleanup levels will apply.
- The Selected Remedy adds a RAO for DNAPL source removal from the impacted monitoring wells. The Proposed Plan included DNAPL retrieval as a component of the remedy, but not as a RAO. The Selected Remedy maintains DNAPL retrieval as a remedy component:

The Selected Remedy for the dissolved phase ground water completes the ground water remedy for the Site, amends the original 1988 ROD and the 2009 ROD Amendment. The proposal and selection of an alternate remedy to amend that selected in the 1988 and 2009 decision documents is in accordance with the National Oil and Hazardous Substance Contingency Plan (NCP) §300.435(c)(2)(ii)(A) through (H). The actions selected by this decision document are a continuation of those previous actions taken for the Site in accordance with the CERCLA (Superfund), 42 U.S.C. §9617(a) and 40 CFR Part 300.

Statutory Determinations

The Selected Remedy for the ground water and soil contamination is protective of human health and the environment. The Selected Remedy and ROD Amendment provides the documentation to waive the Federal and State requirements to meet cleanup levels as applicable or relevant and appropriate (ARARs) to the remedial action within a TI Zone established in this action. The ARARs established in the 2009 ROD Amendment are incorporated by reference and still apply outside the designated TI Zone.

The previous ground water remedy implemented under the 1988 ROD and the 2009 ROD Amendment reduced the DNAPL source to ground water, satisfying the statutory preference for treatment as a principal element of the remedy (i.e., reduces the toxicity, mobility, or volume of hazardous substances, pollutants, or contaminants as a principal element through treatment). Further treatment of the remaining areas of DNAPL is technically impracticable with current technologies.

Since the selected remedy will result in hazardous substances remaining onsite above levels that allow for unlimited use and unrestricted exposure, a statutory review must be conducted within five years of the initiation of the first remedial action to ensure that the remedy is, or will be, protective of human health and the environment. The Five-Year Review will include an evaluation of remedy effectiveness, the appropriateness of new technologies, changes in ARARs, recommendations to implement remedial contingencies, and will be consistent with EPA Five-Year guidelines per CERCLA Section 121(c), 42 U.S.C. § 9621(c). The fourth Five-Year Review for the North Cavalcade Street Superfund Site will be performed in 2013.

ROD Amendment Data Certification Checklist

The following information is included in the Decision Summary (Part 2) section of this ROD Amendment. Additional information can be found in the Administrative Record file for this Site and referenced, as appropriate, in Decision Summary.

- Decisive factor(s) that led to amending the 1988 ROD and 2009 ROD Amendment to select an alternate remedy for two dissolved phase ground water plumes associated with the Site;
- Additional information developed after the 2009 ROD Amendment to document the natural attenuation process and the limitations to further expansion of the two ground water ground water plumes;
- Comparison between the previous remedies for ground water and the Selected Alternate Remedy;
- Justification for a TI waiver of cleanup levels and establishment of a TI Zone;
- Consideration of public comments in the Responsiveness Summary;
- Summary of the Selected Remedy.

Authorizing Signature

This ROD Amendment documents the selection of an alternate Remedy for contaminated ground water (most specifically, the dissolve phase ground water), at the North Cavalcade Street Superfund Site. This remedy was selected by the EPA with the concurrence of the TCEQ (Attachment 1). The Director of the Superfund Division (EPA, Region 6) has been delegated the authority to approve and sign this ROD Amendment.

By: Pamela Phillips, Acting
Samuel Coleman, P.E., Director
Superfund Division
U.S. EPA Region 6

Date: 8/26/11

Concurrence List

Camille D. Hueni, Remedial Project Manager
Superfund Remedial Branch
Date August 23, 2011

Carlos A. Sanchez, Chief
AR/TX Section, Superfund Remedial Branch
Date 8/23/11

Donald H. Williams, Deputy Associate Director
Superfund Remedial Branch
Date 8/23/11

Charles Faultry, Associate Director
Superfund Remedial Branch
Date 8/23/11

Joseph E. Compton, III
Joseph E. Compton, III, Assistant Regional Council
Superfund Branch, Office of Regional Counsel
Date 24 Aug. '11

Mark A. Peycke, Chief
Superfund Branch, Office of Regional Counsel
Date 08/26/11

Pamela Phillips, Deputy Director
Superfund Division
Date 8/26/11

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PART 2: DECISION SUMMARY

1.0 Site Name, Location, and Brief Description

The North Cavalcade Street Superfund Site ("Site"), CERCLIS ID No. TXD 980873343, is a 21-acre property and former wood treating site located in Houston, Harris County, Texas, about one mile southwest of the intersection of Loop 610 and U.S. Highway 59 (**Figure 1**). The Site is located within a commercial/industrial corridor, just north of the downtown Houston, with residential areas to the west (200 feet downgradient) and to the northeast (**Figure 2**). The wood treating facility was established in 1946 and continued in operation until 1961, at which time the property was foreclosed. The property subsequently was subdivided and sold. The southern 10 acres of the Site are now privately owned and occupied by two commercial businesses.

The ground water contaminant source areas and dissolved phase plumes are located on the southern 10-acre portion of the property. The two source areas correspond to the former operation area and waste pits (approximately a one-acre area). The contamination in the lower interbedded dissolved phase plume ("ground water") has an associated offsite ground water component. Contamination in the shallow sand ground water is limited to onsite. The site's contaminated ground water and two source areas have been addressed by remedies implemented under both the 1988 Record of Decision (ROD) and the recent 2009 ROD Amendment.

This 2011 ROD Amendment addresses the remaining element of the ground water remedy, the dissolved phase contaminant plumes (ground water) associated with the two Dense Non-Aqueous Phase Liquid (DNAPL) source areas, which was not included in the 2009 ROD Amendment. The two plumes will also be referred to as Operable Unit 1 (associated with the shallow sand) and Operable Unit 3 (associated with the interbedded sand unit), as appropriate. The Amendment will discuss the information developed since the 2009 ROD Amendment and the selection of a remedy supported by that information. The information developed for the 2009 Amendment is still relevant to this 2011 decision document and is included by reference unless otherwise noted.

2.0 Site History and Selected Remedy

The U.S. Environmental Protection Agency (EPA) proposed the North Cavalcade Street Site to the National Priorities List (NPL) on October 5, 1984 (49 Federal Register [FR] 40320), and added the Site to the final list on June 10, 1986 (51 FR 21054). The original ROD for the North Cavalcade Street Superfund Site was issued on June 28, 1988, and implemented a remedy to address both contaminated soil (OU2) and ground water (OU1) [Investigations in 1987 defined the extent of contamination for the shallow ground water.] The 1988 ROD identified the ground water creosote-related Contaminants of Concern (COCs), including polycyclic aromatic hydrocarbons (PAHs), such as naphthalene, and volatile organic compounds (benzene, ethylbenzene, toluene, and xylene). Metals were not detected in ground water, with the exception of a single detection of arsenic.

The 1988 ground water remedy for OU1 selected the extraction and treatment of contaminated ground water to remove non-aqueous phase liquids (NAPLs) until benzene concentrations in ground water no longer exceeded the Safe Drinking Water Act (SDWA) Maximum Contaminant Level (MCL) of 5 micrograms per liter (μg/L) and carcinogenic PAHs were not detected. The pump and treat remedy for ground water removed an estimated 8,000 gallons of product (creosote source) from the first shallow sand water-bearing unit. Investigations in 1998 and 2000 verified that contamination was also located in the underlying interbedded unit (OU3), a much siltier zone that was not conducive to the pump and treat remedy (EPA 2009). The pump and treat remedy was discontinued, and evaluation of a revised remedy to address the DNAPL and contaminated ground water was initiated.

In January 2004, the EPA and TCEQ completed additional fieldwork to further delineate the lateral and vertical extent of DNAPL and associated dissolved ground water plumes for both the shallow sand (OU1) and the interbedded unit (OU3). Data was collected from the existing shallow sand monitoring wells and the newly installed temporary wells for both the shallow and interbedded unit and documented in the *Supplemental Investigation for Remedy Evaluation Report* (Shaw, June 2005). EPA's findings, summarized in the 2008 *Focused Feasibility Study* (FFS) (CH2M HILL, 2008) confirmed that DNAPL was present onsite within both the shallow and interbedded units. The areas demonstrating DNAPL, as considered potentially mobile, were defined within two source areas to be remediated under the revised remedy. Residual DNAPL, believed immobile, was found to extend offsite to the west in the interbedded unit only.

In September 2009, the U. S. EPA selected an alternate remedy for both ground water (OU1, OU3) and soil (OU2) for the Site in a ROD Amendment. In the 2009 ROD Amendment, EPA selected In-Situ Stabilization (ISS) to provide source control for the two DNAPL source areas. The remedial action objectives (RAOs) for ground water were defined as:

- Prevent or minimize source area migration and contribution to the existing dissolved phase plume [*source control*]
- Prevent or minimize the potential that ground water contaminants from the shallow sand and interbedded unit could impact deeper aquifers [*prevent or minimize further migration of the plume*]
- Prevent current and future use of the shallow sand and interbedded unit ground water impacted by past site operations with ground water contaminants in excess of site cleanup levels (5 µg/L benzene, 0.2 µg/L benzo(a)pyrene, 1500 µg/L naphthalene onsite, and 490 µg/L naphthalene offsite) [*prevent human exposure to contaminated ground water above acceptable risk levels*].
- Return ground water to its expected beneficial use wherever practicable [*restoration*]

The cleanup levels for benzene and benzo(a)pyrene were based on the Federal drinking water standard or maximum contaminant level (MCL). The cleanup levels for naphthalene was based on the Texas Risk Reduction Program (TRRP) promulgated standards for residential and commercial/industrial exposure scenarios.

The 2009 remedy simultaneously addressed further control/reduction for the shallow sand and interbedded ground water source areas, through ISS of two creosote DNAPL ground water source areas in the shallow sand and interbedded unit. Stabilization by solidification of 12,000 cubic yards within the two DNAPL source areas in effect controls the source and restricts further leaching of contaminants into the dissolved phase ground water. The ISS is conceptually illustrated in **Figure 3**. The 2009 ROD Amendment also selected ground water monitoring to provide additional lines of evidence for natural attenuation of the dissolved phase contaminant plume.

The 2009 remedy also included the construction of a permanent cap over an existing soil containment cell (23,400 cubic yards of impacted soils), located in the northern half of the Site. Although, the remedy addressed both soil and ground water source areas, the soil, located on the northern ten acres, is *not* a driver for the ground water contamination. A pre-final inspection of construction completion of the ISS (and permanent soil cover) was completed in February 2011. Construction of the cell is the final action for soils (OU2) and is considered complete. The ISS operation addressed the two primary ground water source areas for the Site and is also considered complete.

As the Site transitioned into remedial design and remedial action to implement the revised remedy described by the 2009 ROD Amendment, temporary monitoring wells, installed and sampled as part of the 2004 fieldwork, were replaced with permanent wells (in December 2010) suitable for use in long-term monitoring. The permanent well network, consisting of 65 monitoring wells for both the shallow sand and the interbedded unit, were sampled in December 2010, providing a baseline of data for comparison to future monitoring events. An offsite subset of the interbedded unit wells was sampled again in April 2011. The EPA also performed additional subsurface investigations to verify previous conclusions about subsurface conditions, including the ongoing natural attenuation process for Site contaminants. These activities are described in two documents: (1) *Technical Memorandum: Summary of Activities and Results, North Cavalcade Street Remedial Design Data Collection*, January 2011 (CH2M HILL, 2011), and (2) *Technical Memorandum: Summary of Activities and Results, Ground Water Data Collection August 2010 through April 2011, North Cavalcade Street Superfund Site Remedial Action* (CH2M HILL, 2011).

3.0 Community Participation

The EPA published the notice on July 7, 2011, to announce the 30-day comment period for the *Record of Decision Amendment Proposed Plan for Ground Water* and to provide information on the July 19, 2011, public meeting. Notices were published in both the *Houston Chronicle Zoned Edition* and the local *Rumbo De Houston* papers. Copies of the Proposed Plan were also mailed to interested parties and posted on the EPA public website. On July 19, 2011, the EPA held a public meeting at the Carnegie Library, in Houston, Texas, to discuss the Proposed Plan, to answer questions, and to take formal comments. A transcript of the public meeting is included in the Administrative Record for this decision. The summary of the significant comments are included in the Responsiveness Summary, as part of this ROD Amendment. The formal comment period opened on July 8, 2011 and closed on August 6, 2011.

The Administrative Record, including the Proposed Plan for the Record of Decision Amendment, was available for review during the public comment period at the Houston Central Library (Houston Metropolitan Research Center), and at the TCEQ offices (Building E, Records Management) in Austin, Texas. [The Administrative Record Index is included as *Attachment 2* to this Record of Decision Amendment and includes those documents referenced herein.]

The EPA met with one of the property owners, on July 18, 2011, to provide information on the proposed ground water remedial action, the public comment process, and to discuss the completion of the ground water source stabilization. The EPA also met with the Harris Country Toll Road Authority (HCTRA) and their contractors that same day to share information on the proposed Site remedy and ground water monitoring information for the ground water wells installed on their property, just outside the western (and downgradient) boundary of the Site.

There were three attendees at the public meeting on July 19, 2011, who are affiliated with the HCTRA. There were no attendees from the community. Questions from the HCTRA centered on what, if any, actions would the Agency take if the plume is shown to be expanding or migrating to the west, and if the EPA will remain as lead for the Site cleanup after a portion of the property transfers to the Texas General Land Office. Those questions and responses are included in the Responsiveness Summary section of this document. No additional comments were received during the comment period, which closed August 6, 2011.

4.0 Basis for the ROD Amendment

This ROD Amendment sets forth the Selected Remedy to address remaining contaminants in the two dissolved phase ground water plumes associated with the former wood treatment facility at this Site. This decision considers additional information developed since the 2009 ROD Amendment implemented the remedial action for ground water (and soils). Whereas the two previous decision documents addressed, in particular, the ground water source areas, this 2011 Amendment addresses the more mobile dissolved phase ground water and the accumulation of residual DNAPL in a limited number of monitoring wells. The discussion herein considers and amends the 1988 ROD and completes the ground water remedy selected by the 2009 ROD Amendment.

Treatment of the two ground water source areas was previously addressed by the 1988 ROD and the 2009 ROD Amendment. The 1988 ROD selected a pump and treat remedy for the shallow sand, recovering over 8,000 gallons of creosote product. The 2009 Amendment selected In-Situ Stabilization (ISS) and solidified the two primary ground water source areas in place, vertically, from 37 below ground surface (bgs) to 5 feet bgs. In the southeast source area, 8,931 cubic yards of soil were stabilized, and in the northwest source area, 2,924 cubic yards of soil were stabilized. The ISS decreased the hydraulic conductivity in the treated areas by more than 4 orders of magnitude (from 10 ft/day in untreated soil to 1.1×10-4 ft/day), significantly reducing the amount of water passing through the source areas and limiting contaminant mass flux from the treated source zone (CH2M HILL, 2010).

There are, however, areas of residual DNAPL and isolated free-phase DNAPL remaining, along with the dissolved phase contamination in ground water. Natural attenuation of the ground water contaminants and the lithologic characteristics of both zones act to limit expansion and provide containment of the dissolved contaminant plume. However, the EPA has concluded that it is technically impracticable to restore all parts of the dissolved phase ground water because of the intermittent occurrence of residual and free-phase DNAPL in the shallow sand and interbedded unit water-bearing zones. In particular, the contaminant plume in the interbedded unit will not be responsive to existing treatment technologies.

The Selected Remedy addresses those *fundamental* changes to the original 1988 and 2009 amended response action for the contaminated ground water by the following actions:

- The EPA selects containment of the two ground water plumes associated with Site's shallow sand and interbedded sand unit, by physical and biological processes. The 2009 ROD Amendment restoration goals will not be achievable throughout the dissolved phase ground water plumes;
- Ground water cleanup levels, for benzene, benzo(a)pyrene, and naphthalene, will be waived within a designated Technical Impracticability (TI) Zone. The boundaries of the TI Zone include both onsite and offsite areas and apply to both of the impacted shallow aquifers (OU1/OU3);
- Exposure to contaminated ground water above acceptable risk levels will be controlled by implementing institutional controls to restrict access to, or use of, contaminated water by restricting the installation of water wells within the TI Zone;
- Provides for long-term monitoring to document the post-construction effectiveness of source stabilization to minimize the flux of contaminants to ground water, as well as to document the continued stability of the two contaminant plumes;
- Provides that DNAPL accumulations in the impacted monitoring wells will be periodically pumped for collection and disposal until the amounts diminish and/or retrieval is no longer practicable;

In summary, this response action amends the ground water remedy previously selected by the 1988 ROD and the 2009 ROD Amendment. The action is limited in scope to the dissolved phase ground water, recognizing that the principal-threat waste (DNAPL) has been reduced or stabilized under two selected treatment remedies. Long-term monitoring will be continued to ensure that the plume is contained and to document contaminant trends throughout the plumes. Institutional controls will be implemented to prevent exposure to contaminated ground water.

5.0 Site Characteristics

The North Cavalcade Street Superfund Site is located in the Southeast Texas Coastal Plain. This region is underlain with Holocene and Pleistocene deposits to a depth of approximately 2,400 feet. The Pecore Fault, a local surficial fault, runs along the southern boundary of the Site. Two cross-sections are provided to illustrate the shallow geologic conditions that are relevant to remediation at the Site (**Figures 4 through 6**).

The geology at the Site generally consists of interbedded clays, silts, and sands of fluvial-deltaic in origin. The lithology onsite consists of a well-developed fine-grained sand in the shallow sand and a thinner interbedded unit, dominated by clays and silts. The shallow sand is encountered at a depth of approximately 10 to 15 feet below ground surface (bgs) and is of consistent thickness (8 to 15 feet) across the Site. The shallow sand is also thinner on the south side of the Pecore fault. The shallow sand is underlain by a predominantly clay layer, approximately 5 feet thick. The interbedded unit lies beneath this clay layer, at a depth between 24 and 27 feet bgs; the base of the interbedded unit generally occurs between 30 and 34 ft bgs. The interbedded unit is quite variable in composition and thickness, consisting of thin interbedded clay, silty clay/clayey silt, silt, and clayey sand, which thins significantly west of the Site boundary. A contour map of the top of the regional clay that occurs below the interbedded unit is illustrated in **Figure 7**, and the variable effective thickness of the interbedded unit is illustrated in **Figures 8 and 9**.

In 2009, during the remedial design of the revised remedy, 141 monitor points (existing wells; temporary wells from the 2004 investigation; and observation wells) were inventoried. Eight wells, located onsite, within or adjacent to the previously defined source areas, demonstrated DNAPL accumulation in the well bores. These wells were removed in 2010 during the ISS construction. In November and December 2010, 53 new monitoring wells were installed and, with 12 pre-existing wells, established the 65-well monitoring network for the Site, up (east) and downgradient (west) of the stabilized source areas. Ground water analytical and microbial data were collected from both the permanent wells and select temporary wells in late 2009 to April 2011, further delineating extent of ground water contamination and establishing the lines of evidence for natural attenuation of plume contaminants.

Observations documented in the soil boring logs from the new wells were evaluated along with the previously-existing soil boring logs to develop a detailed picture of the Site lithology. **Figure 4** provides a cross-section location map, and **Figures 5 and 6** provide west-east and north-south cross-sections, respectively. Results from the ground water sampling events are also shown on the cross-sections. A contour map of the observed top of the regional clay, which underlies the interbedded unit and prevents the vertical migration of contaminants, is shown in **Figure 7.** The effective thickness of the interbedded unit is illustrated in **Figures 8 (3-dimensional view) and 9** (2-dimensional view overlain with the 490 ug/L contour for naphthalene and the extent of residual DNAPL). The potentiometric surface was contoured from water levels measured in permanent wells in April 2011; the potentiometric surface of the shallow sand and interbedded unit are illustrated in **Figures 10 and 11**, respectively. Contaminant plume maps are provided in **Figures 12 through 17** for naphthalene, benzene, and benzo(a)pyrene for both shallow sand and interbedded unit wells, respectively. As points of reference, the plume maps also illustrate the extent of residual DNAPL and those contour lines corresponding to 2009 ROD Amendment cleanup concentrations for the three COCs.

Collectively, this information documents that the extent of dissolved-phase contamination in ground water has been defined and is limited in extent by natural attenuation and the physical character of the subsurface materials. In particular, the offsite extent of the ground water contaminant plumes, associated with the Site, is driven by the extent of naphthalene and benzene in the interbedded unit. The interbedded unit lithology (fining and thinning westward), combined with natural attenuation, is effectively restricting plume growth. Several lines of evidence suggest that the contaminated ground water plumes are stable. In particular, the results of a stable isotope probing (SIP) study conclusively demonstrate that indigenous microbes are actively biodegrading naphthalene contamination and that mineralization and biomass growth was directly observed through this study (*2011 Update to the Evaluation of Natural Attenuation Technical Memorandum (*CH2M HILL, June 2011). Phospholipid fatty acid (PLFA) analyses and other geochemical data indicate an elevated level of bioactivity within the area of contaminated ground water and that biodegradation of Site contaminants is occurring. The Tech Memo concluded that natural attenuation is a viable remedy for the dissolved phase plume based on documented microbial activity combined with the demonstrated plume stability (CH2M HILL, 2011).

During preparation for the April 2011 yield tests, four of the interbedded monitor wells installed in December 2010 were discovered to contain a measurable quantity of DNAPL. These wells are offsite well MW-42I, and onsite wells MW-33I, MW-57I, and MW-59I and are within or adjacent to the previously-defined residual DNAPL (**Figure 13, 15, and 17**). DNAPL was not indicated in any of these wells during installation or development, nor present in the temporary wells near these locations. The DNAPL is most likely a local occurrence associated with the defined residual area and not a demonstration of migrating DNAPL. The presence of DNAPL will, however, limit the ability for natural attenuation to reduce contaminants to below cleanup levels throughout the plumes and meeting the restoration goal of the 2009 ROD remedy. The 2011 ROD Amendment considers this in the selected dissolved phase ground water remedy. DNAPL accumulations will be measured and recovered on a regular basis and volumes noted. Overall trends will continue to be monitored in accordance with the long-term monitoring plan.

Yield tests conducted at four interbedded monitoring wells also indicate that ground water deliverability decreases from east to west, corresponding to the increased clay and reduced thickness of the zone to the west. The yield in well MW-47I located offsite downgradient (at the plume boundary) is 662 gallons per day (gpd), significantly lower than that observed 2,291 gpd yield in onsite well MW-30I, located near the source areas (2,291 gpd), as documented in the *Evaluation of Yield Tests* (CH2M HILL, 2011).

Based on the data collected and illustrated in **Figures 3 through 17**, and discussed in the various references cited above, several observations can be made regarding the status of contamination at the Site.

- The primary shallow water-bearing units at the Site are the shallow sand and the underlying interbedded unit. Both water-bearing zones are hydraulically connected in the eastern and northeastern sections of the southern half of the Site, but separate into two distinct zones downgradient to the west. Towards the west side of the Site, the permeable portion of the shallow sand becomes siltier; and the permeable part of the interbedded unit becomes thin and eventually completely transitions to a clayey silt, 3 feet thick, that limits continued ground water flow to the west.
- The potentiometric surface data from 2004 through 2010 consistently indicates ground water flow direction is to the west for both the shallow sand and the interbedded. Although the ground water flow gradient is relatively flat across the onsite and offsite areas, the potentiometric surface gradients for both units steepen to the west (offsite), suggesting subsurface changes which may impede ground water flow to the west.
- The lithology of the shallow sand is poorly graded sand or silty sand, with some areas entirely silty sand/clayey sand. Contamination in the shallow sand decreases to non-detect within this first offsite block. Except for one detection of benzene at 6.9 ug/L in MW-43S, cleanup levels are not exceeded in the shallow sand offsite.
- The lithology of the interbedded unit is also quite variable in composition and thickness, and is comprised of an interbedded lean clay, silty clay/clayey silt, lean silt, clayey sand, silty sand, and

poorly graded sand. The yield measured in offsite well MW-47I (662 gpd) is significantly lower than that measured in onsite well MW-30I (2,291 gpd), located near the source area, correlating with increasing silt/clay content and thinning westward.

- There is a clear relationship between the effective thickness of the interbedded unit, the top of the underlying regional clay, and the extent of contamination (**Figures 7, 8, and 9**). Contamination originates from the source areas onsite, and has spread somewhat to the west/downgradient, primarily within the interbedded unit, where the top of the regional clay is lower. The decrease (to non-detect) for COC concentrations correlates to where the interbedded unit thins to 3 feet in the offsite area.
- Contamination in the interbedded unit is more extensive than in the shallow sand, but concentrations still drop to below cleanup levels within a block and a half from the western boundary of the Site, and to non-detect within 3 blocks. This is similar to the trend established in 2004 with the installation of temporary wells. The decrease in contamination corresponds to where the gradient increases, the yield decreases, and the character of the interbedded unit decreases in effective thickness and demonstrates more clay. The extent of residual DNAPL and the four locations where some accumulation has been observed coincides with the exceedance of cleanup levels. Within 300 feet of the furthest downgradient DNAPL observation (at MW-42I), contamination in the interbedded unit drops to below cleanup levels (**Figures 13 and 15**).
- As documented by the evaluation of natural attenuation, multiple lines of evidence suggest that natural attenuation is actively controlling the dissolved phase benzene and naphthalene plumes. The stability of the dissolved phase plumes suggests that the observed DNAPL remaining outside the ISS area is also stable. The recent observation of DNAPL accumulation in monitor wells within or adjacent to the previously defined residual DNAPL extent does not affect the conclusions of natural attenuation associated with the dissolved phase plume (CH2M HILL, 2011).
- Of note, the leading edges of the benzene and naphthalene plumes in the interbedded unit are confined to less than 300 feet from the downgradient edge of the observed extent of DNAPL. The stability of the dissolved phase plume suggests that the DNAPL footprint, the presumed source of the benzene and naphthalene, is also stable. This trend has been observed since 2004, when temporary wells into the interbedded unit were first sampled.

6.0 Comparison of the Previous Remedies and Selected Alternate Remedy

Remedial Action Objectives (RAOs) are developed to consider the contaminants of concern (COCs), exposure route(s), receptor(s), applicable federal and state standards, and anticipated future land use for the Site. The RAOs developed in the 1988 *Focused Feasibility Study* (FFS) for soil and ground water at the site required that existing contamination be removed and/or treated to ensure that human health and the environment are protected. As a point of comparison, the following RAOs for ground water were established in the original 1988 ROD and the 2009 ROD Amendment as follows:

Ground Water RAO (1988 ROD)

Removal and/or treatment of ground water containing concentrations exceeding Maximum Contaminant Levels (MCLs) established under the Federal Safe Drinking Water Act.

As part of the 2008 Focused Feasibility Study, the original RAOs were reviewed for applicability with conditions at the Site and revised accordingly. The revised RAOs for the Site again met the overall remedial goals of the original RAOs of ensuring that human health and the environment are protected for ground water, as follows:

Ground Water RAOs (2009 ROD Amendment)

- Prevent or minimize source area migration and contribution to the existing dissolved phase plume [*source control*].
- Prevent or minimize the potential that ground water contaminants from the shallow sand and interbedded unit could impact deeper aquifers [*prevent or minimize further migration of the plume*].
- Prevent current and future use of the shallow sand and interbedded unit ground water impacted by past site operations with ground water contaminants in excess of the site cleanup goals: 5 ppb for benzene, 0.2 ppb for benzo(a)pyrene, 1500 ppb for naphthalene onsite, and 490 ppb for naphthalene offsite) [*prevent human exposure to contaminated ground water above acceptable risk levels*].
- Return ground water to its expected beneficial use wherever practicable [*restoration*].

Both the 1988 ROD and the 2009 ROD Amendment implemented treatment to control the contaminant DNAPL source and prevent or minimize further migration of the contaminated ground water derived from the source areas. The 1988 pump and treat remedy was implemented for the shallow sand only. The 2009 ROD Amendment modified the cleanup levels for three creosote-related contaminants to meet the SDWA MCLs, or State standard:

- Benzene (5 µg/L or 5 ppb);
- Benzo(a)pyrene (0.2 µg/L or 0.2 ppb); and
- Naphthalene (State standard – 1500 µg/L or 1500 ppb for onsite/commercial; 490 µg/L or 490 ppb for offsite/residential).

The 2009 cleanup levels were developed to consider the potential (future) threat to human health by exposure through ingestion, inhalation, and dermal contact of contaminated water by onsite and offsite human receptors, as detailed in the 2007 *Baseline Human Health Risk Assessment* (BHHRA) for the Site. Land use for the Site is expected to continue as industrial/commercial use. The Harris County Toll Road Authority (HCTRA) has plans to construct an extension of the Hardy Toll Road just outside the western (downgradient) boundary of the Site. A residential area is also located just west of the Site boundary. The conclusions summarized in the 2009 ROD Amendment are still applicable for this 2011 Selected Remedy and are included by reference.

Ground Water RAOs (2011 ROD Amendment)

The 2011 Selected Remedy will revise the ground water RAOs as follows;

- Contain two ground water contaminant plumes, associated with the shallow sand (OU1) and the interbedded sand unit (OU3), through natural processes [*containment*];
- Prevent human exposure to contaminated ground water above acceptable risk levels by implementing institutional controls to restrict access to, or use of, contaminated water by restricting the installation of ground water wells within the designated Technical Impracticability (TI) Zone [*prevent exposure to contaminated ground water above acceptable risk levels*];
- Remove Site-related DNAPL accumulations in impacted monitoring wells until the amounts diminish and/or retrieval is no longer practicable [*source removal*];

The selected remedy will address the remaining action for the OU1/OU3 dissolved phase ground water contaminant plumes. The remedy will prevent human exposure to contaminated ground water above acceptable risk though the implementation of institutional controls (i.e. prevent the installation of new water supply wells into impacted ground water). Ground water restoration will be replaced by containment of the contaminated groundwater through natural processes or conditions. A TI Zone will be established, within which existing cleanup levels will be waived. Long-term monitoring will be continued to ensure that the plume is not expanding (plume stability) and to document the post-construction effectiveness of source stabilization. If present, DNAPL will be removed from the affected monitoring wells in the short-term.

In addition, EPA is required to conduct a Site review every five years (Five-Year Review) to ensure that the remedy continues to be protective of human health and the environment in instances where hazardous substances, pollutants, or contaminants are left in place at concentrations that prevent unlimited use and unrestricted exposure. The next Five-Year Review for the North Cavalcade Street Superfund Site is planned for completion in September 2013.

Under the NCP's nine evaluation criteria, 40 CFR §300.430(e)(9), the EPA evaluates remedial alternatives for the cleanup of a release. These nine criteria are categorized into three groups: threshold, balancing, and modifying. The threshold criteria must be met in order for an alternative to be eligible for selection. The threshold criteria are overall protection of human health and the environment and compliance with ARARs. The balancing criteria are used to weigh major tradeoffs among alternatives. The five balancing criteria are long-term effectiveness and permanence; reduction of toxicity, mobility or volume through treatment; short-term effectiveness; implementability; and cost. The modifying criteria are state acceptance and community acceptance.

The TI waiver of cleanup levels, combined with containment of the contaminant plumes, is the alternate remedy that is being considered because other active technologies are impracticable under the current Site conditions and a Natural Attenuation remedy is limited by the presence of DNAPL. Therefore, the remedy comparison will be between the Natural Attenuation remedy presented in the 2009 Proposed Plan and the alternate selected remedy.

The components of the selected remedy for the dissolved phase ground water plumes are:

- Establishment of a TI Zone, as applied to both the shallow sand and interbedded contaminant plumes;
- Waiver of cleanup levels within the specified TI Zone;
- Implementation of ICs to restrict use of, or access to, contaminated ground water above risk-based levels;
- Long-term monitoring will be continued to ensure that the plume is not expanding (plume stability) and to document the post-construction effectiveness of source stabilization;
- Removal of DNAPL in impacted monitoring wells until amounts diminish and/or retrieval is no longer practicable.

Table 1 provides a comparative analysis of the 2009 ROD Amendment recommendation for the dissolved ground water phase and the selected alternate remedy, under the nine-part criteria. The 2009 decision document selected additional monitoring to support that natural attenuation would restore the contaminant plumes after ISS of two DNAPL source areas. The alternate remedy selects the containment of the contaminant plumes and the waiver of ARAR-based cleanup levels within a designated TI Zone.

Table 1: Nine Criteria Comparative Analysis for North Cavalcade Street Superfund Site

Evaluation Criteria	2009 ROD Amendment Ground Water Remedy	2011 Selected Ground Water Alternate Remedy
Overall Protection of Human Health and the Environment	The 2009 remedy would be more protective than the alternate remedy because the natural attenuation processes were expected to restore the ground water to drinking water quality after the DNAPL source was removed. The estimated timeframe for naphthalene to reach cleanup goals in the offsite area was 100 years after solidification of the entire DNAPL source. ICs would be placed to restrict use or access until cleanup goals were met.	The alternate remedy provides adequate protection because the risk from exposure to contaminated ground water will be controlled through containment of the ground water plume from natural processes and lithologic restrictions to plume migration. Proposed water well drilling restrictions and monitoring will prevent exposure to contaminated ground water through use or access.
Compliance with Applicable or Relevant and Appropriate Requirements ("ARAR").	The 2009 ROD Amendment revised cleanup levels based on MCLs for benzene and benzo(a)pyrene, and on a State standard for naphthalene, as restoration goals for the dissolved phase ground water.	The alternate remedy will not meet the ARARs for the MCLs for benzene and benzo(a)pyrene, or the State standard for naphthalene, across the dissolved phase ground water associated with the Site. There is no technology capable of further significant reduction of the contaminated ground water beyond the two treatment remedies implemented and completed for the for the DNAPL source areas. The limited amounts of free-phase NAPL, and to some extent the residual phase, will continue to contribute to dissolved phase ground water contamination, where present. The heterogeneity and clays/silts of the interbedded unit will limit the effectiveness of additional treatment. For this reason, the MCLs for benzene and benzo(a)pyrene, and the State standard for naphthalene, will be waived within the TI Zone because it is technically impractical to meet these standards with yet, another round of treatment.
Long-term Effectiveness and Permanence	The remedy (source stabilization; earlier pump and treatment of the shallow sand) and natural attenuation (if validated) was expected to permanently achieve the cleanup levels with time. Verification of	The natural attenuation process has been demonstrated for naphthalene and benzene in the interbedded unit and is a key contributor to maintaining overall plume stability. However, where DNAPL may still remain, sourcing of contaminants to

Table 1: Nine Criteria Comparative Analysis for North Cavalcade Street Superfund Site

Evaluation Criteria	2009 ROD Amendment Ground Water Remedy	2011 Selected Ground Water Alternate Remedy
	cleanup trends would be documented through long-term monitoring. [The permanent network was installed in December 2010.]	ground water is expected to dominate the natural attenuation process. Although attenuation of the three COCs will continue to decrease concentrations for parts of the dissolved phase plume, the complete restoration of the plume is not anticipated. The contaminated ground water will be monitored to confirm that the contamination is not increasing or migrating out of the proposed TI Zone. Because waste will remain on the Site above health-based levels, a formal review to assess the protectiveness of the remedy will be done every five years.
Reduction of Toxicity, Mobility, or Volume of Contaminants through Treatment	There was a source stabilization component of the 2009 selected ground water remedy that was applied to two source areas that impacted both the shallow sand and the interbedded unit. A previous pump and treat remedy implemented by the 1988 ROD also recovered over 8,000 gallons of creosote DNAPL from the shallow sand. The 2009 remedy implemented monitoring to demonstrate natural attenuation for the remaining dissolved phase plume. Natural attenuation, after the two source control/removals, was expected to restore ground water to the applicable MCLs or State standard over time, for both the shallow sand and interbedded unit, if proven.	The alternate remedy does not include treatment. Two previous treatment remedies were applied to address the DNAPL source. Pump and treat was the initial remedy for the shallow sand only, where the ground water plume is limited to onsite and remaining residual DNAPL is close to the stabilized source area. The 2009 ROD Amendment again addressed the source area; this time, for both the shallow sand and the interbedded unit. The alternate remedy addresses the remaining dissolved phase ground water only. Natural attenuation has been demonstrated for the more mobile plume associated with the interbedded unit and has, along with lithologic restrictions, limited further expansion of the plume. Attenuation is also expected to decrease concentration (volumes) in those areas of the plume where the process is not competing with dissolution of remaining DNAPL. No further treatment is being planned as the complexity of the interbedded zone, in particular, limits the effectiveness of available technologies.

Table 1: Nine Criteria Comparative Analysis for North Cavalcade Street Superfund Site

Evaluation Criteria	2009 ROD Amendment Ground Water Remedy	2011 Selected Ground Water Alternate Remedy
Short-term Effectiveness	The 2009 ROD Amendment implemented additional source treatment; long-term monitoring will document effectiveness over time for the dissolved phase plume. Long-term monitoring will also demonstrate the effectiveness of natural attenuation over time. Construction of the remedy was completed with no impact to existing infrastructure or the community.	No construction is required and no impact over the short-term is expected to the areas surrounding the Site. Long-term ground water monitoring will document containment (no further migration) over time for both the shallow sand and interbedded unit.
Implementability	Implementation of the 2009 ground water remedy was successful. Natural attenuation was demonstrated as an ongoing process. Implementation of the same pump and treat technology or further stabilization technology is technically impracticable for the remaining residual or isolated DNAPL, or for the dissolved phase ground water, particularly for the interbedded unit.	Implementation of the ICs related to deed notices or restrictive covenants will depend on individual property owner's response to the proposed requests. ICs will be placed to provide notice of the presence of ground water contamination. ICs will include provisions to restrict access to maintain protectiveness of the remedy (i.e. prevent contact with contaminated ground water) and to protect the physical components of the construction (stabilized areas; monitoring wells). The TI Zone will be registered with the Texas Department of Licensing and Regulation (TDLR) for the purpose of issuing an advisory to area water well drillers.
Cost	Annual monitoring costs range from \$60,000 – \$150,000.	Annual monitoring costs range from \$60,000 – \$200,000 based on frequency of sampling, wells sampled, and parameters (There are 65 permanent wells in the monitoring network.) In particular, monitoring will document continued containment of contaminants to the TI Zone.
State/Support Agency Acceptance	The State of Texas, through the TCEQ, concurred on the remedy	The TCEQ supports the alternate remedy.
Community Acceptance	The remedy was accepted by the community	The remedy was accepted by the community.

7.0 Justification for a Technical Impracticability Waiver

Section 121(d) of CERCLA, 42 U.S.C. § 9621(d), and NCP § 300.430(f)(1)(ii)(B) require that remedial actions at CERCLA sites at least attain legally applicable or relevant and appropriate Federal and State requirements, standards, criteria, and limitations which are collectively referred to as ARARs, unless such ARARs are waived under CERCLA section 121(d)(4), 42 U.S.C. § 9621(d)(4).

The cleanup levels for the Site's ground water are the federal drinking water MCLs for benzene and benzo(a)pyrene, considered as federal ARARs for the Site. Superfund regulations require that all cleanups meet ARARs or justify a waiver of the ARAR. A ground water cleanup level for naphthalene was implemented in the 2009 ROD Amendment, based on the TRRP promulgated standards for residential and commercial/industrial exposure scenarios. Although, there is no federal MCL for naphthalene, the State standard (as a cleanup level), is also being waived by this decision document within the TI Zone.

The EPA *Guidance for Evaluating the Technical Impracticability of Ground-Water Restoration, Restoration,* OSWER Directive 9234.2-25, September 1993, cites the following categories that can lead to a finding of technical impracticability of attaining required ground water cleanup alternatives: hydrogeologic factors; contaminant-related factors; and remediation design considerations.

For the North Cavalcade Street Superfund Site, the evaluation of natural attenuation has demonstrated that the extent of ground water contamination is limited by natural physical and biological processes. The extent of contamination is limited to within 3 blocks west of the Site despite over 50 years since wood treating operations ceased, and both lithology and natural attenuation of the dissolved phase contamination have been shown to provide an effective barrier to plume migration (CH2M HILL, 2011). Little to no change has been observed in contaminant extent during the history of investigation at the Site. The ground water plumes associated with the Site can therefore be considered stable. Complete restoration of ground water across the Site, however, would rely on the removal of the remaining DNAPL source of the ground water contamination. The same factors that limit contaminant migration make it difficult to contemplate further remedial action to achieve cleanup levels in ground water in the area where residual and limited free-phase DNAPL is observed, particularly in consideration of the fact that an effective barrier to further migration already exists.

7.1 Hydrogeologic Considerations

The geology at the Site consists of interbedded clays, silts, and sands of fluvial-deltaic origin. Observations during field characterization efforts indicate that downgradient of the Site the shallow sand contains more silt, and the interbedded unit becomes thin and completely transitions to a clayey silt to the west of the Site (a cross-section of the shallow sand and interbedded unit from west to east is illustrated in **Figure 5**). The two water-bearing zones are hydraulically connected in the eastern and northeastern sections of the southern half of the Site, but separate into two distinct zones down-gradient to the west.

Both water-bearing zones are underlain by a thick regional clay, approximately 100 feet thick, which serves as a barrier to downward ground water flow. The Pecore Fault, a local surficial fault, runs along the southern boundary of the Site and may limit lateral ground water flow to the south.

Limitations to horizontal migration of contaminants is demonstrated by the observed lithology, observed concentrations that drop to below cleanup levels within a block and a half from the Site boundary and to non detect within three blocks of the Site despite more than 60 years since wood treating operations began, and yield tests that demonstrate a drop in yield by more than an order of magnitude in the interbedded unit from up to downgradient (i.e. from onsite at well MW-30I to offsite at well MW-47I) (CH2M HILL, 2011).

The decrease in contamination corresponds to where the gradient increases, the yield decreases, and the character of the interbedded unit decreases in effective thickness and demonstrates more clay. The extent of residual DNAPL, and the four locations where some accumulation has been observed, coincides with ground water COC concentrations which exceed cleanup levels. Within 300 feet of the furthest downgradient DNAPL observation (at MW-42I), contamination in the interbedded unit ground water drops to below cleanup levels, and is not detected within 500 feet.

The same limitations to contaminant migration provided by the hydrogeology at the Site also make any active remediation alternatives for affected ground water offsite unlikely to be effective. Material bound in the predominant clay and silt matrix cannot be removed or treated effectively or sufficiently to eventually achieve cleanup levels throughout the contaminated area. Because the remaining DNAPL cannot be removed effectively and will remain a source for ground water contamination, restoration of the ground water is technically impracticable by current engineering standards.

7.2 Contaminant Considerations

In addition to the lithologic limitations, contaminated ground water, associated with the Site, is being controlled by natural attenuation. Natural processes occurring at the Site actively reduce toxicity, mobility, and total mass and volume (TMV) through biodegradation of the contaminants. Several lines of evidence suggest that the contaminated ground water plumes and observed DNAPL are stable. The results of a study of microbial activity conclusively demonstrate that indigenous microbes are actively biodegrading naphthalene contamination (CH2M HILL, 2011).

7.3 Remediation Technology Considerations

The Site is currently in its third round of remedy selection and implementation. The 1988 ROD selected pump and treat removal of contaminated ground water and DNAPL as the primary remedy for ground water contamination. The pump and treat remedy was implemented, modified, and discontinued after removing 8,000 gallons of creosote from the more permeable shallow sand. The remedy for ground water was re-evaluated in the FFS (CH2M HILL, 2008) and the 2009 ROD Amendment selected ISS for source control for both the shallow sand and the underlying interbedded unit. As indicated in the ROD Amendment (EPA, 2009), remediation technologies at the Site are limited by the physical and chemical properties of the contaminants observed at the Site.

The other active remedies, reviewed in the 2009 ROD Amendment, included modification of the existing pump and treat remedy, ISS with in situ chemical oxidation scrub of the dissolved plume along the western boundary of the Site, and source control via capping and perimeter slurry walls. All remedies evaluated included natural attenuation for the remaining dissolved phase portion of the plume. Modifying the pump and treat system was rejected because it was considered likely to require more time to achieve the RAO's and because hydraulic control was expected to be difficult to maintain and monitor in the interbedded unit. In situ chemical oxidation was rejected because of the uncertainty associated with the functioning of the basic process in low-permeability zones such as the interbedded unit. Capping and installation of perimeter slurry walls was rejected because it was expected to be difficult to achieve the design permeability and underflow restriction, possibly leading to a loss of containment. Cost was considered, however, even less expensive remedies were rejected because they were not expected to meet the RAO's and were expected to be more difficult to implement. The impracticability of these potential remedies at the time of the FFS remains because the Site conditions that make them impracticable have not changed.

Source control through ISS was selected because it was considered capable of isolating a sufficient amount of the known free-phase DNAPL at the Site and minimizing the contaminant flux from the known source areas. In addition, ISS was considered more permanent, requiring less maintenance over time, and could be implemented in one operation rather than over time.

The site is currently being used by two businesses whose buildings and parking lots overlay much of the remaining DNAPL areas not addressed by the ISS. The Site is bounded by two active railroads, and an active gas utility line, the locations of which have already limited the extent of the ISS remedy in the southeast source area. The future Hardy Toll Road expansion along the western boundary of the Site will further limit options for additional active remedial activities. In addition, while ISS is considered successful in achieving the source control RAOs, to be documented through long-term monitoring, application of ISS over the entire area of residual DNAPL was already determined through the 2009 ROD Amendment process to be unnecessary. This approach considered that the natural attenuation process would continue to degrade contaminants in impacted ground water across the Site, as verified by further evaluation of Site data after the 2009 ROD Amendment was implemented.

7.4 Technical Impracticability Summary

Considering the points described above, current restoration of the ground water to its beneficial use throughout is technically impracticable in the presence of DNAPL. However, the dissolved phase ground water contamination, outside the residual DNAPL area, is already being addressed by natural attenuation, and is effectively contained by Site lithology. Although some DNAPL remains at the site, primarily in the interbedded unit, much of it has already been mitigated by the pump and treat and ISS remedies.

Technical impracticability of ground water restoration is supported by the following:

- The remaining residual and free-phase DNAPL, although limited in extent, will continue to act as a source for Site-related contaminants in ground water, essentially outpacing the natural degradation of these contaminants in the areas where DNAPL appears. In this case, natural attenuation serves as a process for plume stability and containment, rather than restoration.
- The heterogeneity and lithologic complexity of the interbedded unit limits the effectiveness of treatment technologies for source material and contaminated ground water. While the predominant clay and silt limit migration of contamination, material bound in the matrix will continue to serve as an active source through dissolution, but it cannot be removed or treated effectively or sufficiently to eventually achieve cleanup levels throughout the contaminated area.
- The occurrence of DNAPL accumulation is limited to four wells of the 65 well network associated with the source areas. This network provides an effective way to document continued contaminant containment. DNAPL accumulation will continue to be measured and recovered when observed, and the data gathered will be used to document the amount of DNAPL present and associated trends in accumulation.
- Source treatment has already been implemented under two different remedies – pump and treat, and ISS. Pump and treat was found to be ineffective for the interbedded unit where the majority of the contamination is observed, and expansion of the implemented ISS remedy or application of other remedies is limited by Site features – active commercial businesses onsite, active rail lines, active gas utility line, and future above-grade construction extending the Hardy Toll Road along the western boundary of contamination.

The finding of technical impracticability for achieving the ground water cleanup levels and thereby restoring the ground water to potential beneficial use supports a waiver of the drinking water ARARs. The RAO of ground water restoration would become an RAO of containment. At this Site, containment (defined as a stable plume) is provided by:

- Lithology that limits migration (the interbedded unit thins to 3 feet of clayey silt in the offsite downgradient area; changes in yield and gradient demonstrate the flow is restricted downgradient)
- A demonstrated natural attenuation process that addresses dissolved phase contamination outside the area where DNAPL is present.

The extent of contamination has been well-documented both vertically and horizontally and has not significantly changed in the history of investigation at the Site. The dissolved phase contamination exists in only a limited footprint around the residual DNAPL.

Based on these findings, EPA is waiving the drinking water ARARs as cleanup levels within a site-specific TI Zone. The TI Zone boundary will be applicable to both the shallow sand and interbedded unit (for consistency), although the downgradient (west) boundary of the zone is driven by the extent of contamination of naphthalene and benzene in the interbedded unit ground water. The downgradient boundary for the TI Zone is set in the transition area between detection and non-detection of these two site contaminants. The downgradient boundary takes into consideration the observed limits to migration discussed above but allows for some fluctuation in contaminant concentrations. However, the downgradient boundary considers the worst case scenario for migration of contaminants in the interbedded ground water plume, based on the site conditions. In addition, the zone is tightly defined to the north, east, south, and southeast corner, where further expansion of the plumes is not anticipated. The 2009 ROD Amendment cleanup levels are included as a frame of reference for each plume map (**Figures 12-17**). Contaminant concentrations cannot exceed the risk-based cleanup levels outside the designated TI Zone boundary.

The designated TI Zone boundary is illustrated on **Figures 12-17**. This 16-acre zone defines the area where the cleanup levels for naphthalene, benzene, and benzo(a)pyrene would be waived for both the shallow sand and interbedded plumes. Ongoing monitoring will document long-term trends of contamination within the TI Zone in comparison to existing plume concentration contours and will demonstrate long-term stability and continued containment of both shallow sand and interbedded unit contaminant plumes. Also, EPA will continue to recover DNAPL accumulation observed in those monitoring wells within the TI Zone. The 2009 ROD Amendment cleanup levels will be applicable outside the TI Zone boundary.

[Note that benzo(a)pyrene was not detected in any of the shallow sand monitoring wells (**Figure 16**), but detected above cleanup levels at two wells interbedded monitoring wells (MW-42I, MW-30I; **Figure 17**). The extent of contamination, for benzo(a)pyrene, was defined in the December 2010 baseline sampling and evaluation using the EPA SW846 Method 8270D SIM (Selected Ion Monitoring). The SIM analysis can be used for those PAHs requiring lower quantitation levels than that provided by the standard Method 8270.]

Portions of the two contaminant plumes are still expected to decrease in size and concentration through an ongoing degradation process, particularly where there is no significant residual creosote, or DNAPL, in ground water. If DNAPL is present, it will however continue to act as continuing source of contamination to the more mobile dissolved phase ground water, at a rate exceeding natural degradation (or attenuation). As previously noted, treatment has already been completed for both source areas, reducing the permanent threat waste as much as is technically practicable. The remaining residual and limited occurrences of DNAPL will be difficult to remove in the interbedded unit, where materials will be bound in the clay and silts.

8.0 State/Support Agency Acceptance

The State of Texas has reviewed the remedial ground water alternative for the Site and supports the action to amend the 1988 ROD and the 2009 ROD Amendment.

9.0 Community Acceptance

On July 7, 2011, the EPA announced the Proposed Plan to amend the 1988 ROD and the 2009 ROD for the North Cavalcade Street Superfund Site, located in Houston, Texas. The public was invited to submit written comments during a 30-day comment period, beginning on July 8, 2011, and concluding on August 6, 2011. Questions were addressed during the public meeting and are summarized in the Responsiveness Summary section of this ROD Amendment. No written comments were received. In conclusion, there were no significant issues or objections directed toward the Selected Remedy.

10.0 Selected Remedy

The Selected Remedy in this Amendment to the 1988 ROD and 2009 ROD Amendment is to address the last remedial component for the ground water, specifically, the dissolved phase contaminant plumes. The Remedy considered new information developed during the remedial action (construction) phase, including the baseline sampling and analysis of the permanent monitoring well network installed in December 2010. The previous well data from the 2004 field investigation was also considered and indicated the same trends in extent and concentrations of COC contaminants. The natural attenuation process was substantiated for the Site and was shown to be actively degrading benzene and naphthalene. Although natural attenuation contributes to plume stability, the degradation process will not be able to restore those parts of the plume where DNAPL is present.

With this action, the EPA is selecting the following RAOs for the Selected Remedy for the North Cavalcade Street Superfund Site:

- Contain two ground water contaminant plumes, associated with the shallow sand (OU1) and the interbedded sand unit (OU3), through natural processes [*containment*];
- Prevent human exposure to contaminated ground water above acceptable risk levels by implementing institutional controls to restrict access to, or use of, contaminated water by restricting the installation of ground water wells within the designated Technical Impracticability (TI) Zone [*prevent exposure to contaminated ground water above acceptable risk levels*];
- Remove Site-related DNAPL accumulations in impacted monitoring wells until the amounts diminish and/or retrieval is no longer practicable [*source removal*];

10.1 Components of the Selected Remedy

10.1.1 Technical Impracticability (TI) Waiver

In the Selected Remedy, EPA is waiving the drinking water ARARs as cleanup levels within a site-specific TI Zone. The TI Zone boundary will be applicable to both the shallow sand and interbedded unit (for consistency), although the downgradient (west) boundary of the zone is driven by the concentrations of naphthalene and benzene. The downgradient boundary for the TI Zone is set between in the transition area between detection and non-detection of these two site contaminants. The downgradient boundary takes into consideration the observed limits to migration discussed above but allows for some fluctuation in contaminant concentrations. However, the downgradient boundary considers the worst case scenario for migration of contaminants in the interbedded ground water plume, based on the site conditions. In addition, the zone is tightly defined on the north, east, and south sides where further expansion of the plumes is not anticipated. The 2009 ROD Amendment cleanup levels are included as a frame of reference for each plume map. Contaminant concentrations cannot exceed the risk-based cleanup levels outside the designated TI Zone boundary.

The proposed TI Zone boundary is illustrated on **Figures 12-17.** This 16-acre zone defines the area where the cleanup levels for naphthalene, benzene, and benzo(a)pyrene will be waived for both the shallow sand and interbedded plumes. The area definition is driven by the extent of naphthalene and benzene in the interbedded unit. Ongoing monitoring will document long-term trends of contaminant concentrations within the TI Zone to demonstrate continued stability and containment of both the shallow sand and interbedded unit plumes. Also, EPA will continue to monitor and recover DNAPL accumulation observed in site wells within the TI Zone. The 2009 ROD Amendment cleanup levels will be applicable outside the TI Zone boundary.

As previously noted, the cleanup levels for the Site's ground water are the drinking water MCLs for benzene and benzo(a)pyrene.. The MCLs are considered federal ARARs for cleanup of the ground water at the Site. Superfund regulations require that all cleanups meet ARARs or justify a waiver of the ARAR. A ground water cleanup level for naphthalene was implemented in the 2009 ROD Amendment, based on the TRRP promulgated standards for residential and commercial/industrial exposure scenarios. In the Selected Remedy, federal MCLs and the State standard for naphthalene are being waived within the TI Zone.

10.1.2 Institutional Controls (ICs)

The contaminated ground water is not used as a drinking water source. Area residents and commercial operations are provided potable water through the City of Houston public water supply system. The Selected Remedy will provide for the further protection of human health through the implementation of institutional controls. ICs are non-engineered instruments such as administrative and/or legal controls that minimize the potential for human exposure to contamination by limiting land or resource use. ICs are generally used in conjunction with, rather than in lieu of, engineering measures such as waste treatment or containment; can be used during all stages of the cleanup process to accomplish various cleanup-related objectives; and should be "layered" (i.e., use multiple ICs) or implemented in a series to provide overlapping assurances of protection from contamination.

ICs (i.e. deed notices or restrictive covenants) will be put in place to provide notice to property owners and prospective purchasers that contaminated water from the shallow and interbedded sand unit should not be used for drinking or potable water where cleanup goals are not met or have been waived (as is the case for the TI Zone. Restrictions will be placed to prevent the installation of water supply wells in those areas. Restrictions should also be used to protect components of the ground water remedy (i.e. digging restrictions into the two stabilized source areas) including the permanent monitoring wells.

EPA will ensure that the necessary ICs are implemented on all properties affected by the ground water and soil contamination following completion of the construction activities at the Site. The Texas Risk Reduction Program [30 TAC ch. 350] requires the placement of ICs (30 TAC §§ 350.4(a)(47) and 350.111) *(i.e.., deed notices or restrictive covenants)* on affected property in different circumstances as part of completing a response action. ICs are also created for response actions that will take greater than 15 years to complete [30 TAC § 350.31(h)]. The fundamental purpose of an IC at this Site is to provide a permanent notice to subsequent owners/operators of affected properties that chemicals of concern are present in the ground water beneath the property above the remedial goal.. A copy of the TCEQ regulatory guidance is available in the Administrative Record as well as online at http://www.tceq.state.tx.us.

Based on the Site location in Harris County, the IC would consist of either a restrictive covenant or a deed notice:

- Restrictive Covenant: an instrument filed in the real property records of the county where the affected property is located which ensures that the restrictions will be legally enforceable by the TCEQ when the person owning the property is the innocent landowner; the covenant can only be filed by the property owner and is binding on current and future owners and lessees even if they are "innocent owners or operators"; as beneficiaries of the document's restrictions, the TCEQ and the State of Texas can enforce the restrictions by means of a legal action in the courts.
- Deed Notice: an instrument filed in the real property records of the county where the affected property is located that is intended to provide to owners, operators, prospective buyers and others notice and information regarding, but which does not, by itself, restrict use of the affected property; the TCEQ can enforce the restrictions against non-innocent owners and operators when there is a substantial change in circumstances (30 TAC §350.35).

The following State and local requirements to track drilling activity may provide additional tiers of ICs to control the use of contaminated ground water for the Site:

The Texas Department of Licensing and Regulation (TDLR) delineates restricted drilling areas in response to individual requests from TCEQ where contaminated water-bearing units have been identified. After the restricted drilling area has been delineated by TDLR, the notices/letters are mailed to the area drillers. Based on this information, the TDLR may prescribe more stringent site-specific drilling procedures, well construction, and well completion specifications. A designated restricted drilling area does not prohibit drilling. There is no "registration" by which to initiate enforcement. The TDLR may learn of drilling in a restricted drilling area via a complaint or after a State of Texas Well Report has been submitted to the TDLR by the licensed driller. If the well report indicates the well was not constructed and completed in accordance with the TDLR specifications defined for the restricted drilling area, the TDLR may initiate enforcement based on improper well construction/completion. This procedure would be used with restrictive covenants or deed notices to further limit use of ground water on and downgradient of the Site.

The Harris-Galveston Subsidence District requires the registration of new wells (Rule 5.1), except leachate wells, monitoring wells, and dewatering wells, by the well owner, well operator, or water well driller prior to being drilled, with some exemptions and exclusions (Rule 5.7). For example, single family wells, with a casing diameter of five inches or less, are excluded from obtaining permit. However, the owner is required to register the well. Although not applicable to monitor wells or extraction/injection wells to be installed during remedial action at the Site, this regulation provides another mechanism for establishing institutional controls restricting ground water use on and downgradient of the Site.

10.1.3 Ground Water Monitoring Program

The ground water monitoring program provides an on-going comparison to historical ground water conditions and the necessary data to evaluate the performance of the Selected Remedy to meet the RAOs for the Site. This monitoring program addresses conditions both onsite and offsite, and documents changes through on-going processes, such as natural attenuation. The permanent monitoring well network was installed and sampled in December 2010 and will provide a baseline for the long-term monitoring of Site conditions. Ground water monitoring will be performed to verify the continued natural attenuation of contaminants within the TI Zone; to ensure that the plume is stable and that cleanup levels are not exceeded outside the TI Zone boundaries; and to verify the results of the source stabilization. A long-term monitoring plan will be developed for the short and long-term life of the project. The monitoring system and sampling plans will be periodically evaluated under the Five-Year Review process.

The EPA will provide one year after construction completion of the remedy to demonstrate O&F ("Operational and Functional") that the source stabilization is reducing contaminant concentrations adjacent and down-gradient to the solidified areas. (The EPA may extend the O&F period by an additional year, if appropriate.)

The Long-Term Monitoring Plan and the Site Operation and Maintenance (O&M) plan will be developed during this O&F period.

10.1.4 DNAPL Retrieval

The occurrence of DNAPL accumulation is limited to four wells (**Figures 12 -17**) completed in the interbedded sand unit of the 65 well network associated with the source areas (Offsite: MW-42I; Onsite: MW-33I, MW-57I, and MW-59I). DNAPL accumulation will continue to be measured and recovered when observed, and the data gathered will be used to document the amount of DNAPL present and any trends which would indicate the DNAPL signifies a new condition for the Site. The DNAPL accumulation in the impacted monitoring wells will be periodically pumped for collection and disposal until the amounts diminish and/or retrieval is no longer practicable.

10.1.5 Expected Outcomes of the Selected Remedy

- Natural attenuation is an ongoing process that contributes to the stability of the plumes. Attenuation will continue to reduce contaminant concentrations over portions of the plume. However, attenuation alone will not reduce concentrations to cleanup levels throughout the plumes where there is a remaining DNAPL presence. Restoration though all points in the contaminant dissolved phase plumes is not achievable. However, the attenuation process and the reduction/stabilization of the DNAPL source areas will result in the reduction of contaminant concentrations in parts of the plumes to levels near or below cleanup levels. Documentation of this will be provided by long-term monitoring. The 2009 ROD Amendment cleanup levels will be used as points of reference within the TI Zone, although the TI waives cleanup levels within the zone. The cleanup levels will continue to apply outside the TI Zone.
- COC concentrations are expected to decrease over time in those areas adjacent to the stabilized source areas.
- The ground water plumes will remain stable with time; further downgradient expansion of the interbedded unit plume will continue to be physically restricted by lithologic characteristics and the natural attenuation of contaminants.
- ICs will restrict access to, and the use of, contaminated ground water to maintain the protectiveness of the Selected Remedy (i.e. prevent contact with contaminated ground water or soils). ICs will be placed to protect the physical components of the Remedy.

11.0 Statutory Determinations

Under CERCLA §121, 42 U.S.C. §9621, the EPA must select remedies that are protective of human health and the environment, comply with ARARs (unless a statutory waiver is justified), are cost-effective, and utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. This Selected Remedy for the dissolved phase ground water is the last component of the ground water remedy to be implemented to amend the 1988 ROD.

The 2009 ROD Amendment provided a detailed comparative analysis of available technologies for both the source areas and the dissolved phase ground water. The DNAPL source was considered to be a principal threat waste at the Site and, as previously discussed, has been significantly reduced to the extent practicable by actions taken under the initial 1988 ROD and the 2009 ROD Amendment (satisfying the preference for treatment).

The remaining dissolved contaminant phase ground water plume is neither considered to be a principal threat waste, nor a low-level threat waste. However, the previous treatment of the two ground water source areas will reduce the mobility of the DNAPL source and minimize the continued flux of contaminants to the existing contaminant plumes. As a result, the dissolved plumes are expected to continue to reduce through natural attenuation processes, except in those areas where DNAPL is still present.

11.1 Compliance with Applicable or Relevant and Appropriate Requirements

The NCP §§ 300.430(f)(5)(ii)(B) and (C) require that a ROD describe the Federal and State ARARs that the Selected Remedy will attain or provide justification for any waivers. ARARs include substantive provisions of any promulgated Federal or more stringent State environmental standards, requirements, criteria, or limitations that are determined to be legally ARARs for a CERCLA Site or action. Applicable requirements are those cleanup standards, standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under Federal or State law that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance found at a CERCLA Site. Relevant and appropriate requirements are requirements that, while not legally "applicable" to circumstances at a particular CERCLA Site, address problems or situations sufficiently similar to those encountered at the Site that their use is well-suited.

Where no ARARs exist for a given chemical, action or location, the EPA may consider non-promulgated Federal or State advisories and guidance as To Be Considered criteria (TBC). Although consideration of a TBC is not required, if standards are selected based on TBC, those standards are legally enforceable as performance standards.

The remedial action, selected in this amendment, will comply with all ARARs detailed in the 2009 ROD Amendment Attachment 4, as those have not changed. Included are those ARARs which would be applicable or relevant to a construction phase and any additional field tests to support the remedy. In addition, the remedial action activities will need to comply with the Occupational Safety and Health Act (OSHA) requirements, 29 CFR § 1910.120, for permissible exposure limits and appropriate worker protection or engineering controls, as necessary for any work continued work during O&M.

With the implementation of this Selected Remedy, the following ground water ARARs are waived within the TI Zone, as previously defined:

- The Federal Safe Drinking Water Act (SDWA), and the 40 CFR §§ 141.61 and 141.62 – National Primary Drinking Water Regulations, establish MCLs for organic and inorganic Compounds in drinking water. [The MCLs are typically applicable or relevant and appropriate if the ground water at the Site is used, or has the potential to be used, for drinking water, and are chemical-specific ARARs.]

  The MCLs for benzene (5 µg/L) and benzo(a)pyrene (0.2 µg/L) will only be used as a point of reference within the TI Zone as a qualitative indicator of plume stability. The MCLs will be considered an ARAR outside the TI Zone boundary.

- The Texas Risk Reduction Rule , 30 TAC § 350.75 – Human-Health Protective Concentration Levels (PCLs), is considered relevant and appropriate for ground water remediation in the absence of a drinking water standard. The TRRP Tier 1 human health PCLs for naphthalene in Class II ground water (relevant to the North Cavalcade shallow ground water) is 1500 µg/L for industrial/commercial use (onsite), and 490 µg/L for residential use (offsite) will, however, be waived within the TI Zone.

The State standard for naphthalene will only be used as a point of reference within the TI zone as a qualitative indicator of plume stability. The State standard will be considered relevant and appropriate outside the TI Zone boundary.

The following IC requirement is still an ARAR under the Selected Remedy: The State Regulatory Authority requires the placement of ICs (e.g., deed notices or restrictive covenants as defined in 30 TAC § 350.4(a)(47)) on affected property in different circumstances as part of completing a response action. ICs are also created for response actions that will take greater than 15 years to complete (30 TAC Administrative Code § 350.31(h)). In the presence of the remaining DNAPL, restoration at all points in the dissolved phase ground water plumes may not be attainable. The EPA will implement a program to place ICs on all properties affected by the ground water and soil contamination following completion of the construction activities at the Site. ICs are considered relevant and appropriate for both the soil and ground water remedy and are action-specific.

11.2 Five-Year Review Requirements

Since the selected remedies will result in hazardous substances remaining onsite above levels that allow for unlimited use and unrestricted exposure, a statutory review must be conducted within five years of the initiation of the remedial action to ensure that the remedy is, or will be, protective of human health and the environment. Pursuant to CERCLA Section 121(c), 42 U.S.C. § 9621(c), and the NCP §300.430(f)(5)(iii)(C), and as provided in the current guidance on Five Year Reviews [OSWER Directive 9355.7-03B-P, *Comprehensive Five-Year Review Guidance* (June 2001)], EPA must conduct a statutory review within five years from the initiation of the first construction at the Site. The EPA will review the remedial action no less often than every five (5) years after initiation of the remedial action to assure that human health and the environment are being protected by the remedial action being implemented. The Five-Year Review will include an evaluation of remedy effectiveness, the appropriateness of new technologies, changes in ARARs, and if deemed necessary, recommendations to implement remedial contingencies, consistent with EPA guidance and the statutory requirements of CERCLA and the NCP.

The fourth Five-Year Review for the North Cavalcade Street Superfund Site is scheduled for FY2013 and will evaluate actions taken under since the previous 2008 Five-Year Review (September 2008) Amendment, including those implemented in this ROD Amendment.

12.0 Documentation of Significant Changes from Proposed Plan

The EPA has determined that a significant change to the remedy, as originally identified in the Proposed Plan, is necessary and appropriate. The area within the TI Zone has been reduced to more tightly bound the areas exceeding the cleanup up levels for any one of the three COCs (naphthalene, benzene, or benzo(a)pyrene). The TI Zone boundaries still represent a worst-case scenario anticipated for the extent of plume contaminants. The revised TI Zone boundary is illustrated on the COC concentration maps **(Figures 12-17)** for the shallow sand and interbedded unit.

The Selected Remedy also adds a RAO for DNAPL source removal from the impacted monitoring wells. The Proposed Plan included DNAPL retrieval as a component of the remedy, but not as a RAO. The Selected Remedy maintains DNAPL retrieval as a remedy component.

PART 3: RESPONSIVENESS SUMMARY

There were no significant issues or objections directed toward the preferred alternatives during the public comment period. The public comment period for the Proposed Plan was from July 7, 2011, to August 6,

2011. The Proposed Plan recommended containment of the dissolved phase contaminant plumes through physical and biological processes and the waiver of cleanup levels for those plumes within a designated TI Zone. No written comments were received during the public comment period. There were several questions received during the July 19, 2011, public meeting. A copy of the transcript has been included in the Administrative Record. The questions are included here as part of the record and were considered when clarifying the sections supporting this Amendment. Additional information is also presented in the response to questions as follows. There were no outstanding technical or legal issues identified which would affect the Selected Remedy.

Question: What will the EPA do if the plume expands or concentration levels increase? Would you just continue to monitor? Or would you implement another action?

The permanent ground water monitoring network, installed in December 2010, will provide sufficient coverage to establish increasing/decreasing trends in the contaminant concentrations inside and outside the TI Zone; to document ongoing natural attenuation of contaminants; and to assess the results of the DNAPL source stabilization on the dissolved phase plumes over time. The TI Zone area was reduced from the area defined in the Proposed Plan to more tightly bound the areas above cleanup levels. Some fluctuation of contaminant concentrations over time, as well as continued degradation, is expected. However, there are indications that the ground water plume is not expanding and is stable. Long-term monitoring over time will further document that this is the case. Note that sampling data for the interbedded unit was not collected until the 2004 field investigation. The sampling data from the 2010 permanent well network showed similar trends, particularly for the offsite area. More frequent long-term monitoring (beginning with quarterly sampling in FY12) will provide the necessary information to confirm plume stability in the presence of limited DNAPL.

The Selected Remedy will be re-evaluated if the plume is shown to be expanding over time and contaminants (above risk-based levels) are no longer contained to the designated TI Zone; or if overall contaminant concentrations and/or DNAPL accumulation in monitoring wells are shown to be increasing with time.

Question: The EPA has monitored the situation for years and proposed a remedy. The remedy did not work. So is EPA going to "let nature take its course" and do nothing but continue to monitor?

EPA has implemented ground water source controls/reduction through the 1988 ROD and the 2009 ROD Amendment remedial actions. Both of those actions were successful in that 8,000 gallons of creosote product were removed from the shallow sand and the combined areas of free-phase DNAPL (two source areas; shallow sand and interbedded unit) were stabilized to minimize the flux of contaminants to dissolved phase ground water. The stabilization was just completed in October 2010; the installation and sampling of the permanent monitoring well network in December 2010 provides the baseline to evaluate the result of stabilizing 12,000 cubic yards soils and free phase DNAPL. More importantly, the stabilization included the DNAPL source for the interbedded unit, which by its nature is difficult to remediate under most other technologies. Again, monitoring is necessary to demonstrate if parts of the dissolved phase plume will decrease in concentration as a result of stabilization and to establish if the DNAPL accumulation in four wells is limited and decreasing over time. The DNAPL in the four wells will continue to be pumped periodically, volumes noted, and waste disposed, until amounts diminish and/or retrieval is no longer practicable.

Question: Does EPA remain lead for the Site after the property transfers to the General Land Office?

The northern ten acres of the property will be transferred in title to the General Land Office after one year of an Operational and Function (O&F) phase is completed. In September 2012, the Texas Commission on Environmental Quality will take over O&M responsibilities for the capped soil cell, including maintenance and detection monitoring. The EPA will maintain lead responsibilities for the ground water monitoring and maintenance on the southern ten acres of the property associated with the contaminated plumes and stabilized source areas, through a one-year (with an option to extend one additional year) O&F period. The TCEQ will take over O&M after completion of the O&F period. The EPA will continue to be responsible for the Five-Year reviews of the remedy.

Figures

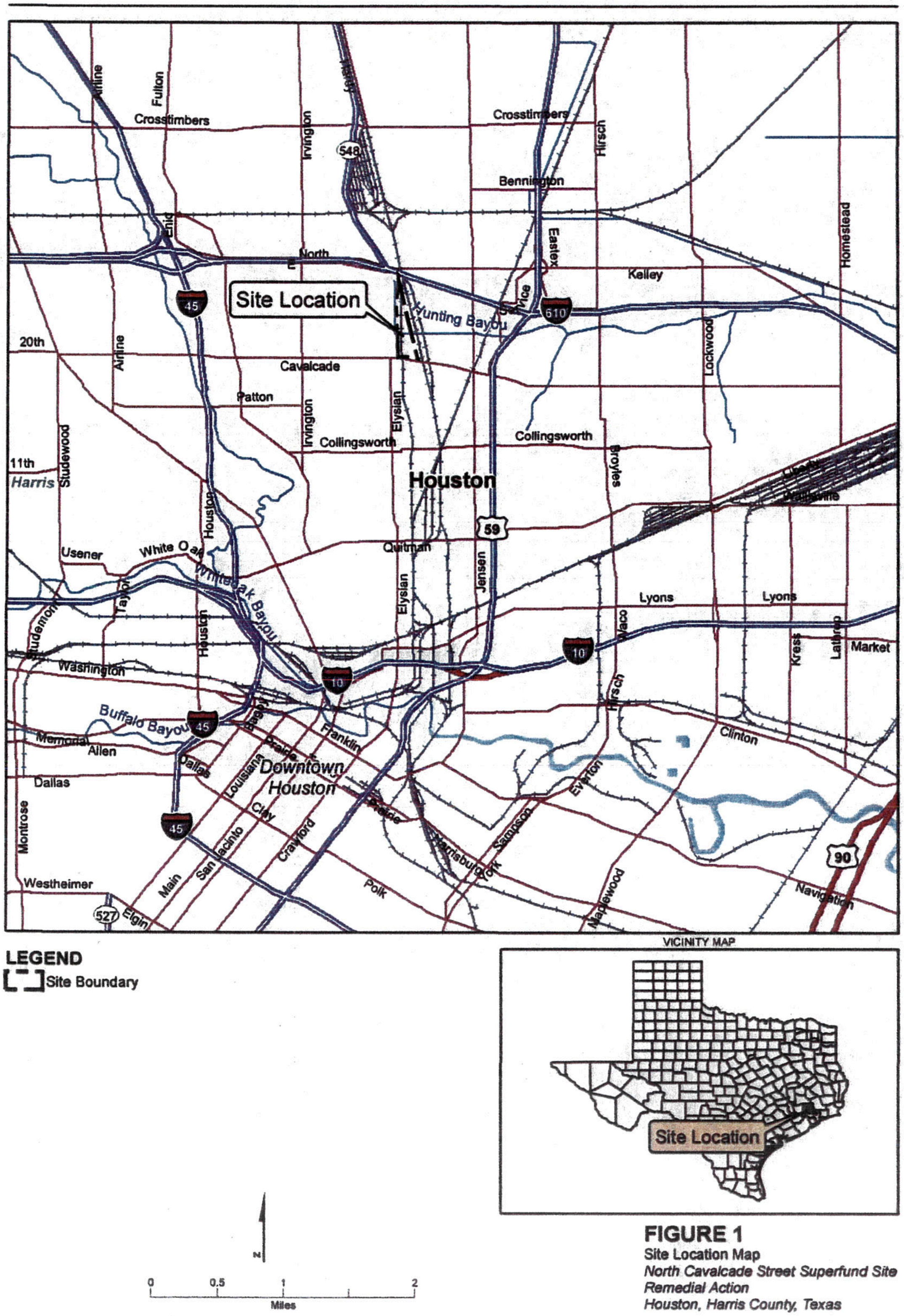

FIGURE 1
Site Location Map
North Cavalcade Street Superfund Site
Remedial Action
Houston, Harris County, Texas

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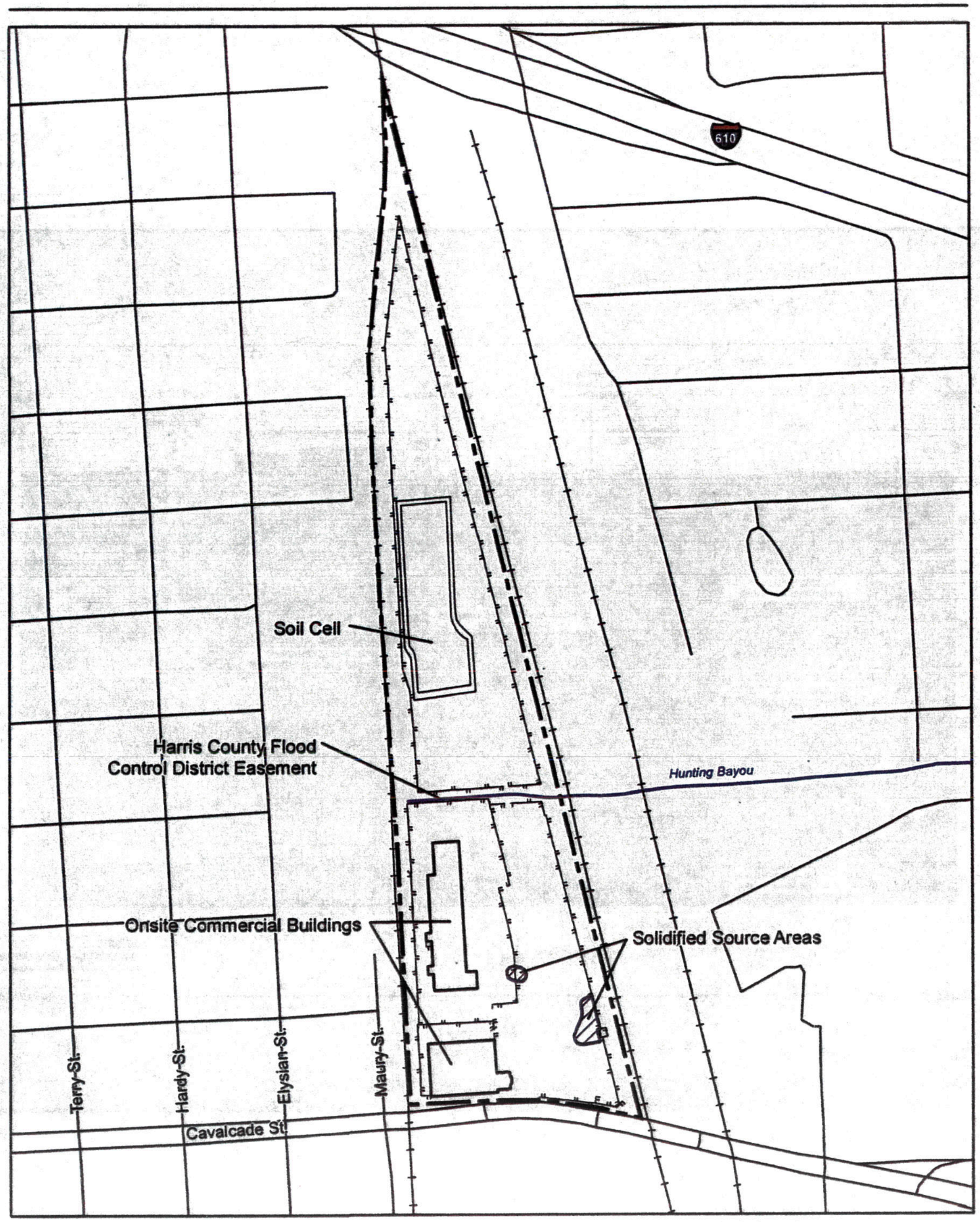

FIGURE 2
Site Map
North Cavalcade Street Superfund Site
Remedial Action
Houston, Harris County, Texas

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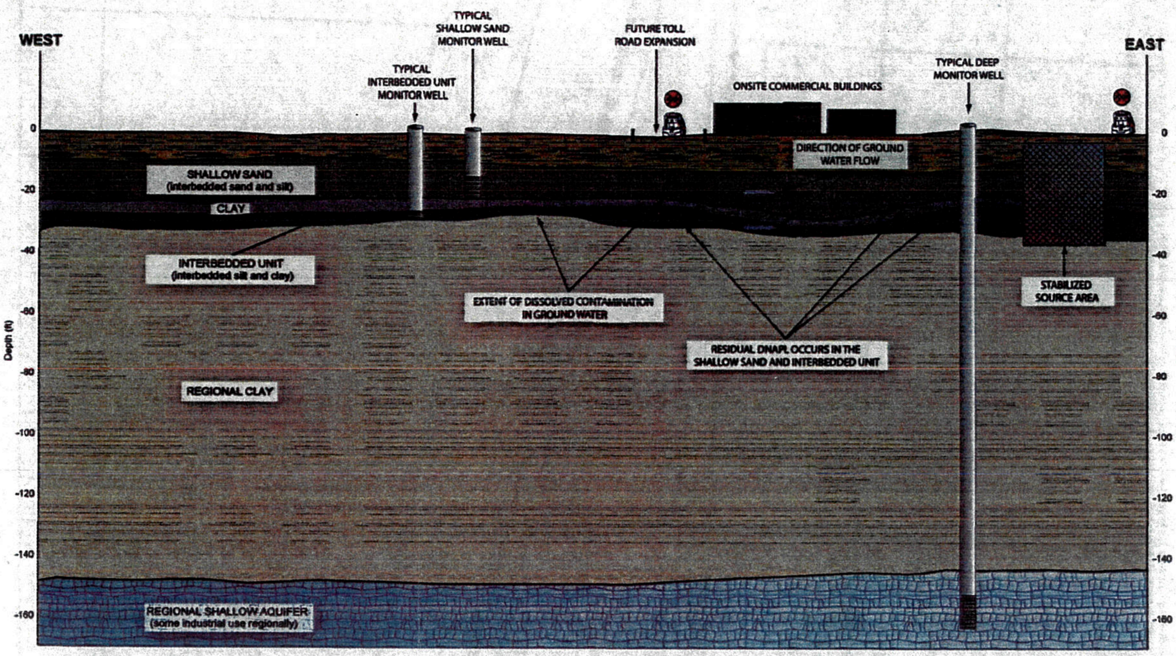

FIGURE 3
CONCEPTUAL SITE MODEL
North Cavalcade Street Superfund Site
Houston, Texas

ES062311132648SFO ConceptualSiteModel.ai 5/24/11 sz

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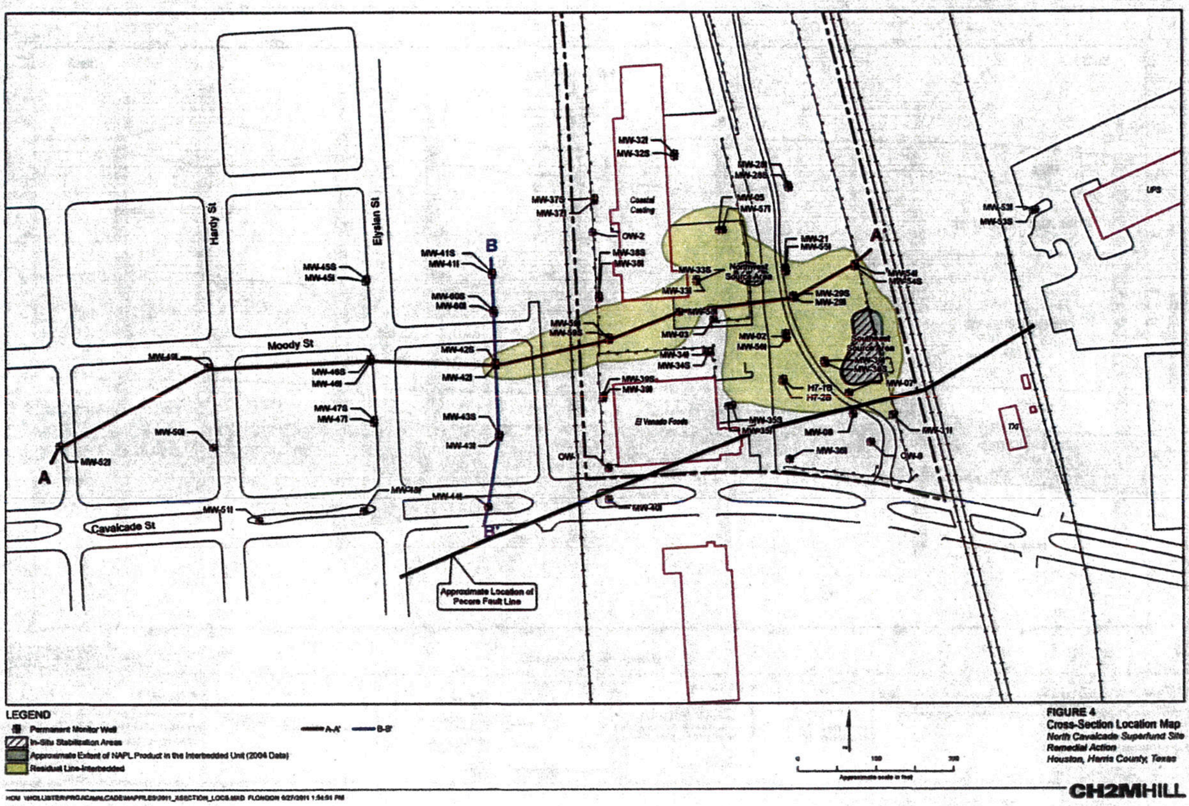

FIGURE 4
Cross-Section Location Map
North Cavalcade Superfund Site
Remedial Action
Houston, Harris County, Texas

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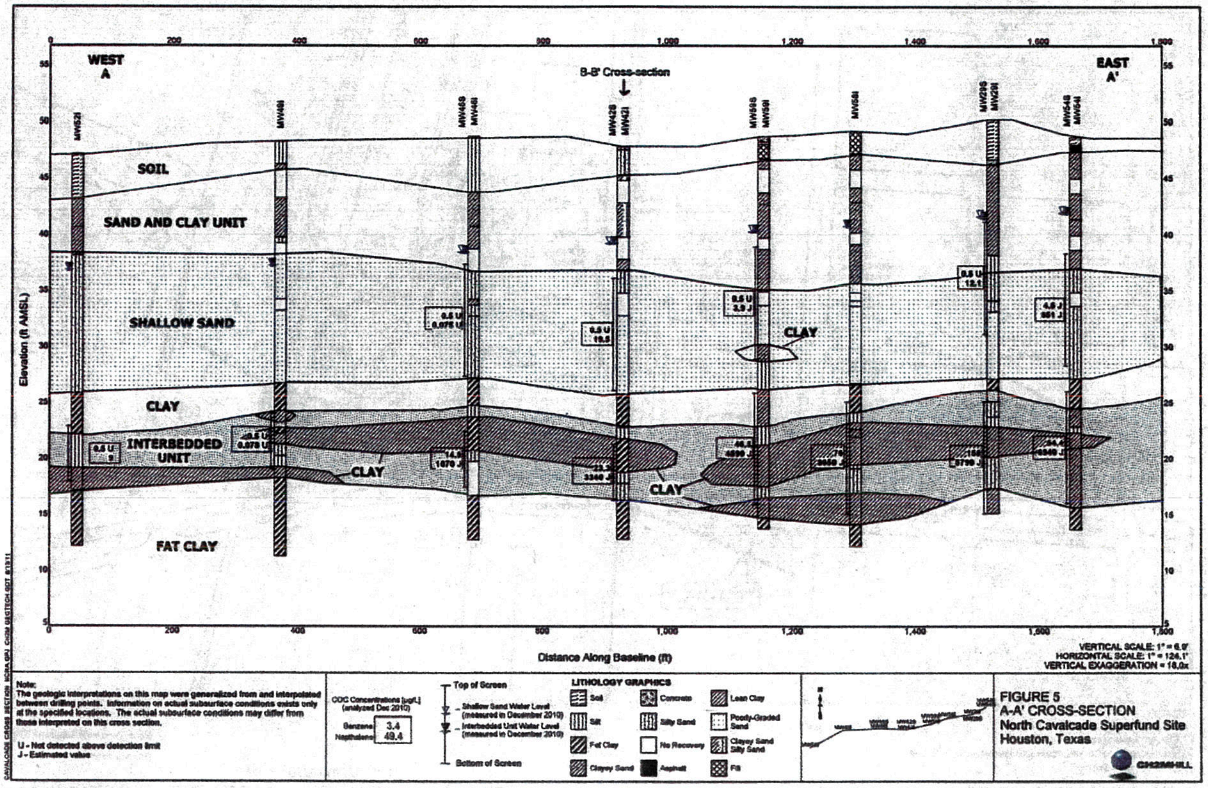
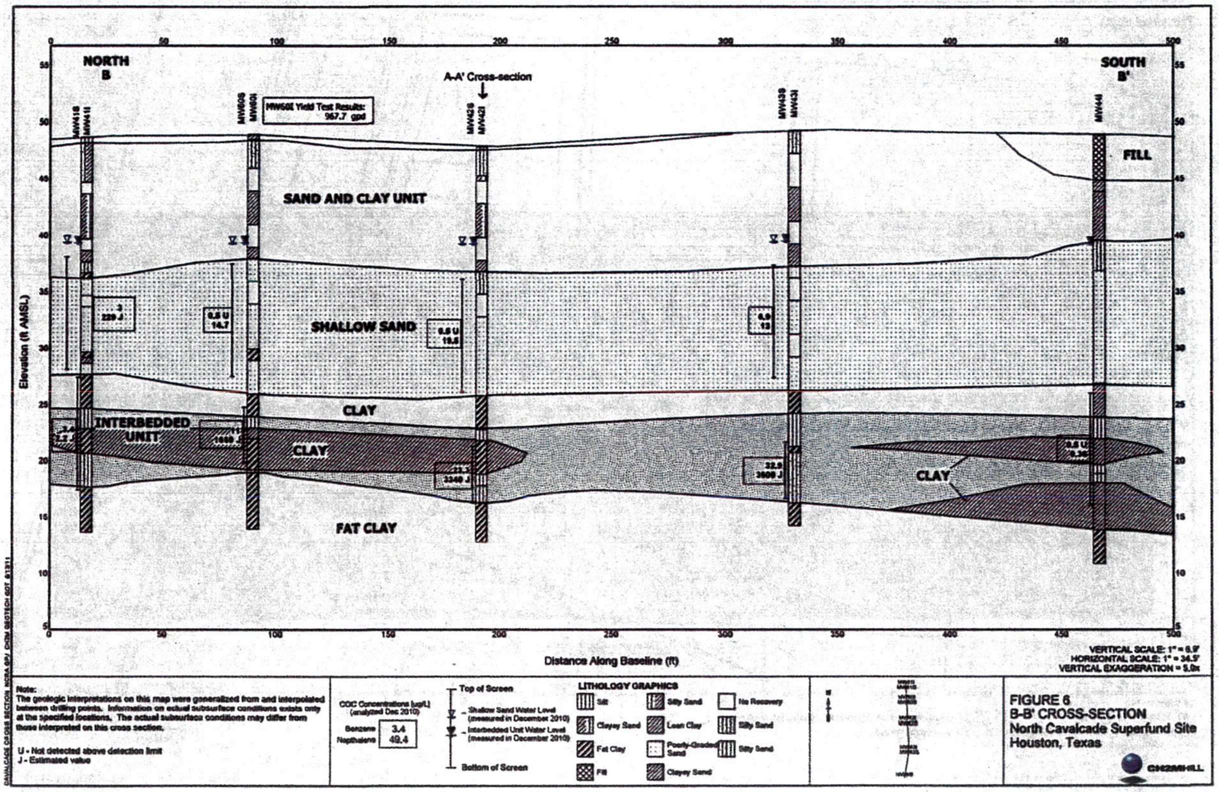


Note:
The geologic interpretations on this map were generalized from and interpolated between drilling points. Information on actual subsurface conditions exists only at the specified locations. The actual subsurface conditions may differ from those interpreted on this cross section.

U - Not detected above detection limit
J - Estimated value

FIGURE 5
A-A' CROSS-SECTION
North Cavalcade Superfund Site
Houston, Texas



Note:
The geologic interpretations on this map were generalized from and interpolated between drilling points. Information on actual subsurface conditions exists only at the specified locations. The actual subsurface conditions may differ from those interpreted on this cross section.

U - Not detected above detection limit
J - Estimated value

FIGURE 6
B-B' CROSS-SECTION
North Cavalcade Superfund Site
Houston, Texas

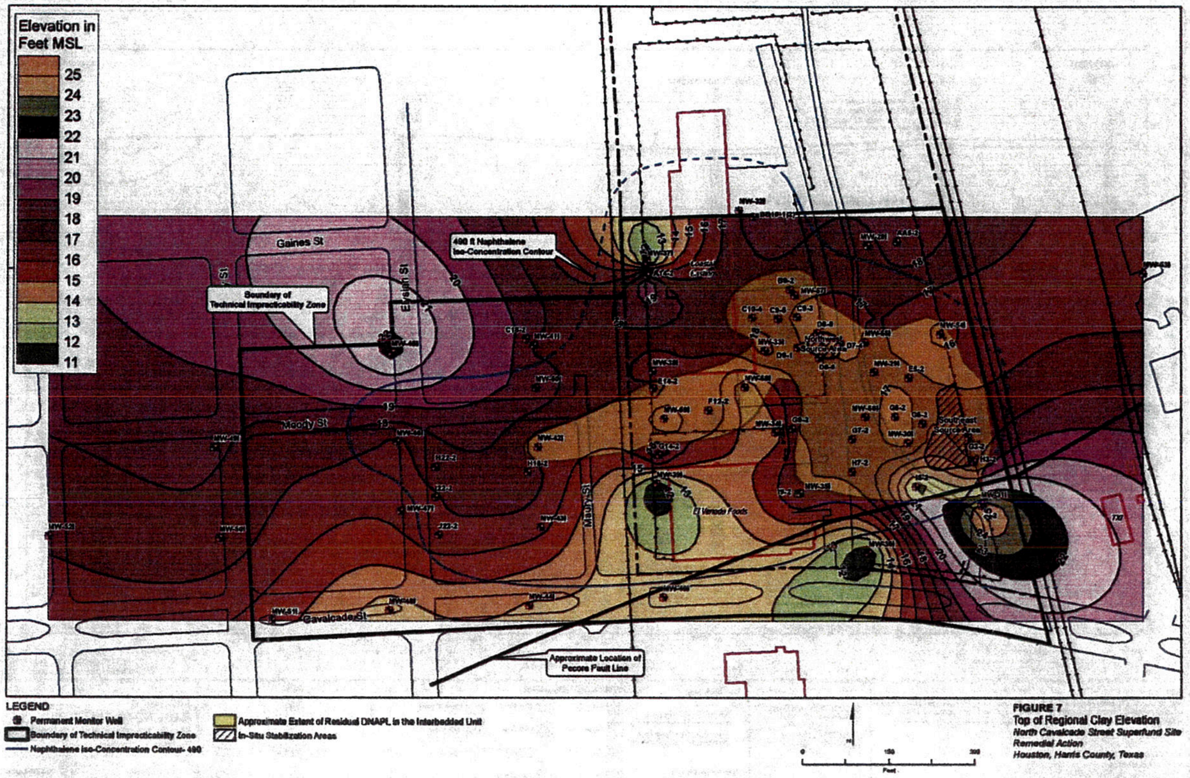


FIGURE 7
Top of Regional Clay Elevation
North Cavalcade Street Superfund Site
Remedial Action
Houston, Harris County, Texas

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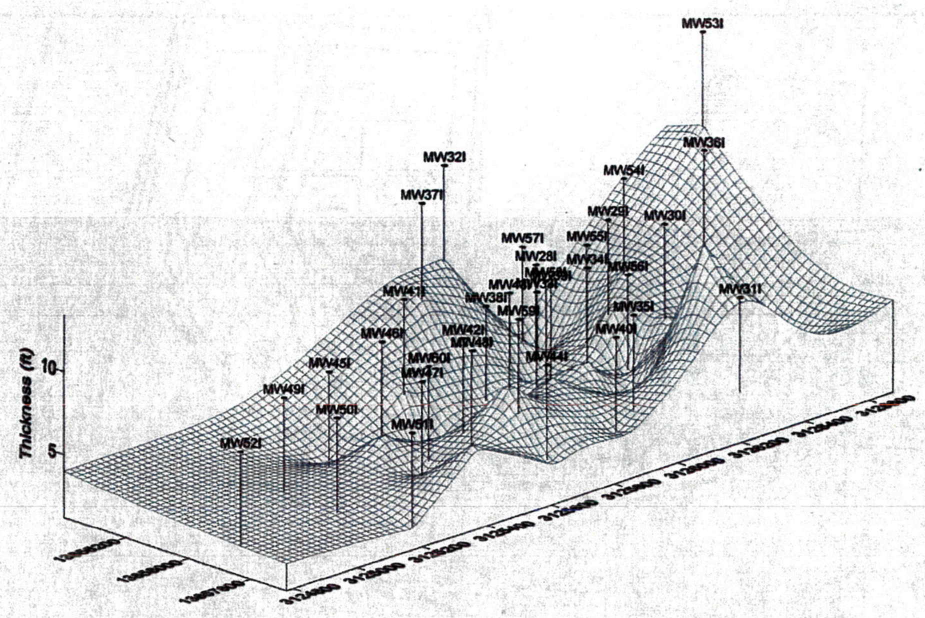

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FIGURE 8
INTERBEDDED UNIT THICKNESS
North Cavalcade Street Superfund Site
Houston, Texas

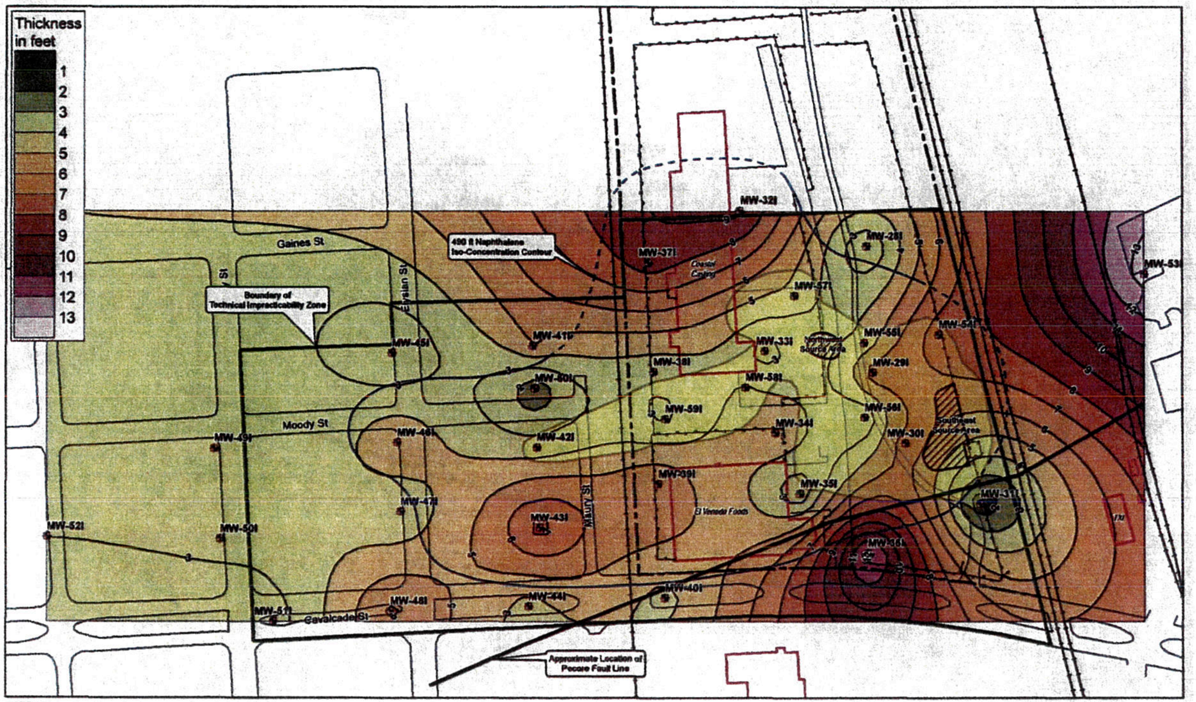

FIGURE 9
Interbedded Unit Effective Thickness
North Cavalcade Street Superfund Site
Remedial Action
Houston, Harris County, Texas

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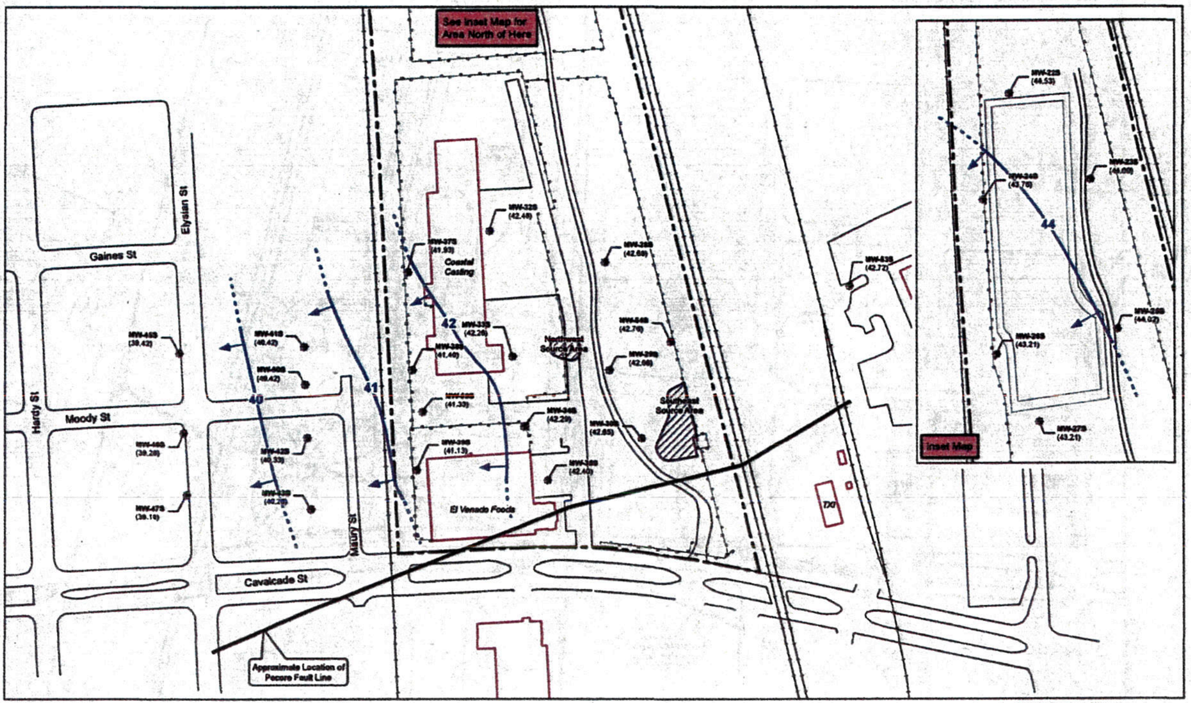

LEGEND
- ● New Monitor Well
- ▨ In-Situ Stabilization Areas
- —— Ground Water Elevation Contour (ft AMSL)
- - - - (Dashed Where Inferred)

NOTE:
1.) Measured within a 24-hour period on April 13 and April 14, 2011.

0 150 300
Approximate scale in feet

FIGURE 10
Potentiometric Surface of the Shallow Sand - April 2011
North Cavalcade Street Superfund Site
Remedial Action
Houston, Harris County, Texas

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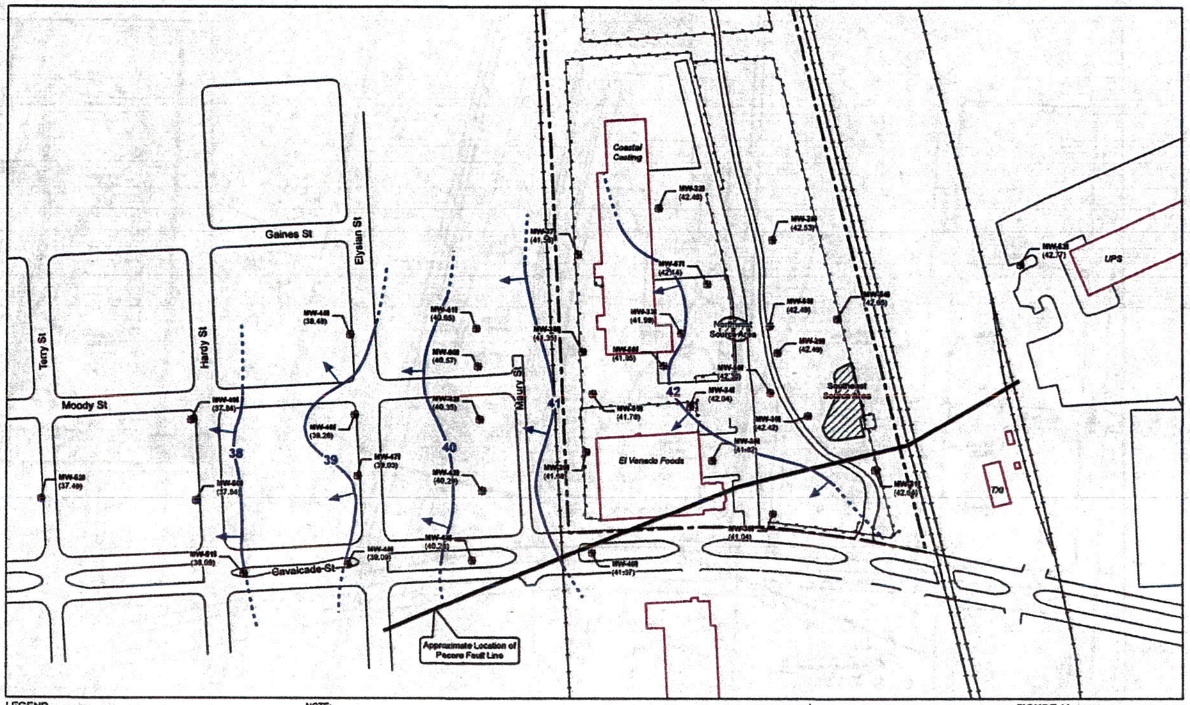

LEGEND
- ▣ New Monitor Well
- ▨ In-Situ Stabilization Areas
- —— Ground Water Elevation Contour
- - - - (Dashed Where Inferred)

NOTE:
Measured within a 24-hour period on April 13 and April 14, 2011.

FIGURE 11
Potentiometric Surface of the Interbedded Unit - April 2011
North Cavalcade Street Superfund Site
Remedial Action
Houston, Harris County, Texas

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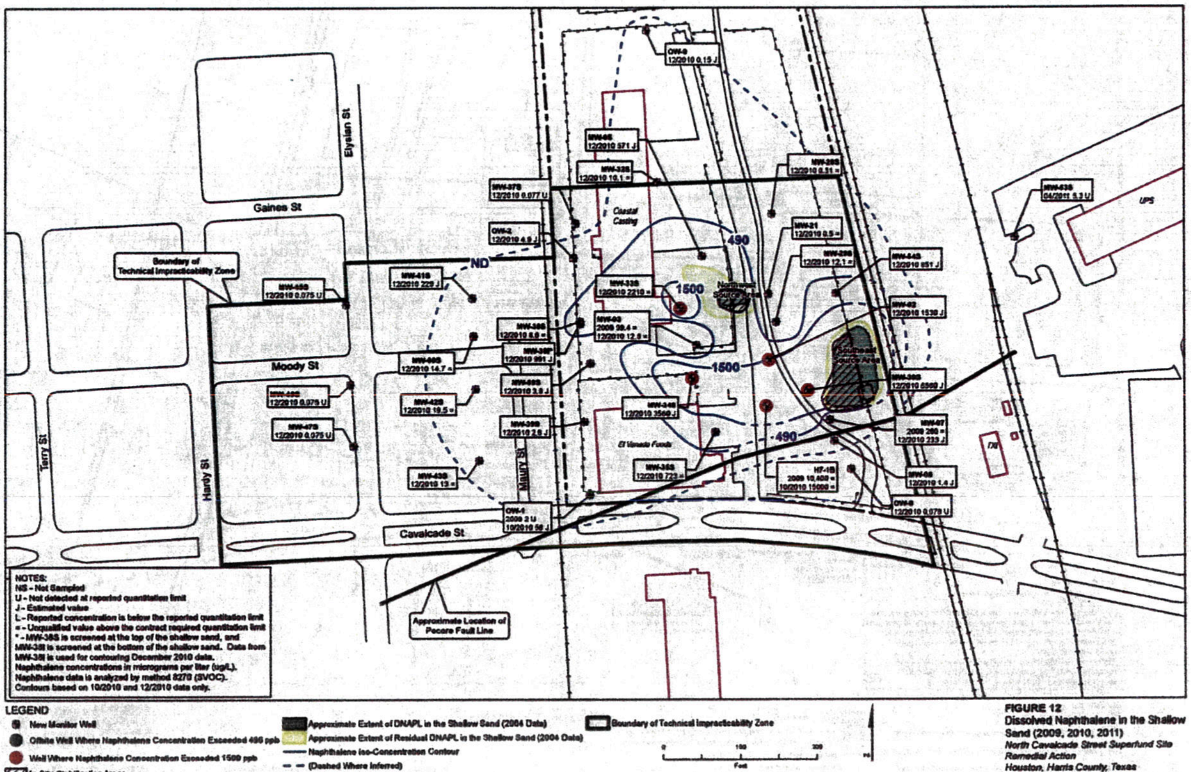


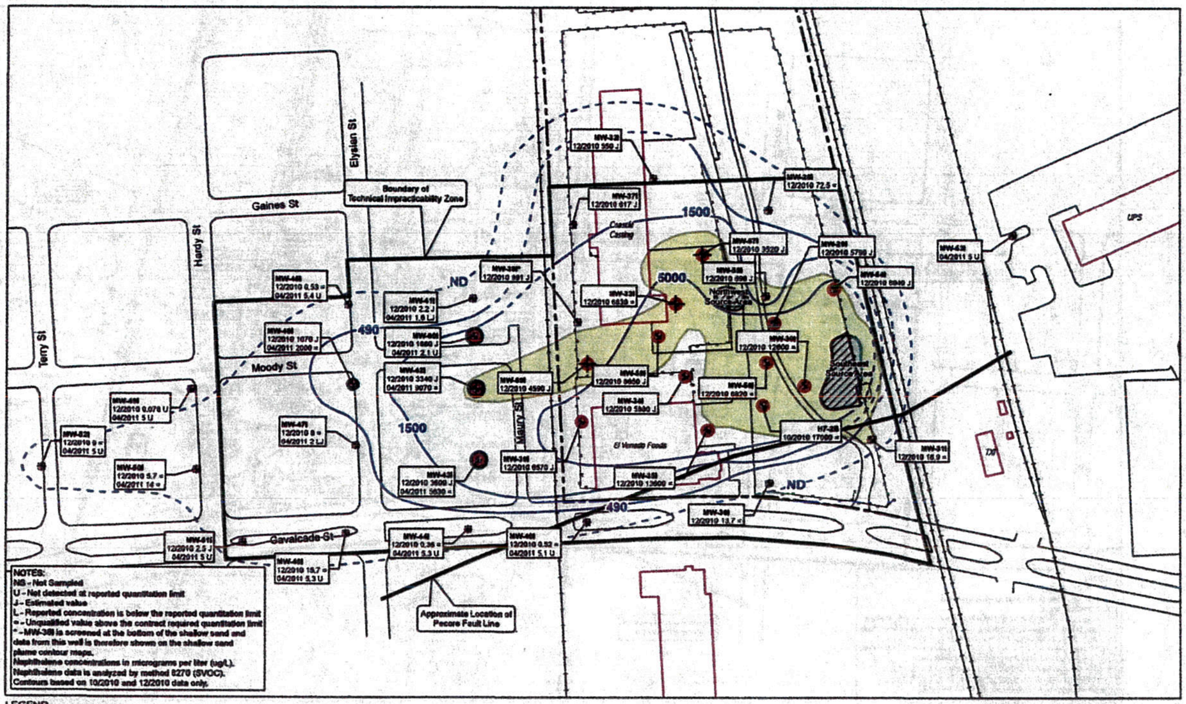
NOTES:
NS - Not Sampled
U - Not detected at reported quantitation limit
J - Estimated value
L - Reported concentration is below the reported quantitation limit
= - Unqualified value above the contract required quantitation limit
* - MW-38S is screened at the top of the shallow sand, and MW-38I is screened at the bottom of the shallow sand. Data from MW-38I is used for contouring December 2010 data.
Naphthalene concentrations in micrograms per liter (ug/L).
Naphthalene data is analyzed by method 8270 (SVOC).
Contours based on 10/2010 and 12/2010 data only.

LEGEND
- ● New Monitor Well
- ● Offsite Well Where Naphthalene Concentration Exceeded 490 ppb
- ● Well Where Naphthalene Concentration Exceeded 1500 ppb
- ▨ In-Situ Stabilization Areas
- ■ Approximate Extent of DNAPL in the Shallow Sand (2004 Data)
- ■ Approximate Extent of Residual DNAPL in the Shallow Sand (2004 Data)
- — Naphthalene iso-Concentration Contour
- – – (Dashed Where Inferred)
- ☐ Boundary of Technical Impracticability Zone

HOU \\HOLLISTER\PROJ\CAVALCADE\MAPFILES\RESULTS_NAPHTHALENE_SHALLOW_2009-10-11.MXD FLONDON 8/19/2011 12:31:58 PM

FIGURE 12
Dissolved Naphthalene in the Shallow Sand (2009, 2010, 2011)
North Cavalcade Street Superfund Site
Remedial Action
Houston, Harris County, Texas

CH2MHILL



NOTES:
NS - Not Sampled
U - Not detected at reported quantitation limit
J - Estimated value
L - Reported concentration is below the reported quantitation limit
= - Unqualified value above the contract required quantitation limit
* - MW-38I is screened at the bottom of the shallow sand and data from this well is therefore shown on the shallow sand plume contour maps.
Naphthalene concentrations in micrograms per liter (ug/L).
Naphthalene data is analyzed by method 8270 (SVOC).
Contours based on 10/2010 and 12/2010 data only.

LEGEND

- ▣ Permanent Monitor Well
- ✛ Monitor Well Where DNAPL Accumulation Observed April 2011
- ● Offsite Well Where Naphthalene Concentration Exceeded 490 ppb
- ● Well Where Naphthalene Concentration Exceeded 1500 ppb
- ▨ In-Situ Stabilization Areas
- ■ Approximate Extent of DNAPL in the Interbedded Unit (2004 Data)
- 🟨 Approximate Extent of Residual DNAPL in the Interbedded Unit
- — Naphthalene Iso-Concentration Contour
- - - (Dashed Where Inferred)
- ▭ Boundary of Technical Impracticability Zone

FIGURE 13
Dissolved Naphthalene in the Interbedded Unit (2009,2010,2011)
North Cavalcade Street Superfund Site
Remedial Action
Houston, Harris County, Texas

HOU \\HOLLISTER\PROJ\CAVALCADE\MAPFILES\RESULTS_NAPHTHALENE_INTERBEDDED_05-10-11.MXD FLONDON 6/10/2011 12:31:22 PM

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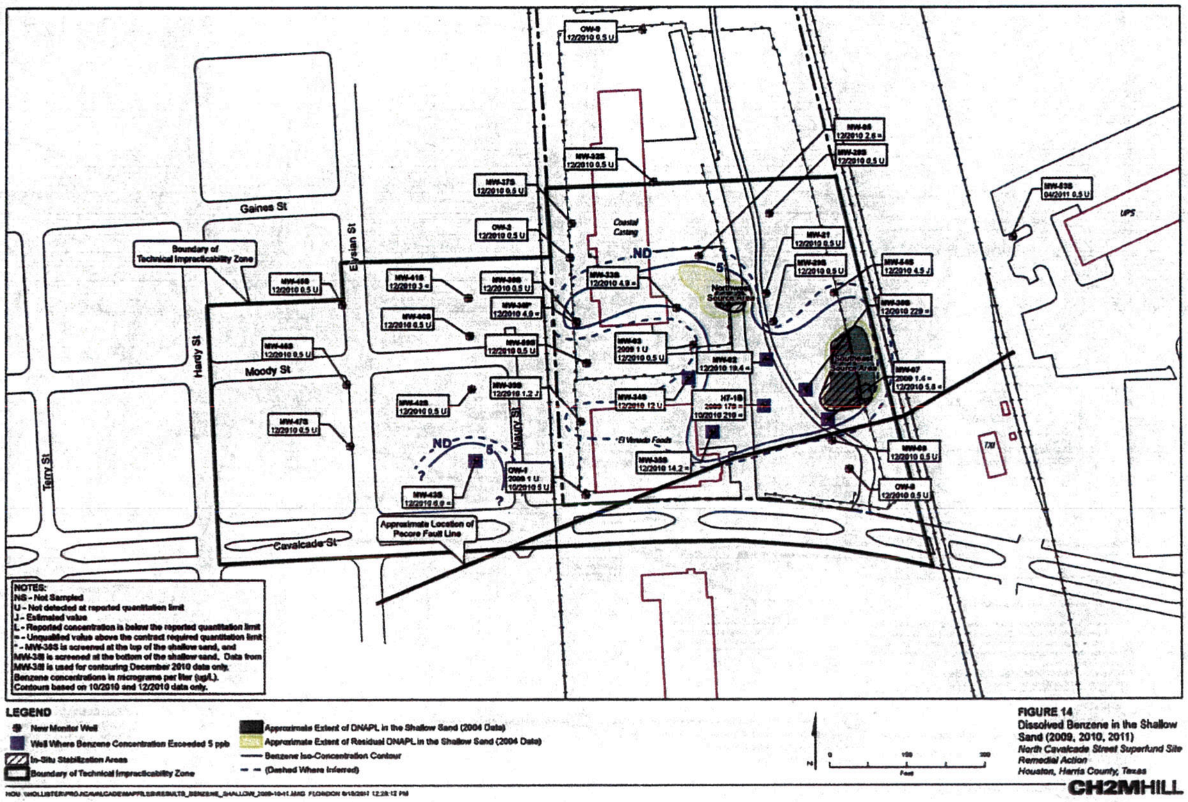

NOTES:
NS - Not Sampled
U - Not detected at reported quantitation limit
J - Estimated value
L - Reported concentration is below the reported quantitation limit
= - Unqualified value above the contract required quantitation limit
* - MW-38S is screened at the top of the shallow sand, and MW-38I is screened at the bottom of the shallow sand. Data from MW-38I is used for contouring December 2010 data only.
Benzene concentrations in *micrograms* per liter (ug/L).
Contours based on 10/2010 and 12/2010 data only.

LEGEND

●	New Monitor Well
■	Well Where Benzene Concentration Exceeded 5 ppb
▨	In-Situ Stabilization Areas
▭	Boundary of Technical Impracticability Zone
■	Approximate Extent of DNAPL in the Shallow Sand (2004 Data)
■	Approximate Extent of Residual DNAPL in the Shallow Sand (2004 Data)
—	Benzene Iso-Concentration Contour
- -	(Dashed Where Inferred)

FIGURE 14
Dissolved Benzene in the Shallow Sand (2009, 2010, 2011)
North Cavalcade Street Superfund Site
Remedial Action
Houston, Harris County, Texas

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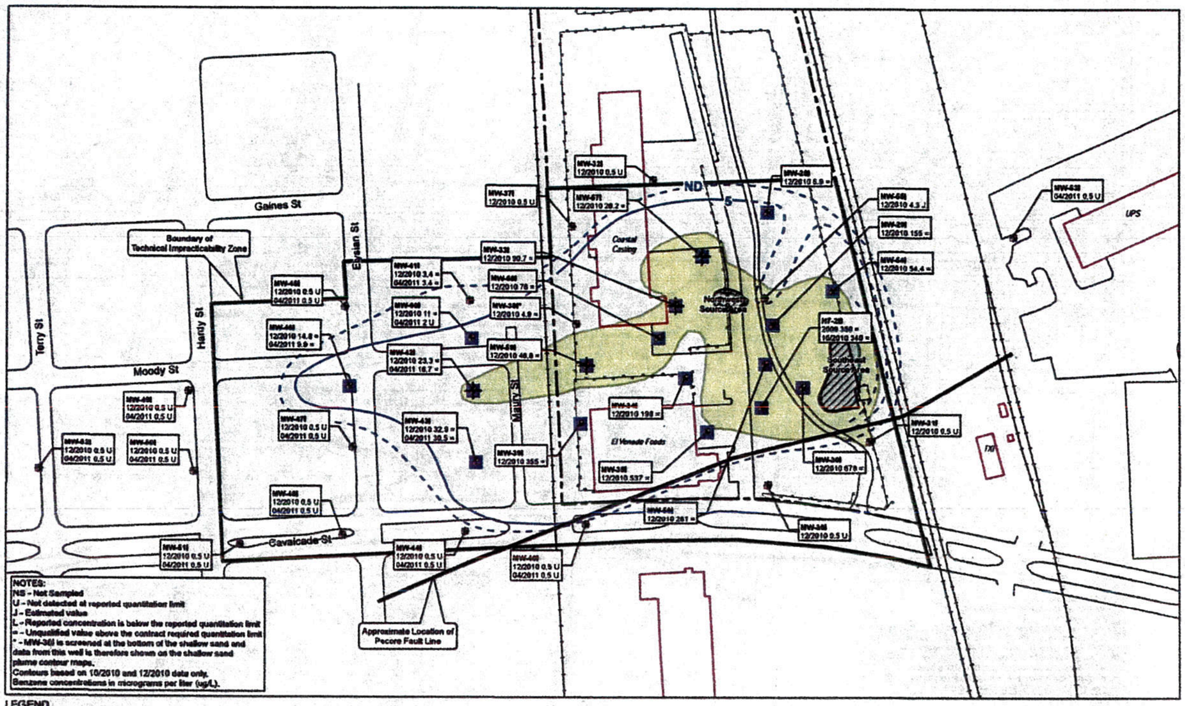
HOU \\HOLLISTER\PROJ\CAVALCADE\MAPFILES\RESULTS_BENZENE_SHALLOW_2009-10-11.MXD FLONDON 6/15/2011 12:28:12 PM



NOTES:
NS - Not Sampled
U - Not detected at reported quantitation limit
J - Estimated value
L - Reported concentration is below the reported quantitation limit
= - Unqualified value above the contract required quantitation limit
* - MW-30I is screened at the bottom of the shallow sand and data from this well is therefore shown on the shallow sand plume contour maps.
Contours based on 10/2010 and 12/2010 data only.
Benzene concentrations in micrograms per liter (ug/L).

LEGEND
- New Monitor Well
- ✚ Monitor Well Where DNAPL Accumulation Observed April 2011
- ■ Well Where Benzene Concentration Exceeded 5 ppb
- ▨ In-Situ Stabilization Areas
- ▩ Approximate Extent of DNAPL in the Interbedded Unit (2004 Data)
- 🟨 Approximate Extent of Residual DNAPL in the Interbedded Unit
- — Benzene Iso-Concentration Contour
- - - (Dashed Where Inferred)
- ☐ Boundary of Technical Impracticability Zone

FIGURE 15
Dissolved Benzene in the Interbedded Unit (2009, 2010, 2011)
North Cavalcade Street Superfund Site
Remedial Action
Houston, Harris County, Texas

CH2MHILL

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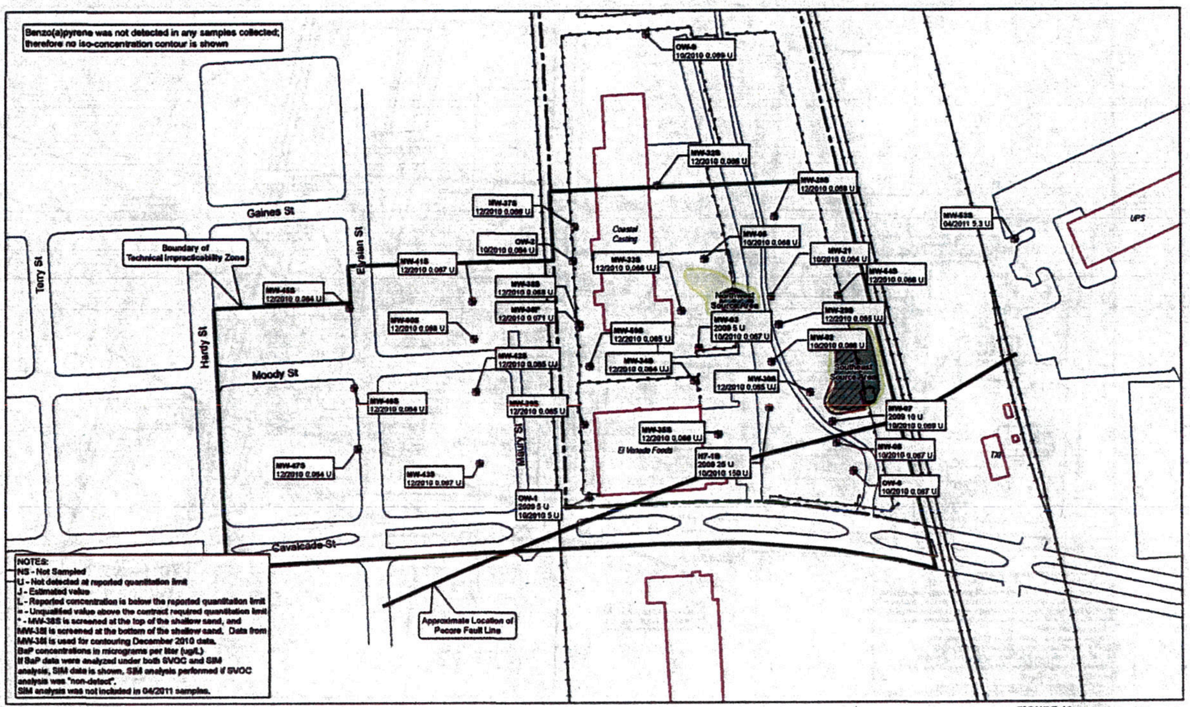

NOTES:
NS - Not Sampled
U - Not detected at reported quantitation limit
J - Estimated value
L - Reported concentration is below the reported quantitation limit
= - Unqualified value above the contract required quantitation limit
* - MW-38S is screened at the top of the shallow sand, and MW-38I is screened at the bottom of the shallow sand. Data from MW-38I is used for contouring December 2010 data.
BaP concentrations in micrograms per liter (ug/L)
If BaP data were analyzed under both SVOC and SIM analysis, SIM data is shown. SIM analysis performed if SVOC analysis was "non-detect".
SIM analysis was not included in 04/2011 samples.

LEGEND
- ● Permanent Monitor Well
- ● Well Where BaP Concentration Exceeded 0.2 ppb
- ▨ In-Situ Stabilization Areas
- ☐ Boundary of Technical Impracticability Zone
- ■ Approximate Extent of DNAPL in the Shallow Sand (2004 Data)
- 🟨 Approximate Extent of Residual DNAPL in the Shallow Sand (2004 Data)
- —— BaP Iso-Concentration Contour
- – – (Dashed Where Inferred)

FIGURE 16
Dissolved Benzo(a)Pyrene in the Shallow Unit (2009, 2010, 2011)
North Cavalcade Street Superfund Site
Remedial Action
Houston, Harris County, Texas

CH2MHILL

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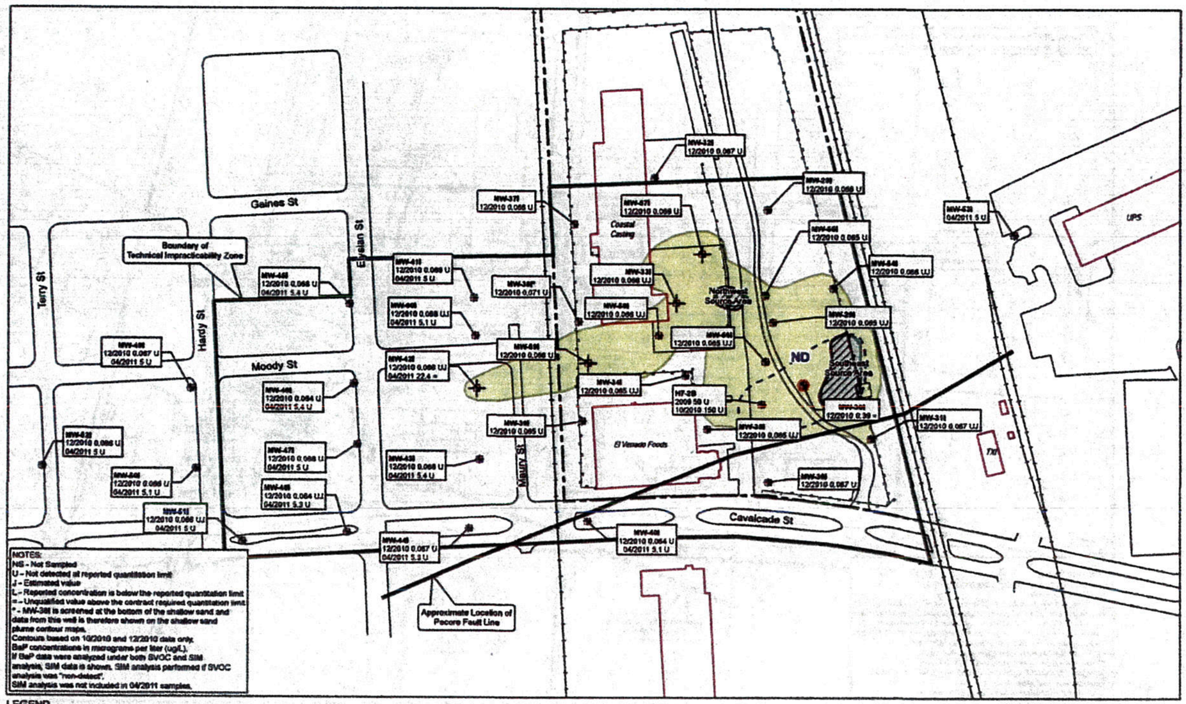

NOTES:
NS - Not Sampled
U - Not detected at reported quantitation limit
J - Estimated value
L - Reported concentration is below the reported quantitation limit
= - Unqualified value above the contract required quantitation limit
* - MW-38I is screened at the bottom of the shallow sand and data from this well is therefore shown on the shallow sand plume contour maps.
Contours based on 10/2010 and 12/2010 data only.
BaP concentrations in micrograms per liter (ug/L).
If BaP data were analyzed under both SVOC and SIM analysis, SIM data is shown. SIM analysis performed if SVOC analysis was "non-detect".
SIM analysis was not included in 04/2011 samples.

LEGEND
- ■ Permanent Monitor Well
- + Monitor Well Where DNAPL Accumulation Observed April 2011
- ● Well Where BaP Concentration Exceeded 0.2 ppb
- ▨ In-Situ Stabilization Areas
- ■ Approximate Extent of DNAPL in the Interbedded Unit (2004 Data)
- 🟨 Approximate Extent of Residual DNAPL in the Interbedded Unit
- — BaP Iso-Concentration Contour
- – – (Dashed Where Inferred)
- ☐ Boundary of Technical Impracticability Zone

0 150 300
Feet

FIGURE 17
Dissolved Benzo(a)Pyrene in the Interbedded Unit (2009, 2010, 2011)
North Cavalcade Street Superfund Site
Remedial Action
Houston, Harris County, Texas

CH2MHILL

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Attachments

Bryan W. Shaw, Ph.D., *Chairman*
Buddy Garcia, *Commissioner*
Carlos Rubinstein, *Commissioner*
Mark R. Vickery, P.G., *Executive Director*

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

Protecting Texas by Reducing and Preventing Pollution

RECEIVED
11 OCT -5 PM 2:06
SUPERFUND DIV.
DIRECTOR'S OFC.

September 27, 2011

Mr. Samuel Coleman, P.E., Director
Superfund Division
U.S. Environmental Protection Agency Region 6
1445 Ross Avenue, Suite 1200
Dallas, Texas 75202

Re: Record of Decision (ROD) Amendment
North Cavalcade Street Superfund Site TXD980873343
Harris County, Texas

Dear Mr. Coleman:

The Texas Commission on Environmental Quality (TCEQ) received the signed Final Superfund Record of Decision (ROD) for the North Cavalcade Street Superfund Site in Harris County, Texas via email on August 28, 2011. The TCEQ has completed the review of the above referenced document and concurs that the response action described is the most appropriate remedy for this site.

Sincerely,

Mark R. Vickery, P.G.
Executive Director

MRV/MCL/

P.O. Box 13087 • Austin, Texas 78711-3087 • 512-239-1000 • www.tceq.texas.gov

How is our customer service? www.tceq.texas.gov/goto/customersurvey

Prepared for

United States Environmental Protection Agency

Region 6

RECORD OF DECISION AMENDMENT ADMINISTRATIVE RECORD INDEX

for

NORTH CAVALCADE STREET SUPERFUND SITE

EPA ID No. TXD980873343
SSID: 0678

EP-W-10-011
Task Order No. EP-DTO6-00002

Camille Hueni
Remedial Project Manager
U.S. EPA Region 6

Prepared by

Toeroek Associates, Inc.
300 Union Blvd., Suite 520
Lakewood, CO 80228

March 29, 2012

PREAMBLE

The purpose of this document is to provide the public with an index to the Administrative Record File (AR File) for the U.S. Environmental Protection Agency's (EPA) selected remedial action to respond to conditions at the North Cavalcade Street Superfund Site (the "Site"). EPA's action is authorized by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), 42 U.S.C. Section 9601 et seq.

Section 113 (j)(1) of CERCLA, 42 U.S.C. Section 9613 (j)(1), provides that judicial review of the adequacy of a CERCLA response action shall be limited to the Administrative Record (AR). Section 113 (k)(1) of CERCLA, 42 U.S.C. Section 9613 (k)(1), requires the EPA to establish an AR upon which it shall base the selection of its remedial actions. As the EPA decides what to do at the site of a release of hazardous substances, it compiles documents concerning the site and its decision into an "AR File." This means that documents may be added to the AR File from time to time. After the EPA Regional Administrator or the Administrator's delegate signs the Action Memorandum or the Record of Decision memorializing the selection of the action, the documents which form the basis for the selection of the response action are then known as the Administrative Record "AR."

Section 113(k)(1) of CERCLA requires the EPA to make the AR File available to the public at or near the site of the response action. Accordingly, the EPA has established a repository where the AR File may be reviewed near the Site at:

Houston Central Library
500 McKinney, Texas Room
Houston, Texas 77002
Phone: (832) 393-1313
Contact: Cindy Page

And

Texas Commission on Environmental Quality
12100 Park 35 Circle
Building E, First Floor, Room 103
Austin, Texas 78753
Phone: (512) 239-2900
Contact: John Flores

The public also may review the AR File at the EPA Region 6 office in Dallas, Texas, by contacting the Remedial Project Manager at the address listed below. The AR File is available for public review during normal business hours. The AR File is treated as a non-circulating reference document. Any document in the AR File may be photocopied according to the procedures used at the repository or at the EPA Region 6 office. This index and the AR File were compiled in accordance with the EPA's Final Guidance on Administrative Records for Selecting CERCLA Response Actions, Office of Solid Waste and Emergency Response (OSWER) Directive Number 9833.3A1 (December 3, 1990).

Documents listed as bibliographic sources for other documents in the AR File might not be listed separately in the index. Where a document is listed in the index but not located among the documents which the EPA has made available in the repository, the EPA may, upon request, include the document in the repository or make the document available for review at an alternate location. This applies to documents such as verified sampling data, chain of custody forms, guidance and policy documents, as well as voluminous site-specific reports. It does not apply to documents in EPA's confidential file. (Copies of guidance documents also can be obtained by calling the RCRA/Superfund/Title 3 Hotline at (800) 424-9346.)

These requests should be addressed to:

Camille Hueni
Remedial Project Manager (6SF-RA)
U.S. EPA Region 6
1445 Ross Avenue
Dallas, Texas 75202-2733
(214) 665-2231

The EPA response selection guidance compendium index has not been updated since March 22, 1991 (see CERCLA Administrative Records: First Update of the Compendium of Documents Used for Selecting CERCLA Response Actions [March 22, 1991]); accordingly, it is not included here. Moreover, based on resource considerations, the Region 6 Superfund Division Director has decided not to maintain a Region 6 compendium of response selection guidance. Instead, consistent with 40 CFR Section 300.805(a)(2) and 300.810(a)(2) and OSWER Directive No. 9833.3A-1 (page 37), the AR File Index includes listings of all guidance documents which may form a basis for the selection of the response action in question.

The documents included in the AR File index are arranged predominantly in chronological order. The AR File index helps locate and retrieve documents in the file. It also provides an overview of the response action history. The index includes the following information for each document:

- **Doc ID**- The document identifier number.
- **Date** - The date the document was published and/or released. "01/01/2525" means no date was recorded.
- **Pages** - Total number of printed pages in the document, including attachments.
- **Title** - Descriptive heading of the document.
- **Document Type** - General identification, (e.g. correspondence, Remedial Investigation Report, Record of Decision.)
- **Author** - Name of originator, and the name of the organization that the author is affiliated with. If either the originator name or the organization name is not identified, then the field is captured with the letters "N/A".
- **Addressee**- Name and affiliation of the addressee. If either the originator name or the organization name is not identified, then the field is captured with the letters "N/A".

ADMINISTRATIVE RECORD INDEX

03/29/2012 **Region Id: 06**

ADMINISTRATIVE RECORD

Site Name: NORTH CAVALCADE STREET
CERCLIS: TXD980873343
OUID:
SSID: 0678
Action: RECORD OF DECISION AMENDMENT

Region Id: 06
Docid: 654429
Bates: 000078 **To:** 000105
Date: 08/12/2011
Pages: 28
Title: [TECHNICAL IMPRACTICABILITY OF GROUND WATER RESTORATION NORTH CAVALCADE STREET SUPERFUND SITE HOUSTON TEXAS]
Doc Type: ELECTRONIC RECORD
MEMORANDUM

	Name	Organization
Author:	NONE,	CH2M HILL

	Name	Organization
Addressee:	HUENI, CAMILLE	U.S. ENVIRONMENTAL PROTECTION AGENCY

Region Id: 06
Docid: 653726
Bates: 000106 **To:** 000167
Date: 08/26/2011
Pages: 62
Title: [RECORD OF DECISION AMENDMENT FOR NORTH CAVALCADE STREET SUPERFUND SITE]
Doc Type: RECORD OF DECISION / AMENDMENT

	Name	Organization
Author:	NONE, NONE	U.S. ENVIRONMENTAL PROTECTION AGENCY

	Name	Organization
Addressee:	NONE, NONE	NONE

Region Id: 06
Docid: 654437
Bates: 000168 **To:** 000811
Date: 03/26/2012
Pages: 644
Title: [SUMMARY OF ACTIVITIES AND RESULTS OF GROUND WATER DATA COLLECTION AUGUST 2010 THROUGH APRIL 2011 NORTH CAVALCADE STREET SUPERFUND SITE HOUSTON TEXAS]
Doc Type: MEMORANDUM
ELECTRONIC RECORD

	Name	Organization
Author:	NONE,	CH2M HILL

	Name	Organization

ADMINISTRATIVE RECORD INDEX

03/29/2012 **Region Id: 06**

ADMINISTRATIVE RECORD

Site Name: NORTH CAVALCADE STREET
CERCLIS: TXD980873343
OUID:
SSID: 0678
Action: RECORD OF DECISION AMENDMENT

Region Id: 06
Docid: 9119532
Bates: 000001 **To:** 000016
Date: 07/07/2011
Pages: 16
Title: [RECORD OF DECISION AMENDMENT PROPOSED PLAN FOR GROUND WATER ADMINISTRATIVE RECORD INDEX]
Doc Type: ELECTRONIC RECORD INDEX

	Name	Organization
Author:	NONE,	SCIENCE APPLICATIONS INTERNATIONAL CORPORATION ENERGY ENVIRONMENT & INFRASTRUCTURE LLC

	Name	Organization
Addressee:	HUENI, CAMILLE	U.S. ENVIRONMENTAL PROTECTION AGENCY

Region Id: 06
Docid: 653727
Bates: 000017 **To:** 000077
Date: 07/19/2011
Pages: 61
Title: [CERTIFIED TRANSCRIPT OF EPA PUBLIC MEETING 07/19/2011 FOR NORTH CAVALCADE STREET SUPERFUND SITE]
Doc Type: MEETING NOTES / MINUTES

	Name	Organization
Author:	RUSSO, RHONDA	ESQUIRE SOLUTIONS

	Name	Organization
Addressee:	NONE, NONE	U.S. ENVIRONMENTAL PROTECTION AGENCY

ADMINISTRATIVE RECORD INDEX

03/29/2012 **Region Id: 06**

ADMINISTRATIVE RECORD

Site Name: NORTH CAVALCADE STREET
CERCLIS: TXD980873343
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Action: RECORD OF DECISION AMENDMENT

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Addressee:	HUENI, CAMILLE	U.S. ENVIRONMENTAL PROTECTION AGENCY

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RECORD OF DECISION
MOLYCORP, INC.
QUESTA, NEW MEXICO
CERCLIS ID NO: NMD002899094
DECEMBER 20, 2010

6.0 CURRENT AND POTENTIAL FUTURE SITE AND RESOURCE USES

6.1 Land Use

6.1.1.3 Future Land Use After Mining

Based on the likely population growth in the mine vicinity and nearby communities and the existing popularity of the surrounding area for recreation and mountain resort development, future post-mining land uses of industrial, commercial, or residential are likely for the Mine Site Area. Residential use is more likely along the flatter lands adjacent to the Red River, rather than the mountainous terrain at the mine site. Population growth projections for Taos County indicate that the northern region, which includes the Village of Questa (population approximately 1,900) and the town of Red River (population approximately 500), will likely absorb the growth that is expected to occur in the Taos area due to the large amount of undeveloped land in this region. The recreational opportunities in the vicinity of the mine and the natural beauty of the Red River Valley make it an attractive and desirable area for residential development, for permanent residences, for temporary vacation homes, and for rental lodges or cabins.

Private residential cabins have been built adjacent to the mine site in the past. A few private cabins were once located along the river in the Columbine Park area. However, they were acquired by Molycorp and demolished. Several company cabins owned by Molycorp were also once located along the river in the Columbine Park area. They have also been demolished.

The Mill Area of the mine site, where the mill structures and buildings are currently located, is likely to be put to industrial use in the future. It is the preliminary location for water treatment facilities to be constructed and operated as part of the Selected Remedy. Future recreational uses are also very likely for the Mine Site Area. The mine site is surrounded by the Carson National Forest, and it is within a few miles of two national wilderness areas. Current and anticipated future uses are recreational skiing, hunting, kayaking, picnicking, camping, and fishing. Other uses include forestry management and oversight activities by U.S. Forest Service personnel.

The currently approved post-mining land use for the Mine Site Area under the New Mexico Mining Act is forestry and water management, as set forth in New Mexico Mining Act Permit TA001RE (MMD 2002; § 5, Part F), which requires closure and reclamation. The post mining land use under the Mining Act is not, however, a fixed land status. CMI can apply to change the post-mining land use designation at any time. Also, the post-mining land use can change after the site is no longer subject to New Mexico Mining Act requirements. State agencies report that as closure of a mine approaches, mine operators often find uses for their lands that were previously unanticipated. It is not unusual for mine operators to request a post-mining land use designation of industrial or commercial for portions of their facilities after mining operations cease. Some mine operators also request a post-mining land use designation of residential use after closure.

After cessation of mining operations, under the Closeout Plan for the mine, which is part of the New Mexico Mining Act permit, the Mine Site Area, including the Mill Area, must be reclaimed to a condition that allows for re-establishment of a self-sustaining ecosystem appropriate for the life zone of the surrounding area, and that does not conflict with the approved post-mining land use of forestry. A request by CMI to waive reclamation requirements for the open pit was approved by MMD in 2002 pursuant to Mining Act Rules (§§ 19.10.5.506 and .507). The approval was based on an assessment by CMI that such reclamation would not be environmentally sound or economically feasible. Structures that are not designated for another post-closure use must be removed. However, it is anticipated that some buildings and structures in the Mill Area will be retained for longterm water management and treatment (MMD 2002; § 9, Parts D and E) (see Section 2.4.1.2). Under the closure plan for the mine, which is part of New Mexico discharge permit DP-1055, the Mine Site Area must be closed to protect ground water quality (see Section 2.4.2.1).

Both existing and planned institutional controls are required to be considered when evaluating future land use. EPA intends to seek temporary restrictions on drilling wells in areas of contaminated ground water from the New Mexico Office of the State Engineer. In addition, on May 21, 2009, CMI recorded the institutional controls with Taos County described below.

- **Deed of Conservation Easement**: The deed of conservation easement (Conservation Easement) is granted to the Village of Questa, with EPA, NMED, and EMNRD named as third-party beneficiaries. It applies to the mine site property, becomes effective when the permanent cessation of all mining activities, including mineral beneficiation at the entire mine, occurs, remains in effect in perpetuity and its provisions are intended to:
    - Prohibit residential land use;
    - Authorize the Village of Questa, at its option, to use the administrative and maintenance and electrical areas and a portion of the Mill Area for light industrial or other low ecological impact uses;
    - Prohibit excavation by more than ten feet;
    - Prohibit the withdrawal of ground water, except for the purposes of ground water remediation or monitoring;
    - Prohibit the capture of any spring or other flowing water on or beneath the property, except for purposes of ground water remediation.

- **Declarations of Restrictive Covenants**: There are separate restrictive covenants for the tailing facility and the mine and mineral processing facility. The Village of Questa is named grantee in each and EPA, NMED, and EMNRD are designated as third party beneficiaries. The restrictive covenants became effective on May 21, 2009, when they were recorded in the Taos County deed records and run with the land. The tailing facility covenants are intended to prohibit all residential uses prior to the termination of mining activities and, thereafter, allows uses which are consistent with the Conservation Easement. The restrictive covenants also prohibit:

  - Excavation to a depth of more than 10 feet below ground surface;
  - The collection, storage, or use of any present or future spring or other surface water with the exception of closure or reclamation;
  - The use of ground water for human consumption or installation of wells to obtain ground water for any purpose except closure or reclamation.

These proprietary controls should restrict residential land use and ground and surface water uses if they are effectively monitored and enforced. They allow light industrial development over part of the mine property and the Mill Area.

To comply with the conditions established by MMD for the pit waiver, CMI must restrict access to the pit through use of perimeter fencing and berms, signage, and institutional controls to ensure that the pit does not pose a current or future hazard to public health or safety.

Notwithstanding the current post-mining land use designation and the institutional controls that have been established or planned, EPA has developed alternatives for the Mine Site Area that address the potential hypothetical future resident and recreational visitor or trespasser.

6.2.2.1 Ground Water

The current and anticipated future use of ground water at the mine site (through the end of mining) is primarily process water in milling and tailing disposal operations and for pipeline maintenance and dust suppression at the tailing facility. Ground water is also withdrawn at the mine site for potable use by workers. Currently, ground water is pumped out of the underground mine workings as part of CMI's mine dewatering operations and transported to the mill for use in transporting tailing slurry to the tailing facility during milling periods and for pipeline maintenance and dust suppression at the tailing facility during non-milling periods. Ground water extracted or collected from mine production wells, as well as the NPDES water collection systems (ground water withdrawal well system and seepage interception systems), are also sent to the mill and used or disposed of in this manner. Additionally, diversion of Red River surface water provides a significant source of mill makeup water.

The Lab Well at the mill and the Columbine domestic well near the confluence of Columbine Creek and the Red River are used to supply the mill, the administration and maintenance and electrical areas with potable water and drinking water. Water from these wells is not used in milling operations.

After cessation of mining, ground water will continue to be withdrawn from the underground mine workings as part of the Selected Remedy and New Mexico's mining and ground water discharge permit requirements for reclamation. Additionally, ground water will be withdrawn along the roadside waste rock piles by the NPDES ground water withdrawal well system and along tributary drainages by the Selected Remedy. The collected ground water from these remedial systems will be treated and discharged to the Red River. The dewatering of the underground mine will be conducted for many years and possibly in perpetuity.

Other potential future uses of Mine Site Area ground water include drinking water and other domestic use associated with residential, commercial, or industrial land use. As stated above, CMI has established institutional controls over portions of the mine property which are intended to restrict withdrawal of ground water. If these institutional controls are effectively maintained, monitored and enforced, they should limit ground water use for drinking water and other domestic purposes.

The beneficial future use of ground water that flows from CMI's property to the Red River alluvial aquifer beyond the CMI property boundary is drinking water, other domestic water uses, and agriculture uses (livestock watering and irrigation).

The increasing population trends for the Questa area indicate that it is foreseeable that demands on area water supplies and the need for future sources of water to supply population demands will increase over time (NMED 2010).

8.0 REMEDIAL ACTION OBJECTIVES

8.2 Remedial Action Objectives for the Mine Site Area

8.2.1 Remedial Action Objectives

The remedial action objectives for the Mine Site Area are:

- Prevent ingestion by humans of ground water containing mine-related inorganic COCs exceeding state/federal ARARs or Site-specific risk-based cleanup levels. Eliminate or reduce, to the maximum extent practicable, leaching and migration of inorganic COCs and acidity from waste rock (acid rock drainage) to ground water at concentrations and quantities that have the potential to cause exceedances of the numeric ground water ARARs or Site-specific risk-based cleanup levels.

- Restore contaminated ground water to meet state/federal ARARs or Site-specific risk-based cleanup levels for inorganic COCs.

- Eliminate or reduce, to the maximum extent practicable, the migration of minerelated inorganic COCs in ground water to Red River surface water at concentrations that would result in surface water concentrations exceeding surface water ARARs or Site-specific risk-based cleanup levels.

- Protect Red River aquatic species from chronic exposure to inorganic COCs and acidity at Springs 13 and 39 by eliminating or reducing discharge, to the maximum extent practicable, of Springs 13 and 39 water to the Red River at levels that result in total aluminum concentrations below the Site-specific risk-based cleanup level of 1 mg/L in Red River surface water at Spring 13 and 0.8 mg/L in Red River surface water at Spring.

- Prevent future transport of mine site soil containing inorganic COCs to surface water entering the Red River to prevent future adverse impacts to habitat, physical toxicity, and exceedances of surface water quality ARARs.

- Protect recreational visitor/trespasser by reducing exposure (incidental ingestion) of surface water containing beryllium, cadmium, and manganese exceeding federal drinking water standards or Site-specific risk-based cleanup levels.

- Eliminate or reduce direct exposure and exposure via the food web, to mine site soil that contains molybdenum at concentrations that exceed the Site-specific risk-based cleanup level of 300 mg/kg for terrestrial ecological receptors.

- Maintain underground mine water elevations below those of the Red River, prevent ingestion by humans, and treat ground water from the underground mine workings containing mine-related inorganic COCs exceeding state/federal ARARs or Sitespecific risk-based cleanup levels.

9.0 DESCRIPTION OF ALTERNATIVES

9.2 Mill Area Alternatives

9.2.1.1 Access Controls

The Mill Area is currently surrounded by a chain linked fence with restricted access through a central gate with a badge identification system. Signs are posted at the gate and on fences to control access. The existing fence, restricted access through the gate, and signage will be maintained as part of these alternatives.

9.2.1.3 Institutional Controls

Government controls would be used to restrict access to contaminated ground water. Proprietary controls that have been recorded by CMI are intended to legally restrict land and resource use at the Mill Area to minimize the potential for human exposure. They are or would be used in the following manner for the Mill Area remedial alternatives:

- Temporary well drilling restrictions would be imposed by the New Mexico Office of State Engineer at the Mill Area; the prohibition will only apply to new requests for water well permits and cannot be enforced against existing water well permit holders;

- Restrictive covenants and the Conservation Easement recorded by CMI prohibit residential use of the mine site property (including the Mill Area) (see Current and Potential Future Land and Resources Use, Section 6.0, above). These proprietary controls also restrict the use of surface water and ground water, as well as certain construction activities to protect any remedial or reclamation measures required by EPA or New Mexico. CMI conveyed the Conservation Easement to the Village of Questa and identified EPA, NMED, and EMNRD as third party beneficiaries. The Declaration of Restrictive Covenants identifies CMI, the Village of Questa, EPA, NMED, and EMNRD as enforcing parties and the Village of Questa and the three government agencies as third party beneficiaries. The Conservation Easement and restrictive covenants run with the land in perpetuity and are binding on CMI and future owners, tenants, licensees, occupants and users of the property. They are to be maintained and enforced in perpetuity.

9.3 Mine Site Area Alternatives

9.3.1.1 Access Controls

As the mine site covers approximately three square miles of mountainous land, the alternatives will include access controls only in specific areas of the mine site that are easily accessible. Current access restrictions are in place for those areas with operating facilities (buildings, structures, etc.) and include fencing, placement of signage and guarded entry points. These land use controls will continue during the operational life of the mine. The fencing and signage will be maintained after closure.

9.3.1.4 Institutional Controls

EPA would request that the New Mexico Office of the State Engineer temporarily prohibit issuance of new water well permits for well drilling while the mine site ground water is being remediated. Such prohibition shall cease once ground water cleanup levels are achieved. In addition to the government controls, CMI has recorded proprietary controls intended to legally restrict land and resource uses, including all future residential land uses. These institutional controls are discussed in more detail under the Mill Area Alternatives, Section 9.2.1.2, and Current and Potential Future Land and Resources Use, Section 6.0, above.

The above controls would reduce or eliminate future human health exposure to soil. The recorded proprietary controls identify specific requirements and how they have been implemented, the length of time they are to be maintained and monitored, and the entities that are responsible for their enforcement.

9.3.2 Key Applicable or Relevant and Appropriate Requirements

The following ARARs are key requirements that provide a basis for developing the remedial alternatives for the Mine Site Area. A summary of the chemical-, action-, and location-specific ARARs that apply to each remedial alternative for the Site is presented in Tables 9-1 through 9-12.

9.3.2.1 Safe Drinking Water Act Regulations

Safe Drinking Water Act regulations, 40 C.F.R. Part 141, have been adopted by New Mexico (§ 20.7.10.100 NMAC). See below. 40 C.F.R. Part 141 specifies maximum contaminant levels (MCLs) and MCL goals (MCLGs) for select chemicals in drinking water at the tap. The MCLs and MCLGs are relevant and appropriate for ground water if the ground water is a current or potential source of drinking water.

UNITED STATES
ENVIRONMENTAL PROTECTION AGENCY
REGION 6

RECORD OF DECISION

MOLYCORP, INC.
QUESTA, NEW MEXICO

CERCLIS ID NO: NMD002899094

DECEMBER 20, 2010

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ACRONYMS AND ABBREVIATIONS

ac-ft	acre-feet
ACGIH	American Conference of Governmental Industrial Hygienists
Al_2O_3	aluminum oxide
AOC	Administrative Order on Consent (or Order)
ARAR	Applicable or Relevant and Appropriate Requirement
ARD	acid-rock drainage
ATSDR	Agency for Toxic Substances and Disease Registry
AVS	acid volatile sulfide
BERA	baseline ecological risk assessment
BLM	Bureau of Land Management
BMI	benthic macroivertebrates
BMP	best management practice
C. dubia	*Ceriodaphnia dubia*
$CaCO_3$	calcium carbonate
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980
CFR	Code of Federal Regulations
cfs	cubic feet per second
cm	centimeters
cm^2	square centimeter
CMI	Chevron Mining Inc. – Questa Mine
CNS	central nervous system
COC	contaminant of concern / chemical of concern
COPC	contaminant of potential concern
CTE	central tendency exposure
CVP	concentrating photovoltaic
DOI	U.S. Department of the Interior
DROs	diesel-range organics
EA	exposure area
EEA	ecological exposure area
EMNRD	New Mexico Energy, Minerals, and Natural Resources Department
EPA	United States Environmental Protection Agency
ESI	expanded site investigation
ETO	ephemeroptera, trichoptera, odonates
F	Fahrenheit
FS	feasibility study
FSP	Field Sampling Plan
GI	gastrointestinal
gpm	gallons per minute
GROs	gasoline-range organics
GSI	ground water-to-surface water interaction
HCL	hydrochloric acid
HHEA	human health exposure area
HCO_3	bicarbonate

HDPE	high-density polyethylene
HHRA	baseline human health risk assessment
HI	hazard index
HQ	hazard quotient
IC	institutional control
IC_{25}	inhibition (of growth) concentration at 25 percent
IRIS	Integrated Risk Information System
Isco	Instrumentation Specialties Company
IX Plant	ion exchange water treatment plant
kt	kiloton
lb	pound
La	lanthanum
LC_{50}	lethal concentration at 50 percent
LOAEC	lowest observed adverse effects concentration
LOAEL	lowest observed adverse effect level
Lu	lutelium
LUC	land use control
LR	Lower River
MCL	maximum contaminant level
MCLG	maximum contaminant level goal
M&E	Mechanical and Electrical
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
$\mu g/m^3$	micrograms of particles per cubic meter of air
MMD	Mining and Minerals Division
Molycorp	Molybdenum Corporation of America
Molycorp, Inc.	Molycorp (now Chevron Mining, Inc [CMI])
MoS_2	molybdenite
m/s	miles per second
µS/cm	microSiemens per centimeter
MSGP	Multi-Sector General Permit for Storm Water Discharge Associated with Industrial Activity
MSHA	Mine Safety Health Administration
NAAQS	National Ambient Air Quality Standards
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NIOSH	National Institute of Occupational Safety and Health
NMAC	New Mexico Administrative Code
NMDGF	New Mexico Department of Game and Fish
NMED	New Mexico Environment Department
NMEMNRD	New Mexico Energy, Minerals, and Natural Resources Department
NOAEC	no observed adverse effects concentration
NOAEL	no observed adverse effects level
NOEC	no observed effects concentration
NPDES	National Pollutant Discharge Elimination System
NSR	New Source Review
NTU	nephelometric turbidity unit

O&M	operation and maintenance
ONRT	Office of the Natural Resources Trustee
Order	Administrative Order on Consent
OSE	New Mexico Office of State Engineer
PAHs	polycyclic aromatic hydrocarbons
PCB	polychlorinated biphenyl
PHREEQC	PHREEQC version 2 – computer program for simulating chemical reactions and transport processes in natural or polluted water
$PM_{2.5}$	particulate matter less than 2.5 microns in size
PM_{10}	particulate matter less than 10 microns in size
PMLU	post-mining land use
PSCR	Preliminary Site Characterization Report
QCC	Questa Community Coalition
RA	remedial action
RAGS	Risk Assessment Guidance for Superfund
RCRA	Resource Conservation and Recovery Act
RCRC	Rio Colorado Reclamation Committee
RD	remedial design
RfD	reference dose
RG	remediation goal
RGC	Robertson GeoConsultants
RI	remedial investigation
RI/FS	remedial investigation and feasibility study
RL	reporting limit
ROD	Record of Decision
RME	reasonable maximum exposure
RR	Red River
RRE	rare earth element
R3G	Red River Remediation Group
SCD	Taos County Soil and Conservation District
SCEM	Site Conceptual Exposure Model
SDWA	Safe Drinking Water Act
SEM	simultaneously extracted metal
SLC	screening level criteria
SMCL	secondary maximum contaminant levels
SMCRA	Surface Mining Control and Reclamation Act of 1977
SMOW	Standard Mean Ocean Water
SO_4	Sulfate
SPLP	Synthetic Precipitation Leaching Procedure
SPRI	South Pass Resources, Inc.
SRB	Stability Review Board
SRK	Steffen, Robertson and Kirsten
SVOC	semi-volatile organic compound
SWPPP	Storm Water Pollution Prevention Plan
t	ton
t/kt	tons per kiloton (of rock)

TAG	Technical Assistance Grant
TAL	Target Analyte List
TBC	To-be-considered
TDS	total dissolved solids
TMDL	Total Maximum Daily Load
TRV	toxicity reference value
TSCA	Toxic Substances Control Act
UCL	upper confidence limit
UFL	Upper Fawn Lake
URS	URS Corporation
USDA	U.S. Department of Agriculture
USFWS	U.S. Fish and Wildlife Service
USGS	United States Geological Survey
USGS Baseline Investigation	Questa Baseline and Pre-Mining Ground-Water Quality Investigation
VOC	volatile organic compound
WIS	Wildlife Impact Study
WQCC	New Mexico Water Quality Control Commission
ww	wet weight
WWTP	Wastewater Treatment Plant
Y	yttrium
yd^3	cubic yards
YOY	young of the year

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PART 1
THE DECLARATION

1.0 SITE NAME AND LOCATION

The Molycorp, Inc. (Molycorp) site, currently the Chevron Mining Inc. – Questa Mine (CMI) site (hereinafter the "Site") is located near the village of Questa, Taos County, New Mexico.

2.0 STATEMENT OF BASIS AND PURPOSE

This decision document, entitled "Record of Decision" (ROD), presents the "Selected Remedy" for the Site. The Selected Remedy is chosen in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), 42 U.S.C. § 9601 *et seq.* and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), 40 C.F.R. Part 300.

This decision is based on the Administrative Record file for the Site, which has been developed in accordance with CERCLA § 113(k), 42 U.S.C. § 9613(k).

In accordance with the NCP, the United States Environmental Protection Agency (EPA) has consulted with the State of New Mexico and the federal and New Mexico natural resource trustee agencies during development of the Selected Remedy. The State of New Mexico concurs with the Selected Remedy.

3.0 ASSESSMENT OF THE SITE

The Selected Remedy is necessary to protect the public health and welfare and the environment from actual or threatened releases of hazardous substances, pollutants and contaminants into the environment. Such a release or threat of release may present an imminent and substantial endangerment to public health, welfare, or the environment.

4.0 DESCRIPTION OF THE SELECTED REMEDY

4.1 Overall Site Cleanup Strategy

The Selected Remedy focuses on engineering controls for source containment of waste rock at the mine site and tailing at the tailing impoundment as sources of acid rock drainage or tailing seepage that contaminates ground water, surface water, and sediment at the Site. The Selected Remedy also focuses on active ground water remediation (extraction, seepage interception) and treatment, soil removals to address polychlorinated biphenyl (PCB) and molybdenum contamination, and the dredging and removal of lake sediment to address metals contamination. By focusing on source containment and ground water remediation at the mine site, including seeps and springs at zones of ground water upwelling, the Selected Remedy will improve the water quality of the Red River.

The Selected Remedy takes into account the current and reasonably anticipated future land uses. It also takes into account the current and potential future uses of ground water resources at the Site, as well as New Mexico statutes and regulations for the abatement and protection of ground water as Applicable or Relevant and Appropriate Requirements (ARARs).

The Selected Remedy is consistent with the requirements and conditions for mining reclamation and ground water abatement set forth in the current New Mexico mining permit (TA001RE) and ground water discharge permits (DP-1055 and DP-933).

The Selected Remedy includes further ground water characterization at the tailing facility to evaluate the adequacy of the remedial actions and determine whether any expansion of the remedy or additional response actions are necessary to provide protection of human health and the environment. The Selected Remedy also includes additional pilot and treatability studies for remediation of the waste rock piles and monitoring of the effectiveness of the source containment and ground water components.

4.2 Principal Threat Waste

Principal threat wastes are those source materials considered to be highly toxic or highly mobile that generally cannot be reliably contained and/or would present a significant risk to human health or the environment should exposure occur.[1] PCB-contaminated soil does not warrant consideration as principal threat wastes based on concentrations alone. However, the location of the PCB-contaminated soil in an active milling facility, with constant truck and foot traffic and periodic road grading and snow plowing operations, significantly elevates the potential for mobility of the PCBs. Therefore, in considering both toxicity and mobility, the PCBs in the Mill Area constitute a principal threat. The NCP at 40 C.F.R. § 300.430(a)(1)(iii)(A) establishes an expectation that EPA will use treatment to address principal threat wastes posed by a site wherever practicable.

4.3 Major Components of the Selected Remedy

The Site has been divided into the following five areas for clean up:

- Mill Area;

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[1] Additional information for defining principal threat wastes can be found in USEPA (1991b) *A Guide to Principal Threat and Low-Level Threat Wastes*.

- Mine Site Area;
- Tailing Facility Area;
- Red River, Riparian, and South of Tailing Facility Area;
- Eagle Rock Lake.

EPA will remediate Site contamination in these five areas as one Site-wide operable unit. However, recognizing the practical limitations of undertaking such a large and complex remedy at one time with very large volumes of waste rock and tailing and because the Site is currently an operating facility, EPA will implement the Selected Remedy in phases as described herein.

The Selected Remedy is a combination of the following response actions selected for each of the five areas:

4.3.1 Mill Area

For the protection of human health, the component of the Selected Remedy for the Mill Area is:

Soil Removal [High Concentrations of PCBs greater than 25 Milligrams per Kilogram (mg/kg)], Off-Site Treatment and Disposal (Low Occupancy – Commercial/Industrial); Regrade, Cover, Apply Amendments, and Vegetate after Mill Decommissioning

The major components of the Mill Area remedy are as follows:

- Continue controlled access to the site (fencing, signage, etc.);
- Continue current worker health and safety program and hazard communication;

- Excavate soil contaminated by PCBs in concentrations above the Toxic Substances Control Act (TSCA) cleanup level of 25 mg/kg for low occupancy (commercial/industrial) use;
- Perform confirmation sampling;
- Import clean fill and grade;
- Transport PCB soils to EPA-approved off-Site facilities for treatment and/or disposal;
- Regrade, cover, apply amendments and vegetate Mill Area as part of mill decommissioning;
- Monitor plant growth performance to assess if molybdenum uptake from borrow material to plants inhibits vegetative success or poses risk to wildlife;
- Perform general maintenance of the Mill Area, including water quality monitoring for all wells, seeps, and springs at the Mill Area.

4.3.2 Mine Site Area

For the protection of human health and the environment, the component of the Selected Remedy for the Mine Site Area is:

Source Containment by Regrading and Re-Contouring Waste Rock Piles to Achieve a Minimum Interbench Slope of 3Horizontal:1Vertical (3H:1V) or 2H:1V, including Partial to Complete Removal of Waste Rock to Accommodate Slope Requirements, followed by Cover, Amendment Application and Revegetation; Surface Water (Seepage) Interception, Underground Mine Dewatering, and Ground Water Extraction; Water Treatment

The major components of the Mine Site Area remedy are as follows:

- Regrade and re-contour waste rock piles to achieve a minimum interbench slope of 3H:1V, with partial or complete removal of waste rock to accommodate slope requirement; cover, apply amendments and vegetate;
- For waste rock piles where 3H:1V interbench slopes are determined to be impracticable, regrade and re-contour waste rock piles to achieve a minimum interbench slope of 2H:1V; cover, apply amendments and vegetate;
- Construct and utilize on-site repository(ies) for waste rock, the location(s) to be determined during the remedial design;
- Continue controlled access (fencing, gate, and signage);
- Continue operating existing seepage interception and ground water withdrawal well systems, dewater underground mine, pipe water to mill and treat water[2]; pH adjust water until the water treatment plant is available to treat water;
- Continue collection and conveyance of waste rock pile seepage to subsidence area on interim basis until piping and collection systems constructed at which time water will be piped to the Mill Area for treatment;
- Install new seepage collection systems near the base of Capulin and Goathill North waste rock piles to enhance seepage capture; pipe seepage to the Mill Area and treat water; decommission Capulin Leachate Collection System;
- Install and operate new ground water extraction systems in lower portion of tributary drainages; pipe water to Mill Area and treat water;
- Construct and operate water treatment plant at Year 0 Construction of the remedial action and treat water;
- Water in the underground mine will be maintained at an elevation below the Red River in perpetuity;

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[2] "Water Treatment" or to "treat water" at the mine site means the use of chemical precipitation utilizing the high-density sludge treatment process. This includes solids separation of the metal precipitated sludge with proper disposal before discharging the effluent.

- Temporary well drilling restrictions will be imposed by the New Mexico Office of the State Engineer;
- Provide temporary alternate water supply or point-of-use treatment system until attainment of ground water cleanup levels;
- Continue ground water and geotechnical monitoring and general site maintenance;
- Monitor performance of store and release/evapotranspiration cover systems to assess their effectiveness at reducing infiltration to levels that allow attainment of ground water cleanup levels;
- Monitor plant growth performance to assess if molybdenum uptake from borrow material to plants inhibits vegetative success or poses risk to wildlife;
- Monitor performance of the seepage interception and ground water extraction well systems to assess effectiveness at achieving ground water cleanup levels;
- Perform additional molybdenum characterization of Spring Gulch waste rock pile to assess suitability as borrow material for cover.

4.3.3 Tailing Facility Area

For the protection of human health and the environment, the component of the Selected Remedy for the Tailing Facility Area is:

Source Containment by Regrade, Cover and Revegetation of Tailing Impoundments; Upgrade Seepage Collection; Piping of Irrigation Water in Eastern Diversion Channel; Continue Ground Water Extraction with Additional Extraction Southeast of Dam No. 1(MW-4 and MW-17 Area); Water Treatment

The major components of the Tailing Facility Area remedy are as follows:

- Perform additional ground water characterization in the bedrock aquifer beneath and west of tailing impoundments , as well as in the bedrock and/or alluvial aquifer downgradient of Dam No. 1;
- Cover and revegetate tailing facility (and remove limited soil at the dry maintenance area at the cessation of tailing deposition);
- Replace the lower 002 seepage barrier with extraction wells and replace the upper 003 seepage barrier with a deeper barrier; treat water;
- Pipe unused irrigation water in the eastern diversion channel to prevent infiltration through historic buried tailing;
- Install and operate ground water extraction well system in alluvial aquifer southeast of Dam No. 1 and downgradient of historic buried tailing; treat water;
- Refurbish existing ion exchange plant or construct new water treatment plant at Year 0 Construction of the remedial action and operate to treat water;
- Temporary well drilling restrictions will be imposed by the New Mexico Office of the State Engineer
- Provide temporary alternate water supply or point-of-use treatment system until attainment of ground water cleanup levels;
- Control access to the site, including use of an exclusion fence to restrict access by deer and elk; provide wildlife drinkers;
- Continue tailing dust control measures;
- Perform air monitoring;
- Monitor water quality at Red River State Fish Hatchery;
- Monitor remedy performance to assess effectiveness in achieving ground water cleanup levels southeast and downgradient of Dam No. 1;

- Monitor remedy performance to assess effectiveness in achieving ground water cleanup levels downgradient of Dam No. 4 and Dam No. 1 in the alluvial and bedrock aquifers;
- Monitor performance of store and release/evapotranspiration cover system to assess effectiveness in reducing infiltration to levels that allow dewatering of the tailing piles and attainment of ground water cleanup levels;
- Monitor metals uptake in plant tissue;
- Monitor tailing piles for early detection of acid generation and metals leaching;
- Perform monitoring and maintenance of tailing dams;
- Continue ground water monitoring and general site maintenance.

4.3.4 Red River and Riparian and South of Tailing Facility Area

For protection of wildlife and livestock in the area south of the tailing facility and wildlife in the Red River riparian corridor, the component of the Selected Remedy for the Red River and Riparian and South of Tailing Facility Area is:

Removal of Soil and Tailing Spill Deposits and On-Site Disposal

The major components of the Selected Remedy for the Red River, Riparian, and South of Tailing Facility Area are as follows:

- Excavate soil contaminated with molybdenum south of tailing facility and tailing spill deposits along the Red River riparian corridor, including the large tailing pile at the Lower Dump Sump;
- Dewater soil in area south of tailing facility and stabilize excavated soil;
- Transport and dispose excavated soil and tailing at the tailing facility;

- Backfill excavations with alluvial soil.

Red River water quality is being addressed through response actions at the Mine Site Area to reduce Contaminants of Concern (COCs) entering the river from ground water at seeps and springs, including source control measures for the waste rock piles. However, the following performance monitoring of the Red River is included with the component of the Selected Remedy for the Red River, Riparian, and South of Tailing Facility Area:

- Perform physical, chemical and biological monitoring of the Red River to assess effectiveness of response actions at the Mine Site Area on improving Red River surface water quality and protecting aquatic life.

4.3.5 Eagle Rock Lake

For protection of the environment, the component of the Selected Remedy for Eagle Rock Lake is:

Inlet Storm Water Controls; Dredge Sediment and On-Site Disposal

The major components of the Eagle Rock Lake remedy are as follows:

- Install inlet controls to manage storm water entering the lake;
- Dredge and dewater sediment;
- Transport and dispose excavated sediment at an appropriate on-Site facility;
- Perform physical, chemical and biological monitoring to assess long-term effectiveness of Eagle Rock Lake remediation.

5.0 STATUTORY DETERMINATIONS

The Selected Remedy complies with the mandates of CERCLA § 121 and the regulatory requirements of the NCP. The Selected Remedy is protective of human health and the environment, complies with federal and state ARARs for the remedial action, is cost-effective, and utilizes permanent solutions and alternative treatment (or resource recovery) technologies to the maximum extent practicable.

The Selected Remedy also satisfies the statutory preference for treatment as a principal element of the remedy (*i.e.,* reduces the toxicity, mobility, or volume of hazardous substances, pollutants, or contaminants as a principal element through treatment).

Because the Selected Remedy will result in hazardous substances, pollutants, or contaminants remaining on-Site above levels that allow for unlimited use and unrestricted exposure, a statutory review will be conducted within five years after initiation of remedial action to ensure that the remedy is or will be protective of human health and the environment. Such a review will be conducted every five years after the date of the initiation of the remedial action.

6.0 ROD DATA CERTIFICATION CHECKLIST

The information identified below is included in the Decision Summary section of this ROD. Additional information can be found in the Administrative Record file for the Site.

- COCs and their respective concentrations.
- Baseline risk represented by the COCs.
- Cleanup levels established for the COCs and the basis for these levels.
- How source materials constituting principal threats are addressed.

- Current and reasonably anticipated future land use assumptions and current and potential future uses of ground water used in the baseline risk assessments and ROD.
- Potential land and ground water use that will be available at the Site as a result of the Selected Remedy.
- Estimated capital, lifetime operation and maintenance (O&M), and total present value costs, discount rate, and the number of years over which the remedy cost estimates are projected.
- Key factors that led to selecting the remedy.

7.0 AUTHORIZING SIGNATURE

This ROD documents the Selected Remedy for contaminated soil, ground water, surface water and sediment at the Site. EPA selected this remedy with the concurrence of the New Mexico Environment Department (NMED, see Appendix A). The authority to approve this ROD has been delegated to the Director of the Superfund Division (EPA, Region 6).

Sam Coleman

12/20/10

Samuel Coleman, P.E.
Superfund Director
EPA Region 6

Date

12.0 SELECTED REMEDY

EPA has selected a remedy (the Selected Remedy) that is a combination of remedial alternatives and subalternatives for each of the five areas of the Site that warrant response action under CERCLA. The Selected Remedy is described below.

Mill Area

- **Alternative 3** – Removal of soil with high concentrations of PCBs (greater than 25 mg/kg) for low occupancy (commercial or industrial) land use and off-Site treatment and disposal of soil; backfill excavation with clean fill and placement of cover at mill decommissioning.

Mine Site Area

For the Mine Site Area, EPA is selecting two similar remedial alternatives, and will make site-specific determinations during remedial design to allow optimum flexibility.

- **Subalternative 3A** – Source containment by regrading and re-contouring waste rock piles to a minimum interbench slope of 3H:1V, with partial or complete removal of waste rock to accommodate slope requirement, covering, and revegetation; surface water (seeps/springs) interception and collection, perpetual underground mine dewatering, ground water extraction, and water treatment.
- **Subalternative 3B** – Source containment by regrading and re-contouring waste rock piles to a minimum interbench slope of 2H:1V, covering and revegetation; surface water (seeps/springs) interception and collection, perpetual underground mine dewatering, ground water extraction, and water treatment.

- **Water Treatment** – Construction of a water treatment plant will commence at the start of the remedial action (Year 0 Construction). Water treatment will be performed upon completion of plant construction.

Tailing Facility Area

- **Modified Subalternative 3B** – Source containment by regrading, covering, and revegetation of tailing impoundments; upgrading seepage collection systems; piping of water in eastern diversion channel, continue ground water extraction with additional extraction southeast of Dam No. 1 (MW-4 and MW-17 Area), and water treatment
- **Tailing Facility Water Treatment** – Construction of a water treatment plant will commence at the start of the remedial action (Year 0 Construction). Water treatment will be performed upon completion of plant construction.

Red River and Riparian and South of Tailing Facility Area

- **Subalternative 3B** – Removal of soil with molybdenum concentrations greater than 11 mg/kg in the area south of the tailing facility and tailing spill deposits with molybdenum concentrations greater than 54 mg/kg along the Red River riparian corridor; dispose of contaminated soil and tailing on Site.

Eagle Rock Lake

- **Subalternative 3B** – Install inlet storm water controls; dredge sediment to an approximate total depth of three feet below the current lake bottom and dispose of sediment on Site.

EPA will implement the Selected Remedy in two overall phases to address the complexities associated with remediation of the mine site waste rock piles as well as the status of the Site as an operating mining, milling, and tailing disposal facility. EPA will also consider the potential beneficial uses of former mine features.

Phase I

- Conduct pre-design investigation of ground water contamination before initiating design work for the ground water component of the remedy at the Tailing Facility Area as well as additional characterization of the spatial distribution, concentration and chemical form of molybdenum at the Spring Gulch Waste Rock Pile, the preferred borrow source for cover material at the Mine Site Area.
- Conduct response actions to mitigate soil contamination at the Mill Area, soil contamination and tailing spills at the Red River Riparian and South of Tailing Facility Area, sediment contamination at Eagle Rock Lake, and surface water and ground water contamination at the Mine Site Area and Tailing Facility Area.
- Conduct response actions for treatment of contaminated water collected by the tailing facility remedial systems as well as contaminated water collected from the mine site remedial systems. Although the CERCLA on-Site action does not require an NPDES permit for authorization to discharge to waters of the U.S., EPA has decided that all discharges of treated effluent to the Red River shall require an NPDES permit.
- Conduct response actions for source control at the Mine Site Area waste rock piles in a phased approach, with the design of the first rock pile conducted as a pilot study. The pilot study will incorporate treatability studies to identify appropriate cover amendments and designs to achieve water resource protection. The treatability studies will be conducted concurrently with the pilot study and will not impede the start of the design and construction of the second tier of waste rock piles to be remediated. The first waste rock pile to be remediated will likely be the Goathill North Waste Rock Pile. Upon approval of the first design, remedial construction will proceed on the Goathill North Waste Rock Pile at the same time design work is initiated for two subsequent waste rock piles, one of which shall be a

roadside waste rock pile. This work shall continue with design and construction of no less than two waste rock piles at a time through completion of this component of the remedy. The phased approach allows for a "toolbox" approach for developing individual mine reclamation designs on a rock pile-by-rock pile basis, while taking into consideration lessons learned after implementation of each design.

- Obtain temporary well drilling restrictions from the New Mexico Office of the State Engineer, with assistance from NMED. These restrictions will remain in place until ground water has been cleaned up to meet appropriate federal and New Mexico standards.

Phase II

- Conduct response actions for placement of cover at the Mill Area following permanent cessation of milling operations.
- Conduct response actions for source containment at the Tailing Facility Area following permanent cessation of tailing disposal operations.

12.1 Rationale for the Selected Remedy

12.1.1 Mill Area

EPA chose the soil removal alternative for high concentrations of PCBs (greater than 25 mg/kg) and off-Site treatment and disposal over the other soil removal alternatives because EPA has determined, based on current information, that the reasonably anticipated future land use at the Mill Area is wildlife habitat, forestry, and low occupancy commercial or industrial use following permanent cessation of milling operations and decommissioning. The selected alternative is the only alternative that will be protective of human health and the environment given these land use assumptions.

EPA's determination that the reasonably anticipated future land uses are wildlife habitat, forestry, and low-occupancy commercial or industrial use is based on several factors. These factors include (1) the past and current land use, which has been milling of ore from the mine (2) the existence of buildings and infrastructure at the Mill Area, such as roadways, parking facilities, a water supply, and an electrical power supply, (3) the NMED preliminary evaluation of place of withdrawal of water which states that the Mill Area is likely to be put to industrial use, and (4) the MMD-approved post-mining land use, which is forestry and water management under New Mexico Mining Permit TA001RE-96-2. The Mill Area is the likely location of the future water treatment plant, which is a necessary component of the Selected Remedy. However, EPA recognizes that land use may change, and that the Mill Area may be an attractive place for a future residential development after the cessation of mining and milling operations. If the actual or the anticipated future land use should change to residential or another high-occupancy land use, then additional response actions at the Mill Area would be necessary to ensure protection of human health and the environment. EPA will investigate land use at the Mill Area during its periodic five-year reviews of the remedy.

EPA expects the removal and off-Site treatment and disposal of soils contaminated with greater than 25 mg/kg of PCBs to reduce to acceptable levels the long-term risk from human exposure to PCBs. Molybdenum in soil does not pose an unacceptable risk to a future commercial or industrial worker at the Mill Area.

The cover to be placed over the Mill Area in areas designated for forestry as the post-mining land use will be a minimum of 36 inches (three feet) deep. Although the Mill Area was not evaluated for ecological risk (see Ecological Risk Assessment, Section 7.2), the 36-inch thick cover is expected to provide protection to terrestrial plants and animals because the molybdenum concentrations in Mill Area soils exceed the molybdenum remediation goal established by EPA for the mine site of 300 mg/kg, based on Site-specific molybdenum toxicity testing. A discussion of EPA's rationale for selecting the minimu 36-inch cover thickness for protectiveness is presented in Section 12.1.2 below. This cover thickness is also consistent with the cover requirements set forth in Mining Permit TA001RE-96-2. The permit requirements have been identified as TBC items. Additionally, the Spring Gulch waste rock to be used as borrow for covering Mill Area soil will be screened to meet grain size specifications and the 600 mg/kg molybdenum suitability criterion developed by EPA for screening borrow material. The suitability criterion is higher than the remediation goal because site-specific testing at the Spring Gulch Waste Rock Pile showed that a significant portion (approximately 50 percent) of the molybdenum in the waste rock was of a form (molybdenite) which is significantly less soluable and, hence, less bioavailable to plants.

12.1.2 Mine Site Area

EPA chose source containment; storm water, surface water, and ground water management; and ground water extraction and treatment, along with water treatment for the Mine Site Area. These alternatives were selected over other alternatives because the others did not include source containment for the acid generating and potentially acid generating waste rock, a critical component for effectively and permanently mitigating ground water as well as surface water contamination at the mine site.

Source containment will include both the 3H:1V alternative (balance-cut-fill, partial/complete removal, regrade and cover to 3H:1V slopes) and the 2H:1V alternative (balance-cut-fill, regrade and cover to 2H:1V slopes) to provide a "tool box" approach for remediation of each waste rock pile. EPA recognizes that each waste rock pile is unique in size, shape, and position within the tributary drainages. It may not be practicable to achieve the 3H:1V interbench slope for every waste rock pile. However, slopes of 2H:1V or shallower are likely achievable. During remedial design, each waste rock pile will be evaluated independently based factors such as, but not limited to, underlying bedrock slope, volume of waste rock to be removed, probability of revegetation success, stability, factors of safety, critical structure determinations,[79] public safety, worker safety, possible

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[79] Critical structures are those that, because of their location, could result in damage to off-site properties, injury or loss of life, or unacceptable environmental consequences if there was a failure. The roadside waste

construction-related environmental impacts, and compliance with ARARs. By selecting both alternatives, EPA retains flexibility in determining the appropriate design of each waste rock pile (on a rock pile-by-rock pile basis) when balancing the relative value of these factors. Additionally, both alternatives also are consistent with conditions in the New Mexico Mining Permit (TA001RE-96-1) and Ground Water Discharge Permit (DP-1055) and Closure/Closeout Plan requirements, which are TBCs, for reclamation of the waste rock piles.

The evaluation and implementation of appropriate engineering designs for remediation of the waste rock piles will include a pilot study conducted as the remediation of the first waste rock pile (*e.g.*, Goathill North). The information obtained from the pilot study will be used in the detailed evaluation and design of subsequent waste rock piles. Additionally, based on the results of the previously unsuccessful revegetation test plots conducted by CMI for the waste rock pile cover design, closely targeted test plots (as treatability studies) will also be performed for the store and release/evapotranspiration cover system to demonstrate the anticipated improvement in vegetative productivity with organic amendment application, erosion resistance of amended cover materials, and moisture holding properties sufficient to provide an effective cover system that protects ground water. The treatability studies will also be conducted as part of the initial remediation of the waste rock piles. The pilot study will also be used to assess the frequency of needed maintenance of the cover systems resulting from erosion.

For the Mine Site (and portions of the Mill Area where the anticipated land use is not commercial/industrial), the cover system technology selected in this ROD is a store and release/ET cover system with Spring Gulch waste rock as the preferred cover material. This cover system must achieve the remedial action objective for eliminating or reducing, to the maximum extent practicable, the leaching and migration of inorganic COCs and acidity from waste rock (acid-rock drainage) to ground water. It must also be protective of

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rock piles (Sulphur Gulch South, Middle, and Sugar Shack South) are considered critical structures by NMED and MMD.

wildlife and vegetation by limiting the uptake of metals, including molybdenum, by plants at levels that would be harmful to the plants or herbivorous native wildlife.

For a store and release/ET cover system to be effective in reducing acid-rock drainage and metals leaching to ground water it has to be thick enough to store the water until it can be transpired by vegetation or evaporated at the surface, thereby minimizing the net-percolation of water beyond the depth of influence of ET. To effectively reduce net percolation below the cover, the cover material must, at a minimum, hold an equivalent amount of water to the average yearly winter precipitation. The unamended Spring Gulch waste rock has an average water holding capacity of 0.76 inches/foot. Based on this water holding capacity and the precipitation record compiled by CMI at weather stations located at and in the vicinity of the mine site, the cover thickness would have to be greater than five feet to hold an average winter precipitation of four to five inches. However, lysimeter test-plot studies conducted at the mine site indicate that the depth of effective evaporation is approximately three feet. The placement of Spring Gulch material at depths greater than three feet, even though it will increase the overall water holding capacity of the cover, will not provide any greater levels of protectiveness. Therefore, Spring Gulch waste rock will require amendments to increase water holding capacity to retain winter precipitation within the range of effective ET.

At the mine site all the waste rock piles are characterized as acid-generating or potentially acid-generating. Scientific research has shown that plant root growth is impeded in acidic materials. At low pH it has been found that cell wall integrity diminishes, trace metal availability increases, available macronutrients and beneficial soil organism activity decreases. Any of these alone or combined, may impede plant growth in acidic wastes. If a cover is underlain by acidic, metaliferous or saline materials (common at the mine site), vegetative productivity may be unsustainable in shallower covers and/or subject to increased plant uptake of metals.

At the mine site vigorous conifer trees must be an important component of the vegetative cover to protect against erosion and transpire water from the ET cover. For most conifers, about 80 percent of rooting can be expected in the top three feet of soil. Based on CMI's Site-specific Root Zone Evaluation Summary Report (Buchanan, 2008), associated field activities and direct observations for vegetation growing at the mine site, including on the waste rock piles, EPA has determined that the majority of rooting activity, including that of trees, is contained within the materials that are no more than moderately acidic. Aggressively acidic materials, about pH 4 or below severely retard root exploration. A sufficiently thick cover, amended to enhance moisture holding and promote productivity, must be provided to ensure that conifer roots can explore ample volume to grow unimpeded and provide nominal ET function.

Therefore, the minimum thickness of the cover for the mine site will be 36 inches, or three feet. This is consistent with industry standard practice, as cover systems constructed over acid generating mine wastes, like those at the mine site, typically range from about three feet to more than six feet. The three-foot cover depth will reduce acid-rock drainage and metals leaching to ground water, thereby providing effective source containment for enhancing ground water remediation efforts and overall protection of ground water resources. Equally important to protecting ground water, the specified minimum cover depth of three feet also provides protection to plants and wildlife by limiting re-exposure of underlying waste through processes of erosion and translocation of contaminants through plant uptake. The top three feet of Spring Gulch waste rock (*i.e.,* the material within the depth affected by ET) will be amended to increase the water holding capacity and improve the edaphic properties necessary to support robust vegetative growth for effective transpiration.

Storm water management is included with this response action. However, such management will only be for controlling and diverting storm water off and away from the store and release/evapotranspiration cover systems to be placed on the waste rock piles. Overall management of storm water at the mine site is conducted in accordance with the NPDES Multi-Sector General Permit for Storm Water Discharge Associated with Industrial Activity (MSGP) and CMI's Storm Water Pollution Prevention Plan (SWPPP). See Section 2.5.2 above. Under the MSGP and SWPPP, CMI is authorized to collect, convey, and discharge contaminated storm water to the open pit, the subsidence area, and the infiltration galleys at the toe of the roadside waste rock piles, where it is allowed to infiltrate into the subsurface, percolate to ground water and potentially contaminate ground water. This practice is intended to prevent storm water from discharging to the Red River. To the extent that the storm water discharge is a federally-permitted release under CERCLA § 107(j), the contamination of ground water caused by the release must be addressed under the Clean Water Act, rather than by a CERCLA response action. Therefore, based on the available information, the Selected Remedy does not include any modifications to the current approved storm water management practices, nor does it incorporate such practices into, or approve such practices as part of, this response action.

Current practices for water management and disposal are to send all water collected by the seepage interception systems, ground water extraction systems and mine dewatering to the mill for (1) use in transporting tailing as slurry to the tailing facility during milling periods, or (2) ph adjustment, blending with unimpacted water, and conveyance through the pipeline for dust suppression and pipeline maintenance during non-milling periods. The commingling of collected impacted mine water with unimpacted water results in all water discharged to the tailing impoundments exceeding New Mexico water quality standards. The water disposal practice during non-milling periods allows the discharge of this contaminated water to the tailing impoundments where the majority (estimated at 2,510 gpm based on water balance calculations) seeps downward (as tailing seepage) and contaminates ground water. NMED Ground Water Discharge Permit DP-933 requires that CMI submit a proposal for reducing the volume of mine water which is discharged to the tailing impoundments. In May 2010 NMED issued a Notice of Violation to CMI for failing to comply with this requirement. See Section 2.4.2.1.

The Selected Remedy includes treatment of all water collected at the Mine Site Area by the mine dewatering, seepage interception systems, and ground water extraction well systems, excluding the water collected as part of the NPDES Best Management Practices (discussed below). The Selected Remedy also includes treatment of all water collected at the Tailing

Facility Area, excluding the water collected by the NPDES Best Management Practices and discharged via permitted Outfall 002, as discussed in Section 12.1.3, below.

Although an on-Site CERCLA action does not require an NPDES permit for authorization to discharge to waters of the United States, due to the unique circumstances related to the on-going operations at the facility, EPA has decided to proceed with NPDES permitting for such discharges under the Selected Remedy. A pre-construction draft NPDES permit application will be developed and submitted to EPA in accordance with 40 C.F.R. Part 122. In administering an individual NPDES permit, there are explicit requirements for issuing public notice, holding public hearings, State 401 Certification under 33 U.S.C. § 1341, developing effluent discharge limitations for protecting the receiving water body, and compliance monitoring. The permit will have effluent discharge limits for specific pollutants, and a violation of a limit may subject CMI to an enforcement action.

The FS Report provides a conceptual evaluation of water treatment through use of two systems: (1) a lime high-density sludge primary treatment process with a polishing step involving reverse osmosis is assumed to be used at the Mine Site Area, and (2) an ion exchange primary treatment process with a reverse osmosis polishing step is assumed to be used at the Tailing Facility Area to meet remedial action objectives, remediation goals, and chemical-specific ARARs at the treated effluent discharge locations.

Both treatment system concepts evaluated within the FS Report could be acceptable methods to meet the remedial action objectives, remedial goals, and chemical-specific ARARs at the effluent discharge location(s). The concepts and costs presented in the FS Report are presented in this ROD. However, there are significant Site-specific complexities that preclude final determination of these concepts within this ROD but can be addressed during the subsequent remedial design (RD). These complexities include uncertainty in water flow and chemistry after blending of the individual water sources collected as part of the selected remedy and uncertainty regarding the impact of ongoing mining operations on water flow and chemistry. Issues such as long-term performance of the water treatment systems, the need for and scope of treated effluent polishing steps to meet chemical-specific ARARs, and disposal of treatment residuals (including but not limited to lime sludge, depleted resin, scale, and brine) have been conceptual in nature and have not been fully addressed to date.

It is also possible during RD to determine efficiencies in treatment system processes, locations, and sizing that result in cost savings for construction and O&M of the water treatment systems and reduce ongoing O&M and treatment residuals disposal with respect to these systems. These potential efficiencies have not been fully vetted to date.

Thus, EPA has determined that a performance-based approach is appropriate for water treatment for the Mine Site Area and Tailing Facility Area. The requirements described below shall be met, at a minimum, for water treatment.

- The water treatment system(s) shall be designed and constructed to treat all collected water from the Mine Site Area as discussed in this section, and for the Tailing Facility Area as discussed in Section 12.1.3. Treated water discharged from the final water treatment systems shall comply with all NPDES permit requirements for discharges at the treated effluent discharge locations.
- Acceptable treatment systems shall consist of conventional, readily available components that are proven capable of treating the COCs and other constituents within the influent water stream and that can be designed and constructed within the timeframes discussed below or as established through the NPDES permitting process. Delays due to evaluation and/or selection of components that cannot readily meet these requirements are unacceptable.
- The existing ion exchange plant at the Tailing Facility Area may be used for water treatment, provided that NPDES permit effluent limits can be met at the treated effluent discharge location for that plant.
- Discharge of treated effluent to surface water shall be acceptable to EPA and NMED, as this allows flexibility in determining locations for treated effluent

discharge; discharge of treated effluent to ground water shall not be performed without approval by EPA.

- The primary treatment processes for the water treatment systems shall be designed, constructed and operational within 12 months of start of the remedial action for the Site. Primary processes (*e.g.,* a lime high-density sludge process) shall be defined as the water treatment components that result in significant reductions to COC concentrations from the influent water stream prior to discharge; any delays in initial startup must be approved by EPA. It is likely that a primary treatment process (such as lime high-density sludge treatment) will achieve compliance with most, but not all chemical-specific ARARs and NPDES permit effluent discharge limits; therefore, a shakedown period not exceeding 18 months (or as determined through the NPDES permitting process) will be allowed for stable operation of the primary treatment processes and to determine the design of any secondary (supplemental) process steps required to "polish" the resulting effluent to meet all remedial action objectives, remediation goals, chemical-specific ARARs and NPDES effluent discharge limits for treated effluent prior to discharge at the approved discharge locations. During this shakedown period, strict compliance with the NPDES effluent discharge limits will not be required for the treated discharge.

- The secondary (supplemental) treatment processes for the water treatment systems shall be constructed and shall commence operation within six months of completion of the shakedown period described above. Any delays in commencing operation of the secondary treatment processes must be approved by EPA.

- After commencement of the secondary treatment processes (if any), a second shakedown period not to exceed six months (or as determined in the NPDES permitting process) will be allowed. During this time, the treatment system(s) shall demonstrate successful water treatment and full compliance with the remedial action objectives, remediation goals, chemical-specific ARARs and NPDES effluent discharge limits when operating at designed capacity and when operating under a wide range of conditions. It must be demonstrated that treatment residual removal and management can be performed effectively without causing treatment system upsets. At the end of this shakedown period, all water treatment discharge(s) shall meet remedial action objectives, remediation goals, chemical-specific ARARs and all NPDES effluent discharge limits and other requirements.

- Treatment residuals (including but not limited to sludge, spent resin, scale, and brine) shall be managed in facilities compatible with the residuals, sufficiently contained to prevent release of the residuals to the surrounding environment, and at suitable locations for the residual. Locations, design, and operation of treatment residual disposal facilities shall be approved by EPA.
- To prevent the discharge of untreated water into receiving waters, contingency measures shall be developed and implemented to manage collected water during extended periods of treatment system upset (*e.g.,* flooding, equipment malfunction or failure, extended periods of freezing, etc.).

Design of the water treatment systems and disposal facilities for treatment residuals must be approved by EPA, in consultation with NMED. The construction, operation, and maintenance of the water treatment systems and disposal facilities will be monitored by EPA and NMED. The treatment systems and disposal facilities will be designed to achieve NPDES effluent discharge limit established for compliance with state water quality standards and federal ambient water quality criteria (ARARs) in the receiving water body. Design, construction, maintenance, and monitoring of the treatment systems and disposal facilities shall be conducted according to the requirements of this ROD, the engineering standards established during RD, the NPDES permitting requirements and as approved by EPA in consultation with NMED.

12.1.3 Tailing Facility Area

The EPA chose source containment, continued ground water withdrawal operations with upgraded seepage collection, piping of water in the eastern diversion channel, ground water extraction southeast of Dam No. 1 (MW-4 and MW-17 area), and water treatment. This represents a modification to Subalternative 3B as it includes the component of Alternative 4 for ground water extraction in the alluvial aquifer southeast of Dam No. 1. The additional ground water extraction is expected to remediate ground water contamination in the area of MW-4 and MW-17. If the source of the contamination is the historic buried tailing north of the Change House, the piping of unused irrigation water in the eastern diversion channel would reduce the source. However, without ground water extraction contaminant levels will likely decrease by natural attenuation[80] over time as the contaminant continues to move downgradient. Since there are residences located near and down gradient of this ground water contamination, there is a need for active remediation of the contaminated ground water to prevent further migration of contamination and restore ground water to its beneficial use. If the source of the contamination is the eastern tailing impoundment (behind Dam No. 1), rather than the historic buried tailing, the piping of the unused irrigation water would not be expected to result in attainment of the ground water cleanup levels in this area.

Since all of the alternatives (excluding the No Further Action alternative) included source containment, the primary differences between the alternatives are related to the degree of ground water remediation. Overall, Alternative 4 is the best alternative to address ground water contamination at the Tailing Facility Area as it includes ground water extraction for the basal bedrock (volcanic) aquifer south of Dam No. 4 and is expected to restore ground water to appropriate cleanup levels (MCLs and New Mexico ground water quality standards) in the shortest time (8 years following placement of the cover). However, it is significantly more costly than the selected alternative (an increase of up to $85 million in present value) because the volume of water that would have to be extracted from the volcanic aquifer and treated (approximately 4,500 gpm) was an order of magnitude higher than the volume (approximately 400 gpm) estimated for the selected alternative. Additionally, the current limited use of this ground water in the area south of Dam No. 4

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[80] The natural attenuation processes that are at work in such a remediation approach include a variety of physical, chemical, or biological processes that, under favorable conditions, act without human intervention to reduce the mass, toxicity, mobility, volume or concentration of contaminants in ground water. These in-situ processes include biodegradation, dispersion, dilution, and sorption.

(*i.e.,* Red River State Fish Hatchery) and the likelihood of minimal future increase in such use led EPA to select Alternative 3B over Alternative 4.

For the Tailing Facility Area, the cover system technology selected is a store and release/ET cover system utilizing alluvial soil material from a local borrow source area. This cover system must achieve the remedial action objective for eliminating or reducing, to the maximum extent practicable, the leaching and migration of inorganic COCs from tailing to ground water at concentrations and quantities that have the potential to cause exceedances of ground water ARARs or health-based criteria. It must also be protective of wildlife and vegetation by limiting the uptake of metals, including molybdenum, by plants at levels that would be harmful to the plants or wildlife.

For the store and release/ET cover system to be effective in protecting wildlife and vegetation, it must provide a barrier to the underlying tailing waste for the long-term; which includes eliminating re-exposure of the tailing through erosion, pedoturbation by burrowing animals and translocation of contaminants to the surface through ET, with subsequent elevated concentrations in plant tissue and litter. Visual observation of rooting depth at the tailing facility indicates significant rooting of plants into underlying tailing waste where shallow (interim) soil covers have been placed. This is likely due to the tailing waste currently being non-acidic. However, pyrite content of the tailing is at a level (approximately 3 percent) which potentially could cause acidification in the future. This potential acidification of the tailing, and the mobilization of metals caused by the acidification, may be detrimental to plant productivity depending on the degree of metals uptake. Most metals have increased solubility and mobility in acidic environments, a potential future risk if the tailing waste becomes acidic. However, molybdenum is actually more soluble and mobile at a neutral pH and presents a current risk to plants rooting in the waste material. CMI's Wildlife Impact Study showed that the uptake of contaminants (primarily molybdenum) in plants was common across the shallow soil cover. For plants growing in these shallow covers the bioaccumulation factor for molybdenum was much greater than 1 in roots and shoots, strongly suggesting future translocation of molybdenum into cover materials and eventual deposition to the surface as plant litter. In addition to metals uptake by plants, visual observations of the interim covers verify significant reoccurrence of tailing on the surface due to pedoturbation and erosion of the thin covers.

For the alluvial soil cover to be effective in reducing the seepage of inorganic COCs from tailing (*i.e.,* tailing seepage) to ground water it has to be thick enough to store the water until it can be transpired by vegetation or evaporated at the surface, thereby minimizing the net-percolation of water beyond the depth of influence of ET.

To effectively reduce net percolation below the cover, the cover material must, at a minimum, hold an equivalent amount of water to store the "worst-case" infiltration quantity resulting from the critical infiltration event(s), with an appropriate factor of safety[1]. For the tailing facility, critical infiltration event(s) correspond to large, or consecutive, summer monsoonal precipitation events. Based on the estimated water holding capacity of alluvial soil (taken from the literature) and the precipitation record compiled by CMI at weather stations located at and in the vicinity of the tailing facility, the cover system would have to be greater than three feet to hold the precipitation. However, lysimeter testing conducted in site alluvial soil indicates the depth of effective evaporation is approximately four feet. As a result, placing alluvial soil at depths greater than about four feet, even though it will increase the overall water holding capacity, will likely not provide any greater levels of protectiveness.

Therefore, EPA has determined that the cover for the tailing facility must have a minimum thickness of 36 inches (three feet) to be effective as a store and release/ET cover and protect vegetation and wildlife. This is consistent with industry standard practices as cover systems constructed over mine wastes, like those at the tailing facility, typically range from about 3 feet to more than 6 feet in thickness. It is also consistent with the New Mexico Mining Permit TA001RE and Ground Water Discharge Permit DP-933.

In light of the ongoing use of ground water from the volcanic aquifer as a drinking water supply at the Red River State Fish Hatchery, the Selected Remedy will include temporary provision of an alternate water supply or placement of point-of-use treatment systems (*e.g.,* filter at tap) to current users of ground water as drinking water in those specific areas of Site-related ground water contamination (*e.g.,* Red River State Fish Hatchery and specific areas south of Dam No. 1) as needed until ground water cleanup levels are attained. At this time, EPA is not aware of anyone being exposed to contaminants in ground water at levels above federal/state standards or EPA health-based criteria. Currently, the molybdenum concentrations at the Red River State Fish Hatchery are just below EPA's health-based criterion of 0.08 mg/L. However, trends in molybdenum concentrations over time are increasing. Recently, at the request of hatchery personnel, CMI began providing bottled water to the hatchery.

Currently, CMI discharges approximately 400 gpm of untreated seepage and seepage-impacted water to the Red River via NPDES permitted Outfall 002. The remainder of the collected seepage and water is currently pumped back to the Dam 5A impoundment in order to meet the permit discharge limit for manganese at the Outfall 002 pipe. The discharge of this water to the Red River under the authority of the NPDES Program is expected to continue. To the extent that this water represents a federally-permitted release under the Clean Water Act NPDES Program, it is excluded from CERCLA response actions. Therefore, based on available information, only the seepage and water that is pumped back to the tailing impoundments and any additional seepage and water collected by the upgraded collection systems will be treated as part of the Selected Remedy. Treatment requirements are discussed in Section 12.1.2.

The selected alternative will include ground water monitoring and other monitoring along the perimeter or within the tailing piles to provide early detection of any potential acid generation and metal leaching. Pyrite and other sulfide-bearing minerals are known to be present in the tailing at levels sufficient to generate acid. At this time, the tailing appears to be sufficiently buffered with some carbonates and hydrated lime to preclude acid-generating conditions. However, over a longer time period, should these relatively soluable materials be leached by deep seepage processes or applied process waters then acid producing conditions may prevail. Although soil cover and vegetative canopy should minimize this risk, EPA believes it prudent to include such monitoring.

The selected alternative will also include additional ground water characterization for the Tailing Facility Area. In light of the significant water loss known to be occurring at the tailing impoundments (approximately 2,510 gpm based on water balance calculations), additional ground water characterization will be performed for the volcanic aquifer beneath and/or west of the tailing facility as well as other areas south of the tailing facility. NMED continues to investigate other seeps and springs west of the Guadalupe Mountains to determine if they are impacted by tailing seepage as well as some historic wells constructed in the Guadalupe Mountains by Molycorp.

12.1.4 Red River and Riparian and South of Tailing Facility Area

EPA chose the removal of soil and tailing spill deposits with on-Site disposal over the other alternatives because it is expected to achieve long-term risk reduction through the permanent removal of the source and direct exposure pathway. The alternative for capping the tailing spill deposits and contaminated soil in the area south of the tailing facility is protective. However, the cap would require long-term maintenance and contamination remains in place.

The selected alternative is also expected to reduce the risk within a reasonable timeframe and at less cost than the removal and off-Site disposal alternative. The on-Site disposal of excavated soil/tailing decreases costs by approximately $2.5 million (present value) over off-Site disposal.

12.1.5 Eagle Rock Lake

EPA chose inlet storm water controls and the dredging of lake sediment with on-Site deposal over the other alternatives because it is equally as effective in reducing risk to the benthic macroinvertebrate population, but permanently removes the contamination from the lake. The alternative for capping the sediment in place will require long-term maintenance of the in-lake cap and contamination remains in place. The alternative for filling in the existing lake and constructing a new lake would require a change in the point of diversion from the river and may require the addition of water rights. Additionally, on-Site disposal is slightly less costly ($900,000 present value) than the off-Site disposal alternative, although construction and long-term management of a new on-site disposal cell for sediment is required.

The selected alternative is supported by the U.S. Forest Service, which currently manages the lake.

12.2 Description of the Selected Remedy

This section presents a detailed description of the Selected Remedy as defined for each of the five areas at the Site which warrant CERCLA response actions. The level of detail is provided to minimize the likelihood of unanticipated changes to the scope and intent of the Selected Remedy during the remedial design phase of the response action. It must be recognized that the Selected Remedy may change somewhat as a result of the remedial design and construction process. Any significant or fundamental change to the remedy described herein will be fully documented by EPA using a technical memorandum in the Administrative Record, an Explanation of Significant Difference, or an amendment to the ROD in accordance with the NCP.

12.2.1 Mill Area

The Selected Remedy includes the following alternative for the Mill Area:

- **Alternative 3** – Soil Removal (High Concentrations of PCBs greater than 25 mg/kg) and Off-Site Treatment and Disposal (Low Occupancy – Commercial/Industrial); Regrade, Cover, Apply Amendments, and Vegetate at Mill Decommissioning

The major components of the remedy for the Mill Area are described in detail below. As the Mill Area is an operating facility, EPA and state officials will need to coordinate all response actions with mining personnel.

Continue Controlled Access to the Site (Fencing, Signage, etc.)

The Mill Area is currently surrounded by a fence with restricted access through a central gate with a badge identification system. Signs are posted at the gate and on fences to control public access. The existing fence, restricted access through the gate, and signage will be maintained as part of remedy to protect future receptors from direct contact or ingestion of soil.

Continue Current Worker Health and Safety Program and Hazard Communication

Under current operations, CMI provides a worker health and safety program and hazard communication that specifically addresses potential risks from exposure to PCBs. The worker programs will continue. Oversight of worker health is a responsibility of the Mine Safety and Health Administration (MSHA) of the U.S. Department of Labor.

Excavate Soil contaminated by PCBs in Concentrations above the TSCA cleanup level of 25 mg/kg for Low Occupancy (Commercial/Industrial) Use

Approximately 2,400 yd^3 of soil with total PCB concentrations above the TSCA cleanup level of 25 mg/kg for low occupancy/commercial/industrial use will be excavated from an area covering about 0.6 acres. Figure 12-1 depicts the area of PCB contamination requiring excavation. Affected soil will be removed initially to a depth of 2.5 feet. Front-end loaders and smaller earth moving equipment will likely be used to excavate soil around buildings.

Perform Confirmation Sampling

Confirmation soil sampling will be conducted to determine if cleanup levels have been attained. If not, additional soil will be excavated until cleanup levels are met or an EPA-acceptable depth has been reached.

Import Clean Fill and Grade

The excavation will be backfilled with approximately 2,400 yd^3 of clean fill material. Sources of fill material include Spring Gulch Waste Rock Pile, which may require screening to achieve a suitable gradation for the backfill. The fill will be separated to an appropriate gradation of fine and coarse-grained material, hauled to the mill, end-dumped into the excavation, compacted, and graded.

Transport PCB Soils to EPA-Approved Off-Site Facilities for Treatment and/or Disposal

The excavated soil will be separated into soils containing PCBs greater than 50 mg/kg and those with PCBs less than or equal to 50 mg/kg. The greater than 50 mg/kg PCB-soils will be transported by truck-mounted roll-offs to the nearest off-Site treatment facility that accepts and treats PCB-affected soil.

The excavated soil with PCBs less than or equal to 50 mg/kg will be transported to the nearest off-Site facility that accepts but does not treat the PCB-affected soil. Soil samples will be collected and analyzed to identify contaminant concentrations prior to transport.

Regrade, Cover, Apply Amendments and Vegetate Mill Area as part of Mill Decommissioning

Those areas designated for forestry at the Mill Area will be regraded, covered with amended Spring Gulch waste rock, and revegetated as part of mill decommissioning. The cover shall be of a minimum 36-inch depth and consist of amended Spring Gulch waste rock which passes an 8-inch screen for grain size and is less than or equal to the 600 mg/kg molybdenum screening criterion for borrow material. Vegetation will include grasses, forbs, shrubs and trees. Those areas designated for commercial/industrial use will not require cover or capping as part of this CERCLA response action.

Monitor Plant Growth Performance to Asses if Molybdenum Uptake from Borrow Material to Plants Inhibit Vegetative Success or Poses Risk to Wildlife

Performance monitoring will be conducted to assess the success of plant growth on borrow material that will used as cover for the Mill Area. Such monitoring will include measuring concentrations of molybdenum in plant tissue co-located with media samples (cover material) to quantify oxide and sulfide species of molybdenum and degree of uptake by plants. Molybdenum uptake from borrow material to plants shall not be at levels such that inhibits attainment of revegetation success standards or exceeds risk-based concentrations for herbivorous native wildlife. Performance criteria will be developed using existing and new data from laboratory studies on plant uptake and toxicity using cover material as well as field monitoring results. The timeframe for developing the performance criteria is at the start of the remedial design and continuing through implementation and monitoring of the remedy. Examples of some parameters likely to require field monitoring on a 5-year basis include cover material molybdenum concentrations, plant molybdenum concentrations, and revegetation success.

Perform General Maintenance of the Mill Area, Including Water Quality Monitoring for All Wells, Seeps and Springs at the Mill Area

General maintenance of the Mill Area with monitoring will be continued during operation and after closure. This will consist of grading of roads, maintenance of structures, and water quality monitoring for all wells, seeps, and springs at the Mill Area.

12.2.2 Mine Site Area

The Selected Remedy includes the following subalternatives and timing of water treatment for the Mine Site Area:

- **Subalternative 3A** – Source containment by regrading and re-contouring waste rock piles to achieve a minimum interbench slope of 3H:1V, including partial to complete removal of waste rock to accommodate the slope requirement, followed by cover, amendment application and revegetation; surface water (seepage) interception, underground mine dewatering, and ground water extraction; water treatment;
- **Subalternative 3B** – Same as Subalternative 3A, except waste rock piles will be regraded and re-contoured to achieve a minimum interbench slope of 2H:1V;
- **Water Treatment** – The construction of a water treatment plant will commence at Year 0 Construction of the remedial action. Upon completion of construction, the water treatment plant will be operated to treat all contaminated water collected by the remedy.[81]

The major components of the response action are described below.

Regrade and Re-contour Waste Rock Piles to Achieve a Minimum Interbench Slope of 3H:1V, with Partial or Complete Removal of Waste Rock to Accommodate Slope Requirement; Cover, Apply Amendments and Vegetate

For Waste Rock Piles where 3H:1V Interbench Slopes are Determined by EPA to be Impracticable, Regrade and Re-contour Waste Rock Piles to Achieve a Minimum Interbench Slope of 2H:1V; Cover, Apply Amendments and Vegetate

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[81] Water to be treated does not include the water and seepage collected by the NPDES Best Management Practices under NPDES Permit NM0022306. The NPDES water is currently sent to the mill and then to the tailing facility for disposal.

The design and remediation of the waste rock piles will be conducted in a phased approach, with the design and remediation of the first waste rock pile conducted as a pilot study. The first waste rock pile to be remediated will likely be the Goathill North Waste Rock Pile, as interim reclamation for mitigating instability of the pile was completed in 2005. However, active subsidence associated with ongoing mining may be a factor in determining which waste rock pile is best suited for the pilot study. EPA will make such determination during remedial design.

The pilot study will incorporate treatability studies to identify appropriate cover design specifications. However, the treatability studies will not delay actual remedial implementation, but be conducted concurrent with ongoing remediation of the waste rock piles. Treatability studies will be conducted on cover design parameters and physical properties of borrow. The studies will include, but are not limited to determining optimal cover and revegetation design specifications for achieving design performance criteria in reducing infiltration, promoting vegetative growth and protecting wildlife, minimizing erosion, and long-term slope maintenance. The studies will also include evaluation of types, application methods, and application rates of amendments.

Each waste rock pile will be regraded and re-contoured to achieve the minimum 3H:1V or minimum 2H:1V interbench slopes, then covered with amended Spring Gulch waste rock and revegetated. In conducting the earthwork, partial or complete removal of waste rock will also be performed to achieve required interbench slopes. Each rock pile re-contouring will be initially designed to a minimum interbench slope of 3H:1V, with slope breaks provided every 100 to 200 feet. If it is determined by EPA during remedial design that it is impracticable to achieve the 3H:1V minimum interbench slope for certain waste rock piles, then the re-contouring of those piles will be designed to a minimum interbench slope of 2H:1V, with slope break lengths provided approximately every 100 to 200 feet (*i.e.*, designed to achieve the shallowest slope practicable between 3H:1V and 2H:1V). Some partial removal of waste rock may be necessary to achieve interbench slopes shallower than the 3H:1V.

EPA recognizes that each of the mine site waste rock piles is unique. Consequently, during the remedial design phase, each waste rock pile will be evaluated independently to balance the relative value of a number of factors including, but not limited to: attainable slope stability and factor of safety, sustainable vegetation on steep slopes, water management, environmental protection, minimizing construction-related environmental impacts, compliance with ARARs, attainment of TBCs and safety – both worker and public.

Each of the mine site waste rock piles will be regraded to achieve a stable slope for constructing the store and release/evapotranspiration cover. After regrading, each waste rock pile will be covered to a 36-inch depth of amended cover material and revegetated (see typical cover profile, Figure 12-2). The cover material (waste rock) will be excavated from Spring Gulch Waste Rock Pile identified as non-acid generating black andesite and aplite. It will be screened to a maximum grain size of 8 inches and the 600 mg/kg molybdenum screening level criterion for borrow material and amended. The store and release/evapotranspiration cover system will be designed to reduce infiltration within the boundary of the cover to a level which eliminates or reduces the leaching and migration of inorganic COCs and acidity from waste rock to ground water at concentrations and quantities that have the potential to cause exceedances of the numeric New Mexico ground water standards, background levels, or EPA's Site-specific health-based criteria in ground water.

Water management features will be incorporated into the final design of each waste rock pile and may include, but not be limited to terraces, swales, ditches, and other features, as necessary. Both run-off and run-on water will be managed via these features to divert unimpacted water around the rock pile, or off of the waste rock pile to a natural drainage to avoid being contaminated. The cover will incorporate erosion control channels, swales, and benches for surface water run-on and run-off. The cover may also incorporate a geomorphic design intended to blend with the existing surrounding area if the performance standards for protecting ground water can be achieved.

Vegetation will include grasses, shrubs, forbs, and trees. Multiple applications of amendments may be required to promote vegetative growth once the cover is in place.

Prior to construction, the existing access roads will be maintained or widened. Depending on the haul route to be used, turn-outs may need to be constructed to allow for two-way traffic. Bulldozers, equipment operators, and possibly specialized equipment will be used to regrade the rock pile. Construction access to the waste rock pile will be required and maintained throughout regrade and cover placement. Following construction, disturbed areas around the rock pile will be reclaimed to pre-existing conditions and the waste rock pile slopes and covers will be maintained, including repair of damage to the remedy caused by erosion, in accordance with maintenance schedules to be developed during remedial design.

Regrade to Minimum 3H:1V Interbench Slopes

The waste rock piles were individually evaluated to identify possible regrading and re-contouring designs for achieving the minimum 3H:1V interbench slope, with partial or complete removal of waste rock if necessary to accommodate the slope requirement. The waste rock pile with a balanced-cut-fill within the in-place regraded rock pile is Goathill South. The rock piles that were selected for partial or complete removal because the interbench 3H:1V grades are not achievable with an in-place regrade include: Capulin, Goathill North, Sugar Shack West, Sugar Shack South, Middle, Sulphur Gulch South, and Sulphur Gulch North/Blind Gulch.

To achieve the 3H:1V interbench slope angles, varying amounts of waste rock will have to be removed from each pile as well as varying the footprint of the pile. The total surface area for grading and revegetation is approximately 420 acres. The total volume of material to cover the waste rock piles is estimated to be approximately 2.4 million yd^3 based on a 36-inch cover thickness.

The conceptual design for the regrading and re-contouring of the waste rock piles is discussed individually below. In the conceptual design each waste rock pile is re-contoured to a minimum or average interbench slope of 3H:1V to the underlying slope. In developing the conceptual design, a final interbench slope of 3H:1V was targeted, with slope break lengths provided approximately every 200 feet. However, the slopes and slope breaks may vary depending on the final detailed design.

Capulin Waste Rock Pile

The slope of Capulin Waste Rock Pile ranges from 3.7H:1V to 1.0H:1V. The existing disturbed area of the rock pile is 64.9 acres. The regraded pile will be expanded to have a regraded disturbance area of 84.4 acres, an increase of approximately 30 percent. The regraded area will extend over approximately 1,300 feet (1/4 mile) of an existing drainage. A conceptual layout of the regraded waste rock pile is shown on Figure 12-3. Regrading activities include partial removal of the waste rock pile. Removal will include excavation of the waste rock, haul truck loading to an on-site repository, and placement in the repository. The estimated volume of mine rock to be removed is approximately 1.5 million yd^3.

Water management diversions will accommodate the 100-year, 24-hour storm event of approximately 6 acre-feet (ac-ft) from approximately 62 acres of undisturbed forest above the waste rock pile, or an alternative design approved by the EPA during the remedial design phase.

The estimated volume of screened and amended cover material necessary to cover the waste rock pile is approximately 0.2 million yd^3. The underlying slope that will be exposed during the regrade has a slope that varies from 2.8H:1V to 1.8H:1V.

Goathill North Waste Rock Pile

The current slope of Goathill North Waste Rock Pile ranges from 5.1H:1V to 1.4H:1V after interim reclamation regrading. The existing disturbance area is 49.9 acres. Regrade activities will include partial removal of the rock pile. Partial removal will include excavation of the waste rock, haul truck loading to an on-site repository, and placement in the repository. The estimated volume of waste rock to be removed is approximately 2.8 million yd^3. A conceptual layout of the regraded waste rock pile is shown on Figure 12-4.

Water management diversions will accommodate the 100-year, 24-hour storm event of approximately 2 ac-ft from approximately 15 acres of undisturbed forest, or an alternative design approved by the EPA during the remedial design phase.

The estimated volume of screened and amended cover material necessary to cover the waste rock pile is approximately 0.1 million yd^3. The underlying slope that will be exposed has a slope of approximately 1.9H:1V and is approximately 22.2 acres in aerial extent.

Goathill South Waste Rock Pile

The slope of Goathill South Waste Rock Pile ranges from 1.9H:1V to 1.5H:1V. The existing disturbed area of the rock pile is 8.0 acres. The regraded pile will be expanded to have a regraded disturbance area of 9.8 acres, an increase of approximately 22 percent. Regrading activities will include a balanced-cut-fill within the rock pile. A conceptual layout of the regraded waste rock pile is shown on Figure 12-5.

Water management diversions will accommodate the 100-year, 24-hour storm event of approximately 1ac-ft from approximately 3 acres above the waste rock pile, or an alternative design approved by the EPA during the remedial design phase.

The estimated volume of screened and amended cover material necessary to cover the waste rock pile is approximately 0.01 million yd^3. The underlying slope that will be exposed during the regrade has a slope of approximately 1.8H:1V and is approximately 8.0 acres in aerial extent.

Sugar Shack West Waste Rock Pile

The current slope of Sugar Shack West Waste Rock Pile ranges from 1.7H:1V to 1.5H:1V. The existing disturbed area of the waste rock pile is 47.7 acres. The regraded pile will be expanded to have a regraded disturbance area of 57.2 acres, an increase of approximately 20 percent. Regrading activities will include partial or complete removal of the waste rock pile. Removal will include excavation of the waste rock, haul truck loading to an on-site repository, and placement in the repository. The estimated volume of mine rock to be removed is approximately 3.9 million yd^3. A conceptual layout of the regraded waste rock pile is shown on Figure 12-6.

Water management diversions will accommodate the 100-year, 24-hour storm event of approximately 5 ac-ft from approximately 27 acres above the waste rock pile, or an alternative design approved by the EPA during the remedial design phase. During regrading an existing drainage will be covered. A diversion channel will need to be constructed outside the new disturbance limits of the pile to control storm water.

The estimated volume of screened and amended cover material necessary to cover the rock pile is approximately 0.1 million yd^3. The underlying slope that will be exposed during the regrade has a slope of approximately 1.8H:1V and is approximately 38.4 acres in aerial extent.

Sugar Shack South Waste Rock Pile

The slope of Sugar Shack South Waste Rock Pile ranges from 2.1H:1V to 1.4H:1V. The existing disturbed area of the waste rock pile is 115.6 acres. The regrade will be constrained by underlying topography and constraints at the toe, including proximity to State Highway 38 and the Red River. Regrading activities will include partial or complete removal of the waste rock pile. Removal will include excavation of the waste rock, haul truck loading to an on-site repository, and placement in the repository. The estimated volume of mine rock to be removed is approximately 25.7 million yd^3. A conceptual layout of the regraded waste rock pile is shown on Figure 12-7.

Water management diversions will accommodate the 100-year, 24-hour storm event, or an alternative design approved by the EPA during the remedial design phase; however, it is anticipated that storm water run-on will be minimal above the waste rock pile. Maintaining the 8,720 and 8,920 ft. elevation benches for storm water management will not be feasible.

The estimated volume of screened and amended cover material necessary to cover the waste rock pile is approximately 0.2 million yd^3. The underlying slope that will be exposed during the regrade is approximately 38.5 acres in aerial extent.

Middle Waste Rock Pile

The slope of Middle Waste Rock Pile ranges from 1.4H:1V to 1.1H:1V. The existing disturbed area of the waste rock pile is 120.4 acres. A conceptual layout of the regraded waste rock pile is shown on Figure 12-8. Regrade of this rock pile would be constrained by underlying topography and constraints at the toe, including proximity to State Highway 38 and the Red River. Regrading activities will include partial or complete removal of the waste rock pile. Removal will include excavation of the waste rock, haul truck loading to an on-site repository, and placement in the repository. The estimated volume of mine rock to be removed is approximately 34.7 yd^3.

Water management diversions will accommodate the 100-year, 24-hour storm event of approximately 6 ac-ft from approximately 40 acres above the rock pile, or an alternative design approved by the EPA during the remedial design. Maintaining the 8,720 and 8,920 ft. elevation benches for storm water management will not be feasible.

The estimated volume of screened and amended cover material necessary to cover the waste rock pile is approximately 0.06 million yd^3. The underlying slope that will be exposed during the regrade is approximately 108.4 acres in aerial extent.

Sulphur Gulch South Waste Rock Pile

The slope of Sulphur Gulch South Waste Rock Pile ranges from 2.0H:1V to 1.6H:1V. The existing disturbance area is 156.5 acres. The regraded rock pile will be expanded to have a regraded disturbance area of 165.9 acres, an increase of 6 percent. A conceptual layout of the regraded rock pile is shown on Figure 12-9. The regrade will be constrained by underlying topography and constraints at the toe, including proximity to State Highway 38 and the Red River. Regrading activities will include partial or complete removal of the waste rock pile. Removal will include excavation of the waste rock, haul truck loading to an on-site repository, and placement in the repository. The estimated volume of mine rock to be removed is approximately 34.7 yd^3.

Water management diversions will accommodate the 100-year, 24-hour storm event of approximately 1 ac-ft from approximately 4 acres above the rock pile, or an alternative design approved by the EPA during the remedial design phase. Maintaining the 8,720 and 8,920 ft. elevation benches for storm water management will not be feasible.

The estimated volume of screened and amended cover material necessary to cover the waste rock pile is approximately 0.4 million yd^3. The underlying slope that will be exposed during the regrade has portions which are steeper than 1.9H:1V and is approximately 95.7 acres in aerial extent.

Sulphur Gulch North/Blind Gulch Waste Rock Piles

The slopes of Sulphur Gulch North and Blind Gulch waste rock piles range from 2.0H:1V to 1.4H:1V. The existing disturbance area is 129.7 acres. Regrading activities will include partial or complete removal of the waste rock pile. Removal will include excavation of the waste rock, haul truck loading to an on-site repository, and placement in the repository. The estimated volume of mine rock to be removed is approximately 12.7 million yd^3. A conceptual layout of the regraded waste rock pile is shown on Figure 12-10.

Water management diversions will accommodate the 100-year, 24-hour storm event of approximately 7 ac-ft from approximately 68 acres of undisturbed forest, or an alternative design approved by the EPA during the remedial design phase.

The estimated volume of screened and amended cover material necessary to cover the rock pile is approximately 0.9 million yd^3. The underlying slope that will be exposed during the regrade is steeper than 1.9H:1V and is approximately 40.0 acres in aerial extent.

Spring Gulch Waste Rock Pile

The Spring Gulch Waste Rock Pile is the preferred source of cover material. Once sufficient waste rock material has been removed for use as cover for the other waste rock piles, the remaining portion of the Spring Gulch Waste Rock Pile will be regraded and covered with appropriate cover material from Spring Gulch Waste Rock Pile, and revegetated.

The slope of Spring Gulch Waste Rock Pile ranges from approximately 2.0H:1V to 1.6H:1V. The existing disturbance area is 81.3 acres. Regrade activities will include partial or complete removal of the waste rock pile. Removal will include excavation of the waste rock, haul truck loading to an on-site repository, and placement in the repository. The estimated volume of mine rock to be removed is approximately 6.5 million yd^3, 3.9 million yd^3 of which will be removed for cover material. A conceptual layout of the regraded waste rock pile is shown on Figure 12-11.

Water management diversions will accommodate the 100-year, 24-hour storm event of approximately 47 ac-ft from approximately 460 acres of undisturbed forest, or an alternative design approved by the EPA during the remedial design phase.

The regraded Spring Gulch Waste Rock Pile not used for cover material (mixed volcanics) will be covered in the same manner as the other waste rock piles. The estimated volume of screened and amended cover material necessary to cover the rock pile is approximately 0.5 million yd^3. The entire regraded surface will be covered.

Regrade to Minimum 2H:1V Interbench Slopes

The 2H:1V regrade component of the Selected Remedy includes the same general components as the 3H:1V regrade except that waste rock is moved within and between the rock piles to achieve a minimum interbench slope of 2H:1V. Material removed from waste rock piles will be placed at either Spring Gulch or Sulphur Gulch North/Blind Gulch waste rock piles.

The waste rock piles that have an in-place regrade are Capulin, Goathill North, and Sugar Shack West. The rock piles having waste rock material moved to other rock piles include: Goathill South, Sugar Shack South, Middle, and Sulphur Gulch South. The waste rock piles that will receive additional waste rock material include Sulphur Gulch North/Blind Gulch and Spring Gulch. The total surface area for grading and revegetation is approximately 660 acres. The total volume of material to cover the rock piles is estimated to be approximately 3.8 million yd^3 based on a 36-inch cover thickness.

The conceptual design for regrade of each waste rock pile to minimum 2H:1V interbench slopes is discussed individually below. In developing the conceptual design, a final interbench slope of 2H:1V was targeted, with slope break lengths provided approximately every 200 feet. However, slopes and slope breaks may vary depending on the final detailed design.

Capulin Waste Rock Pile

The slope of Capulin Waste Rock Pile ranges from 3.1H:1V to 1.0H:1V. The existing disturbed footprint area of the waste rock pile is 64.9 acres. Under the 2H:1V slope regrade option, the regraded pile will be expanded to have a regraded disturbance area of 88.3 acres, an increase of 36 percent. The expanded pile will extend over approximately 850 feet of existing drainage. Regrading activities will include a balanced-cut-fill within the regraded rock pile. A conceptual layout of the regraded waste rock pile is shown on Figure 12-12.

Water management features would be similar to those described under the 3H:1V regrade design for Capulin Waste Rock Pile. The estimated volume of screened and amended cover material necessary to cover the rock pile is 0.2 million yd^3. The underlying slope that will be exposed during the regrade is approximately 15.9 acres in aerial extent.

Goathill North Waste Rock Pile

The current slope of Goathill North Waste Rock Pile ranges from 5.1H:1V to 1.4H:1V after interim reclamation. The existing disturbed footprint area of the rock pile is 49.9 acres. Regrading activities will include a balanced-cut-fill within the regraded rock pile to the minimum 2H:1V slope. A conceptual layout of the regraded waste rock pile is shown on Figure 12-13.

Water management features would be similar to those described under the 3H:1V regrade design for Goathill North Waste Rock Pile. The estimated volume of screened and amended cover material necessary to cover the rock pile is 0.2 million yd^3. The underlying slope that will be exposed during the regrade is steeper than 1.9H:1V and covers an area of approximately 15.9 acres.

Goathill South Waste Rock Pile

The slope of Goathill South Waste Rock Pile ranges from 1.9H:1V to 1.5H:1V. The existing disturbed footprint area of the rock pile is 8.0 acres. The regraded pile will be expanded to have a regraded disturbance area of 10.0 acres, an increase of 25 percent. Regrading activities will include a balanced-cut-fill within waste rock piles. The regrade will require removing material to Spring Gulch or Sulphur Gulch North/Blind Gulch waste rock piles. The estimated volume of mine rock to be removed is approximately 0.3 million yd^3. A conceptual layout of the regraded waste rock pile is shown on Figure 12-14.

Water management features would be similar to those described under the 3H:1V regrade design for Goathill South Waste Rock Pile. The estimated volume of screened and amended cover material necessary to cover the waste rock pile is 0.02 million yd^3. The underlying slope that is exposed during the regrade covers an area of approximately 6.0 acres.

Sugar Shack West Waste Rock Pile

The slope of Sugar Shack West Waste Rock Pile ranges from 1.7H:1V to 1.5H:1V. The existing disturbed footprint area of the rock pile is 47.7 acres. The regraded pile will be expanded to have a regraded disturbance area of 55.8 acres, an increase of 17 percent. Regrading activities will include a balanced-cut-fill within waste rock piles. A conceptual layout of the regraded rock pile is shown on Figure 12-15.

Water management features would be similar to those described under the 3H:1V regrade design for Sugar Shack West Waste Rock Pile. The estimated volume of screened and amended cover material necessary to cover the rock pile is 0.2 million yd^3. The underlying slope that is exposed during the regrade that is steeper than 1.9H:1V covers an area of approximately 11.6 acres.

Sugar Shack South Waste Rock Pile

The slope of Sugar Shack South Rock Pile ranges from 2.1H:1V to 1.4H:1V. The existing disturbed footprint area is 115.6 acres. The regraded pile will be expanded to have a regraded disturbance footprint of 124.8 acres, an increase of 8 percent. The regrade will be constrained by underlying topography and constraints at the toe, including the proximity of State Highway 38 and Red River. Regrading activities will include a balanced-cut-fill within waste rock piles. Regrading will require removing material to Spring Gulch or Sulphur Gulch North/Blind Gulch. The estimated volume of mine rock removed is approximately 7.3 million yd^3. A conceptual layout of the regraded waste rock pile is shown on Figure 12-16.

Water management features would be similar to those described under the 3H:1V regrade design for Sugar Shack South Waste Rock Pile. The estimated volume of screened and amended cover material necessary to cover the rock pile is 0.5 million yd^3. The underlying slope that will be exposed during the regrade covers an area of approximately 10.6 acres.

Middle Waste Rock Pile

The slope of the Middle Waste Rock Pile ranges from 1.4H:1V to 1.1H:1V. The existing disturbed footprint area is 120.4 acres. The regraded disturbance area will be expanded to have a regraded disturbance area of 130.0 acres, an increase of 8 percent. The regrade will be constrained by underlying topography and constraints at the toe, including the proximity of State Highway 38 and Red River. Regrading activities will include a balanced-cut-fill within the waste rock piles. Regrading will require removing material to Spring Gulch or Sulphur Gulch North/Blind Gulch. The estimated volume of mine rock to be removed is approximately 12.1 million yd^3. A conceptual layout of the regraded waste rock pile is shown in Figure 12-17.

Water management features would be similar to those described under the 3H:1V regrade design for Middle Waste Rock Pile. The estimated volume of screened and amended cover material necessary to cover the rock pile is 0.5 million yd^3. The underlying slope that would be exposed during the regrade that is steeper than 1.9H:1V covers an area of approximately 38.6 acres.

Sulphur Gulch South Waste Rock Pile

The slope of the Sulphur Gulch South Waste Rock Pile ranges from 2.0H:1V to 1.6H:1V. The existing disturbed footprint area is 156.5 acres. The regarded disturbance area will be expanded to have a regraded disturbance area of 162.8 acres, an increase of 4 percent. The regrade will be constrained by underlying topography and constraints at the toe, including the proximity to State Highway 38 and Red River. Regrading activities will include a balanced-cut-fill within the waste rock piles. Regrading will require removing material to Spring Gulch or Sulphur Gulch North/Blind Gulch waste rock piles. The estimated volume of mine rock to be removed is approximately 9.1 million yd^3. A conceptual layout of the regraded rock pile is shown in Figure 12-18.

Water management features would be similar to those described under the 3H:1V regrade design for Sulphur Gulch South Waste Rock Pile. The estimated volume of screened and amended cover material necessary to cover the rock pile is 0.8 million yd^3. The underlying slope that will be exposed during the regrade that is steeper than 1.9H:1V covers an area of approximately 22.7 acres.

Sulphur Gulch North/Blind Gulch Waste Rock Piles

The slopes of the Sulphur Gulch North/Blind Gulch waste rock piles range from 2.0H:1V to 1.4H:1V. The existing disturbed footprint area is 129.7 acres. Regrading activities will include a balanced-cut-fill within the waste rock piles. A conceptual layout of the regarded rock piles is shown on Figure 12-19.

Water management features would be similar to those described under the 3H:1V regrade design for Sulphur Gulch North/Blind Gulch waste rock piles. The estimated volume of screened and amended cover material necessary to cover the rock pile is 0.9 million cubic yards. The underlying slope that is exposed during the regrade steeper than 1.9H:1V covers an area of approximately 36.8 acres.

Sulphur Gulch North/Blind Gulch waste rock piles may be used as repositories for the placement of excess waste rock as described above. It is estimated that up to approximately 30.1 million yd^3 of additional waste rock will be placed onto the existing waste rock piles from the material removed from the other waste rock piles depending on which piles are regraded to 2H:1V interbench slopes. The waste rock piles with the additional fill will be regraded to a minimum interbench slope of 2H:1V to the underlying slope to the maximum extent practicable with slope break lengths provided approximately every 200 feet. The filled footprint will be expanded to 198.3 acres, an increase of 52 percent. The estimated volume of screened cover material necessary to cover the rock pile is 1.0 million yd^3. A conceptual layout of the regarded rock piles as repositories is shown on Figure 12-20.

Spring Gulch Waste Rock Pile

The slope of Spring Gulch Waste Rock Pile ranges from 2.0H:1V to 1.6H:1V. The existing disturbed footprint area is 81.3 acres. Regrading activities will include a balanced-cut-fill within the waste rock piles. Material will either remain in place or move to the Sulphur Gulch North/Blind Gulch waste rock piles. The estimated volume of the waste rock to be removed is 6.7 million yd^3; 5.4 million yd^3 of which will be removed for cover. The estimated volume of screened and amended cover material necessary to cover the rock pile is 0.5 million yd^3.

Spring Gulch Waste Rock Pile may be used as a repository for the placement of excess waste rock material. However, no storage would be required for the material removed from the other waste rock piles if they are regraded to 2H:1V interbench slopes. The rock pile with the additional fill will be graded to a minimum interbench slope of 2H:1V to the underlying slope to the maximum extent practicable with slope break lengths provided approximately every 200 feet. The estimated volume of screened cover material necessary to cover the rock pile is 0.6 million yd^3. A conceptual layout of the regraded waste rock pile is shown on Figure 12-21.

Construct and Utilize On-Site Repository(ies) for Waste Rock

The use of an on-site repository for waste rock will include: (1) placement and compaction of waste rock material, (2) grading of waste rock to achieve a stable slope for the construction of the cover, and (3) covering the graded surface with materials obtained from Spring Gulch Waste Rock Pile. The open pit is used as the on-site repository location for cost estimating purposes. However, EPA will determine the actual location of an on-site repository(ies) during remedial design. EPA will notify the public of the location of the repository(ies) once a determination has been made. Placement of waste rock material in an on-site repository will provide achievable in-place regrade for the waste rock piles that have waste rock material removed. It will also achieve stable slopes for construction of a cover. Partial or complete removal from the rock piles will include excavation of the waste rock, haul truck loading to an on-site repository, placement and compaction in the repository, and grading to achieve design slopes. The estimated maximum volume of waste rock from the nine individual waste rock piles to be moved to the repository is approximately 119 million yd^3, assuming all rock piles are regraded to 3H:1V interbench slopes.

The waste rock material within the repository will be graded to a minimum interbench design slope of 3H:1V, as practical, and covered with a 36-inch depth of cover material. The cover will incorporate erosion control channels, swales, and benches for surface water run-on and run-off. The borrow material to be used for the cover will be excavated from the Spring Gulch Waste Rock Pile identified as non-acid generating. It will be screened to a maximum grain size of 8 inches and the 600 mg/kg molybdenum screening criterion for borrow and amended. Multiple applications of amendments may be required to promote vegetative growth once the cover is in place. The estimate volume of screened cover material necessary to cover the waste rock is approximately 1.5 million yd^3.

Continue Controlled Access (Fencing, Gate, and Signage)

As the mine site covers approximately three square miles of mountainous land, the remedy will include access controls in specific areas of the mine site. Current access restrictions are in place for those areas with operating facilities (buildings, structures, etc.) and include fencing, gate, placement of signage and guarded entry points. These land use controls will continue during the remaining operational life of the mine. The fencing and signage will be maintained after closure.

Additional land use controls to restrict access to the open pit and subsidence area will be put in place at mine closure and maintained for the long term, possibly in perpetuity, to protect public health and safety. Physical barriers to restrict access will include a continuous wire fence and five-foot high berm to be placed around the entire open pit perimeter and signage. The stability of the pit walls will be monitored semiannually to identify potential failure or hazard areas which may adversely impact public health or safety. If any potential failure or hazard areas are identified, they will be mitigated.

Access to the subsidence area will also be restricted. Since it would be impracticable to fence off the subsidence area, signage will be used to warn people of the safety hazards.

Continue Operating Existing Seepage Interception and Ground Water Withdrawal Well Systems, Dewater Underground Mine, Pipe Water to Mill and Treat Water[82], pH Adjust Water Until Water Treatment Plant is Available to Treat Water.

The operation of the existing ground water withdrawal well system in front of the roadside waste rock piles and the seepage interception systems at Springs 13 and 39 as Best Management Practices under EPA NPDES Permit NM0022306 (USEPA 2006b) will continue under the direction and oversight of the NPDES Program (see Figure 12-22). The

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[82] "Water Treatment" or to "treat water" at the mine site means: the use of chemical precipitation utilizing the high-density solids treatment process. This includes solids separation of the metal precipitated sludge with proper disposal before discharging the effluent.

withdrawal well system extracts ground water from the alluvial aquifer. The system includes three extraction wells: GWW-1, GWW-2, and GWW-3. The system extracts approximately 420 gpm of water, which is pumped to the mill and disposed of at the tailing facility.

The seepage interception systems at Springs 13 and 39 are to collect shallow alluvial seepage that forms aluminum hydroxide precipitate along the bank of the Red River. The systems are French drains that are 1.5 feet below the low water level of the river. The collected water flows by gravity to a concrete vault where it is pumped through a pipeline to the mill. The Spring 13 system is located near the mouth of Capulin Canyon. The drain is approximately 1,000 feet long and collects approximately 20 gpm of water. The Spring 39 system is located at the base of the Goathill Debris Fan. The system includes two adjacent drains approximately 400 feet in length that collect approximately 80 gpm of water. These two drain collection systems collect water at a rate of approximately 100 gpm.

Because of hydrologic connection between bedrock ground water and the Red River, the dewatering of the underground mine will continue in perpetuity to maintain the mine water level below the Red River, thus maintaining a hydraulic gradient in bedrock toward the mine. The underground mine collects colluvial and bedrock ground water which drains to the open pit, the subsidence area, old underground workings, and the decline, as well as storm water run-off directed to the open pit and subsidence area and seepage from Capulin and Goathill North waste rock piles. The underground mine is currently dewatered at an average rate of approximately 250 gpm. This water is pumped to the mill for use in milling operations along with make-up water from the Red River and water production wells.

The total flow rate of contaminated water collected by these systems is approximately 770 gpm [420 gpm + 100 gpm + 250 gpm = 770 gpm]. During milling periods, the 520 gpm of contaminated water from the ground water withdrawal well system and seepage interception systems is pumped to Sump 5000 located adjacent to the mill at the mill and mixed with tailing slurry for transport to the tailing facility. No pH adjustment of the acidic water is necessary at this time because the alkaline process of milling ore buffers the acidity of the contaminated water. The mixture of contaminated water and tailing slurry discharged to the tailing facility at the end of pipe meets the allowable discharge pH of between 6 and 9 specified in Ground Water Discharge Permit DP-933.

During non-milling periods, the acidic water is pumped to Sump 5000 at the mill, pH adjusted using hydrated lime and sent to the tailing facility for disposal. Since water is needed for operational maintenance of the pipeline during non-milling period, CMI uses this contaminated water for such purpose. CMI blends the contaminated water with sources of unimpacted water (which can exceed 1,000 gpm) that is collected from production wells and the Red River prior to conveyance through the pipeline. Table 1-1 shows the total volume of water sent to the tailing facility during milling and non-milling periods on a month-by-month basis for 2009. Periodic sampling of the discharge water at the end of pipe by NMED indicates an exceedance of New Mexico water quality standards for manganese and other constituents. The water conveyed through the pipeline is also used for partial dust suppression at the tailing facility. The majority of the water discharged into the tailing impoundments seeps through the tailing (as tailing seepage) to ground water and contributes to the contamination of ground water at the tailing facility.

The water collected by mine dewatering (250 gpm) will be conveyed to the water treatment plant for treatment as described in Section 12.1.2, above. The NPDES Program will determine whether the current disposal practices for the 520 gpm of water collected by the Best Management Practices will continue or be modified.

Continue to pH adjust water until the water treatment plant is available to treat all of this water.

Continue Collection and Conveyance of Waste Rock Pile Seepage to Subsidence Area on Interim Basis until Piping and Collection Systems Constructed, at which time Water will be Piped to Mill Area for Treatment;

Seepage from Capulin and Goathill North waste rock piles are currently being collected and managed. The Capulin Leachate Collection System collects an average of approximately 20 gpm of water derived from seepage from Capulin Waste Rock Pile and storm water. The collected water is pumped through the horizontal borehole to the Goathill Gulch drainage, and then is directed to the subsidence area. The Goathill North Waste Rock Pile toe drain collects seepage at a rate of approximately 10 gpm. This seepage is also directed to the subsidence area. The collection and conveyance of this seepage to the subsidence area will continue on an interim basis until construction of the piping and new seepage collection systems for Capulin and Goathill North waste rock leachate is completed, at which time water will be piped to the mill for treatment.

Install New Seepage Collection Systems near the Base of Capulin and Goathill North Waste Rock Piles to Enhance Seepage Capture, Pipe Seepage to Mill Area and Treat Water; Decommission Capulin Leachate Collection System

Two new interceptor drains will be installed in two drainages below the toe of the Capulin Waste Rock Pile during the rock pile regrade, and one new interceptor drain will be installed approximately 100 feet downstream of the existing toe drain at Goathill North Waste Rock Pile. These drains will enhance seepage capture from waste rock piles. The existing Capulin Leachate Collection System will be decommissioned, including catchments, sediment traps, and the pumpback pond. The drains will be designed to collect subsurface flow, and storm water flow will be directed over or around the systems. The drains will be keyed into competent bedrock by installing a grout curtain or other engineered barrier system to a depth of 50 feet on the downgradient side of the drains (Capulin Waste Rock Pile only). The drains will extend across the drainages and consist of a perforated pipe in a trench backfilled with gravel. For the conceptual design, the two Capulin Waste Rock Pile interceptor drains are assumed to be 100 feet in length, 20 feet deep, and 5 feet wide with an estimated combined seepage collection rate of 50 gpm for both drains. The collected seepage will drain by gravity through an HDPE pipe 8,000 feet in length routed down Capulin Canyon to the Spring 13 collection vault, then pumped to the water treatment facility (other routes for piping will be evaluated in the remedial design). The new Goathill North interceptor drain is assumed to be 50 feet in length, 30 feet deep and 5 feet wide. The estimated collection rate is 30 gpm for both the new drain and existing toe drain. The collected seepage will be drained by gravity through an HDPE pipe 12,000 feet in length and routed down Goathill Gulch to the Columbine pump station, then pumped to the water treatment facility (other routes for piping will be evaluated in the remedial design). A conceptual layout of the Mine Site Area remedial component is shown on Figure 12-22.

Install and Operate New Ground Water Extraction Well Systems in Lower Portion of Tributary Drainages, Pipe Water to Mill Area and Treat Water

New ground water extraction well systems will be constructed within the lower portion of all tributary drainages and operated. The first extraction well system will be located at the base of each of the roadside waste rock pile drainages. A second extraction well system will be constructed in the lower portion of Goathill Gulch near the head of the debris fan. A third extraction well system will be constructed in the lower portion of Slick Line Gulch between existing monitoring wells MMW-21 and MMW-48A. The forth extraction well system will be constructed in lower Capulin Canyon.

A new ground water extraction well system will be installed at the base of the roadside waste rock piles in pre-mine drainages to capture seepage from the waste rock piles before it enters the Red River alluvial aquifer. The wells will be designed to capture the estimated ground water flow in the colluvium and the upper 10 feet of the weathered portion of bedrock in the drainages. When contaminant concentrations in the alluvial aquifer are reduced to cleanup levels, approval will be sought from the EPA NPDES Program to phase out the three existing GWW extraction wells. For the conceptual design, EPA assumes that one well will sufficiently capture ground water flow in each of the four roadside waste rock pile drainages. The assumed pumping rates for the drainages are equivalent to the subwatershed mean annual yield estimates.

The conceptual design of the extraction well systems for the roadside waste rock pile drainages is described below. The actual pumping rates and number of wells will be determined during the remedial design.

- Lower Sulphur Gulch well (or wells if needed) will be approximately 100 feet deep with 50 feet of screen, and will pump at a rate of 110 gpm;
- Lower Sulphur Gulch West well will be approximately 100 feet deep with 50 feet of screen, but will pump at a rate of 10 gpm;
- Lower Middle Waste Rock Pile drainage well will be approximately 120 feet deep with 60 feet of screen, and will pump at a rate of 20 gpm;
- Lower Sugar Shack South Waste Rock Pile drainage well will be 130 feet deep with 70 feet of screen, and pump at a rate of 10 gpm;

The lower Sulphur Gulch well will be 8 inches in diameter; the other wells will be 6 inches in diameter. The extracted water will be pumped to an on-Site water treatment facility and treated.

A new ground water extraction well system will be installed in lower Goathill/Slick Line Gulch, located in lower Goathill Gulch near the head of the debris fan and in Slick Line Gulch between monitoring wells MMW-21 and MMW-48A. A conceptual layout of these extraction systems is shown on Figure 12-22. The purpose of the extraction wells is to capture mine-related ground water contamination within the drainages. For the conceptual design, EPA assumes that the wells in lower Goathill and Slick Line gulches will be screened from approximately 160 to 270 feet deep and 50 to 100 feet deep, respectively. The well screens will primarily intersect colluvium with the lower 10 feet of screen in the underlying bedrock. The well diameters will be 6 inches and the wells are assumed to produce 20 gpm. The extracted water will be pumped to an on-Site water treatment facility.

A new ground water extraction well system will be installed in lower Capulin Canyon to capture potential residual impacts from waste rock pile seepage that occurred before seepage collection was implemented in 1992. For the conceptual design, EPA assumes that one well will be approximately 70 feet deep with 20 feet of screen, and will pump at a rate of 50 gpm. The well casing diameter will be 6 inches. The extracted water will be pumped to an on-Site water treatment facility.

The conceptual total estimated flow of water to be collected and treated by these remedial systems is 220 gpm. The actual pumping rates and number of wells will be determined during remedial design.

Construct and Operate Water Treatment Plant at Year 0 Construction of the Remedial Action and Treat Water

Construction of a new water treatment plant at the mine site will begin at Year 0 Construction of the remedial action. Although an on-Site CERCLA response action does not require issuance of an NPDES permit for authorization to discharge to waters of the United States, due to the unique circumstances related to the on-going operations at the facility, EPA has decided to proceed with NPDES permitting for the water treatment plant effluent discharges to surface water. See Section 12.1.2 above. A pre-construction draft NPDES permit application will be developed in accordance with 40 C.F.R. Part 122. Once construction of the plant is completed and a final NPDES permit is issued by EPA, the water treatment plant will be operated to treat the water.

The conceptual total estimated flow of water to be collected by the remedial systems is approximately 1,070 gpm (Table 12-1). The estimated flow will be refined during remedial design. Of the 1,070 gpm of collected water, approximately 550 gpm will be treated at the water treatment plant. The other 520 gpm of estimated flow will be disposed in a manner to be determined by the NPDES regulatory authority if CMI is in compliance with NPDES Permit NM0022306. NPDES officials conducted a Site inspection the week of October 24, 2010 to assess CMI's compliance with the individual NPDES permit

(NM0022306) as well as the MSGP for storm water discharges. The results of that inspection are pending. If it is determined that CMI is not in compliance with Permit NM0022306 for disposal of the 520 gpm of contaminated water collected, CMI will be required to treat the 520 gpm of water as part of this CERCLA response action.

TABLE 12-1
CONCEPTUALIZED TOTAL ESTIMATED FLOWS FOR WATER TREATMENT

Remedial Component	Estimated Flow (gpm)
Mine Dewatering	250
NPDES BMP Ground Water Withdrawal Well System	420[1]
NPDES BMP Seepage Interception Systems at Springs 13 and 39	100[1]
Seepage Interception Systems at Base of Capulin and Goathill North Waste Rock Piles	80
Ground Water Extraction Well Systems in Lower Drainages	220
Total	1,070

[1] Method of water disposal to be determined by NPDES regulatory authority if CMI is in compliance with NPDES Permit NM0022306.

As stated in Section 12.1.2, the conceptual approach for water treatment is lime neutralization/chemical precipitation/HDS with secondary treatment (*i.e.*, reverse osmosis/ultrafiltration or other membrane/filtration technology) to achieve more stringent discharge limits, if required. The shakedown of primary and secondary treatment processes to be conducted as discussed in Section 12.1.2 may impact the conceptual approach. A conceptual process flow diagram for water treatment is depicted on Figure 12-23.

Conveyance of water (*i.e.*, pipelines, ditches, pumps, etc.) will be included with the water treatment and will use existing infrastructure. If the existing infrastructure is inadequate at the time water treatment begins, new or additional infrastructure will be required. A discharge point for the treated water has not been determined and will be evaluated during RD. The preliminary location for the treatment plant is at the mill.

The major equipment associated with the conceptual lime/neutralization/chemical precipitation/HDS treatment plant includes:

- Equalization basin
- Storage tanks
- Lime slurry system
- Lime reactor system
- Flocculent/polymer feed system
- Clarifier/thickener system
- Chemical feed system for pH adjustment
- Reverse osmosis
- Polishing systems
- Filter press system

Existing buildings and equipment may be used depending on the condition of the equipment at the time the treatment plant will be constructed. Sludge from the clarifier/ thickener bottoms will be pumped to a filter press for dewatering. A portion of the sludge will be recycled to the beginning of the treatment system, mixed with lime, and fed to the first reactor to assist in the chemical precipitation and formation of high density sludge. The sludge pumped to the filter press will be dewatered to an approximately 30 percent solids filter cake. The filter cake is expected to be nonhazardous and will be analyzed to ensure proper disposal.

An engineered repository will be constructed at the mine site for placement of water treatment residuals (sludge and filter cake). Suitable areas will be relatively flat, several acres in size, and accessible year round. Approximately 10 to 15 cells of approximately

7,500 yd^3 capacities will be needed. Maximum height of the downstream impoundment berms will be limited to less than 10 feet so that the cells are not considered jurisdictional dams under the Office of the State Engineer Rules and Regulations. Figure 12-24 shows a plan view of 10 sludge/filter cake cells. Figure 12-25 shows a typical cross section of cell.

The sludge and filter cake will be transported to the cells via dump trucks. The trucks will enter an active cell via an earth-fill access ramp. The cells will be lined with a geosynthetic liner overlain by a low density polyethylene geomembrane. Subgrade material will be well compacted sand, clay, and/or silt material. Cells that have reached design capacity will be covered. Storm water collection and diversion systems would be constructed to manage storm water run-on and run-off.

Water Level in Underground Mine will be Maintained at Elevation below Red River in Perpetuity

Dewatering of the underground mine will continue in perpetuity to maintain the mine water level below the Red River, thereby maintaining a hydraulic gradient in bedrock toward the mine. Currently, the underground mine is dewatered at a rate of approximately 250 gpm.

Temporary Well Drilling Restrictions will be Imposed by the New Mexico Office of the State Engineer

Temporary well drilling restrictions will be sought from the New Mexico Office of State Engineer to limit use of ground water at the mine site until ground water cleanup levels are attained. The restrictions will only apply to new requests for water well permits, not to existing water well permit holders.

Other government controls contemplated for the Selected Remedy after remedial construction is complete include local (village or county) ordinances, permits, and/or zoning to protect source control and water collection and treatment remedy components.

Provide Temporary Alternate Water Supply or Point-of-Use Treatment System until Attainment of Ground Water Cleanup Levels

Temporary actions will be taken to protect any persons using ground water as a drinking water supply in areas where Site-related contaminant levels in ground water exceed federal or New Mexico drinking water standards (MCLs) or EPA health-based criteria. Such action may be provision of an alternate water supply to the affected homes or businesses, or installation and maintenance of point-of-use treatment systems (*e.g.*, filter at tap) in the homes or businesses. The actions will continue until ground water cleanup levels have been attained. At this time, EPA is not aware of human exposure to ground water contamination above such standards or criteria at the Mine Site Area.

Continue Ground Water and Geotechnical Monitoring and General Site Maintenance

General maintenance of the mine site will be continued during operation and after closure. This will consist of grading of roads and maintenance of structures. Water quality monitoring for all wells, seeps, and springs in and along the mine site will also continue. Radionuclides (*e.g.*, uranium, thorium) will be added to the list of analytical parameters. Inclinometers installed at the waste rock piles will continue as part of the geotechnical monitoring of the rock piles.

Monitor Performance of Store and Release/Evapotranspiration Cover Systems to assess their Effectiveness at Reducing Infiltration to Levels that Allow Attainment of Ground Water Cleanup Levels

Performance monitoring will be conducted to assess if the store and release/evapotranspiration cover system has the capacity to limit net percolation by storing precipitation solely within the non-acid generating cover system for a period long enough for water to be removed by evaporation and transpiration and that any net percolation will not cause an exceedance of ground water standards.

A performance criterion will be developed during the remedial design phase for the store and release/evapotranspiration cover system to achieve the remedial action objectives for the Mine Site Area. This criterion will focus on reducing net percolation through the non-acid generating cover system to a level that would allow attainment of ground water remediation goals and be protective of ground water.

Monitor Plant Growth Performance to Asses if Molybdenum Uptake from Borrow Material to Plants Inhibit Vegetative Success or Poses Risk to Wildlife

Performance monitoring will be conducted to assess the success of plant growth on borrow material that will cover waste rock piles. Such monitoring will include measuring concentrations of molybdenum in plant tissue co-located with media samples (*e.g.,* soil, waste rock) to quantify oxide and sulfide species of molybdenum and degree of uptake by plants. Molybdenum uptake from borrow material to plants shall not be at levels such that inhibits attainment of revegetation success standards or exceeds risk-based concentrations for herbivorous native wildlife. Performance criteria will be developed using existing and new data from laboratory studies on plant uptake and toxicity using cover material as well as field monitoring results. The timeframe for developing the performance criteria is at the start of the remedial design and continuing through implementation and monitoring of the remedy. Examples of some parameters likely to require field monitoring on a 5-year basis include cover material molybdenum concentrations, plant molybdenum concentrations, and revegetation success.

Monitor Performance of Seepage Interception and Ground Water Extraction Well Systems to Assess Effectiveness at Achieving Ground Water Cleanup Levels

Performance monitoring will be conducted to assess the effectiveness of the seepage interception and ground water extraction well systems on attaining cleanup levels in alluvial, colluvial and bedrock ground water. Monitoring will include colluvial and bedrock ground water monitoring in all mine site tributary drainages. Monitoring will also include all seeps and springs in the Mine Site Area. The performance monitoring program will be developed during remedial design.

Perform Additional Molybdenum Characterization of Spring Gulch Waste Rock Pile to Assess Suitability as Borrow Material for Cover

Additional characterization will be performed on the spatial distribution, concentration and chemical form of molybdenum in the Spring Gulch Waste Rock Pile during the pre-design phase to verify the suitability of Spring Gulch waste rock as borrow material for cover.

12.2.3 Tailing Facility Area

The Selected Remedy includes the following alternative for the Tailing Facility Area:

- **Modified Alternative 3B** – Source containment by regrade, cover, and revegetation of tailing impoundments; upgrade seepage collection; piping of irrigation water in eastern diversion channel; continue ground water extraction with additional extraction southeast of Dam No. 1 (MW-4 and MW-17 Area); water treatment.

The major components of the response action are described in detail below.

Perform Ground Water Characterization in Bedrock Aquifer beneath and West of Tailing Impoundments, and in Bedrock and/or Alluvial Aquifer Downgradient of Dam No. 1

In light of the significant water loss known to be occurring at the tailing impoundments, additional ground water characterization will be performed in pre-design for the basal bedrock (volcanic) aquifer beneath and/or west of the western tailing impoundments, as well as in the volcanic aquifer and/or alluvial aquifer downgradient (south) of Dam No. 1, to evaluate the need for expanding the ground water component of the remedy. This additional characterization includes installing a well(s) to replace former temporary piezometer TPZ-5B and monitoring for radionuclides (*e.g.*, uranium, thorium). It may also include installation of other monitoring wells to fully characterize the deeper portion of the alluvial aquifer as well as other areas of the alluvial and/or volcanic aquifer if deemed necessary by EPA. If the characterization indicates concentrations above the remediation goal for molybdenum or other COCs, ground water extraction would be included to address these areas.

Cover and Revegetate Tailing Facility (and Remove Limited Soil at the Dry Maintenance Area at the Cessation of Tailing Deposition)

The tailing facility will be covered and revegetated for source containment. Consistent with conditions of the New Mexico Mining Permit TA001RE-96-1 and Ground Water Discharge Permit DP-933, as TBCs, a minimum 36-inch depth soil cover will be placed on the tailing facility, graded, and revegetated.[83] The cover type will be a store and release/evapotranspiration cover designed to reduce infiltration and percolation of water through the tailing material to ground water that would cause an exceedance of ground water quality standards. In limiting infiltration and percolation, the cover will also minimize oxidation and acid generation of the tailing. Tailing and water will no longer be placed at the tailing facility at closure; therefore, dewatering of the tailing will occur and seepage will decrease with time once the facility is covered.

A store and release/evapotranspiration cover system is an appropriate cover type for the climate conditions near Questa and the type of borrow materials that are locally available. It will also provide a condition that allows for the re-establishment of a self-sustaining ecosystem appropriate for the life zone of the surrounding areas, not conflicting with the MMD-approved post-mining land use.

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[83] In November 2009, EPA approved a joint proposal by CMI and Chevron Technology Ventures for a concentrated photovoltaic (CPV) solar facility and cover depth pilot demonstration at the northeastern corner of the tailing facility. The pilot demonstration will be for a period of five years and include an evaluation of 1-, 2-, and 3-foot cover depths. In a joint letter with NMED and MMD, dated November 13, 2009, EPA agreed that if a 1-foot or 2-foot thick cover is demonstrated to be successful in the five-year pilot, the CERCLA remedy would be modified accordingly. A copy of the November 13, 2009 letter is included in Appendix C.

The estimated area to be covered is approximately 1,050 acres, which is shown on Figure 12-26. This will include the historic buried tailing adjacent to, but outside the current impoundments. The volume of cover material is estimated at 5.4 million yd^3. The source of the cover material will be the alluvial soils in the northern portion of the tailing facility. The alluvial soils from the northern tailing facility were used to construct the interim cover over the Dam No. 1 impoundment in the mid-1990s. The interim cover has revegetated since then and now supports several native species of vegetation similar to species outside of the tailing facility. The interim cover materials were not screened; therefore, screening of materials for the final cover is not necessary and simplifies construction and reduces costs. The vegetation is well established (*e.g.,* vegetation density, species constancy and uniformity).

The final cover will be revegetated with grasses and forbs and possibly woody shrubs. Revegetation will be designed to optimize the effectiveness of the cover to reduce infiltration and percolation through the underlying tailing to protect ground water, promote evapotranspiration from the cover system, and provide cover stability and protection from wind and water erosion. Revegetation will also be designed to screen out species that may take up metals at levels harmful to the plants as well as large herbivorous wildlife (e.g., deer and elk) that would graze on the plants. Species-specific evaluations will be performed during remedial design to assess the potential uptake and release of metals in vegetation through roots/soil interactions, organic material/live stems and leaf tissue, and fruit/seed pathways since containment of waste that would accumulate in living tissue and decomposing biomass may be an issue for several contaminants.

The likely procedure for placement of cover consists of several steps. The alluvial cover material will be excavated and hauled using scrapers. In trafficable areas, the scraper will be used to place the cover materials, which is the same method used for placing the interim cover. In areas where the tailing may be moist and would not support scraper traffic, scrapers will stockpile cover materials nearby, and dozers will be used to advance the material over the tailing.

Drainage of the cover will be accomplished by grading the final surface for positive drainage with slopes between 1 to 5 percent, in order to provide for long-term diversion of flow around and from the surface of the tailing impoundments. Run-off will be collected in ditches that direct the water to the large storm water diversion channels on the west and east sides of the tailing facility.

Although soil in the area outside the tailing impoundments does not require remediation based on protection of terrestrial ecological receptors, one location outside of the impoundment footprint with elevated molybdenum (above EPA's ecological soil remediation goal for molybdenum of 300 mg/kg) will be excavated and placed at the tailing facility prior to cover placement. This soil sample (TSS11-4) is located south of the Change House.

Contaminated soil will be removed initially to a depth of 2 feet. Confirmation soil sampling will be conducted to determine if cleanup levels have been obtained. If not, additional soil will be excavated until cleanup levels are met or an EPA acceptable depth has been reached. The extent of elevated molybdenum in soil at this location is considered to be small in comparison to the impoundment area to be covered. Assuming a 2-foot depth of excavation, the area of contaminated soil at this single location was estimated to be approximately 200 yd^3. The excavation will likely be accomplished using wheel-mounted front-end loaders. The excavated soil will be transported by truck to the tailing impoundments, placed, and graded prior to cover installation. Since there is no remedial action objective requiring a remediation goal to be achieved, no confirmation soil sampling will be conducted.

Replace the Lower 002 Seepage Barrier with Extraction Wells and Replace the Upper 003 Seepage Barrier with a Deeper Barrier; Treat Water

There are two seepage interception systems located at the tailing facility which have been operating since 1975. They currently collect approximately 550 gpm of water and seepage. The Outfall 002 seepage interception system is located south of Dam No. 1 and consists of a combination of shallow rock-filled drains, seepage barriers, and extraction wells. The Outfall 003 seepage interception system includes seepage barriers across the drainage on the eastern slope of Dam No. 4 and an extraction well, EW-1 (Figure 12-26). A detailed description of the Outfall 002 and Outfall 003 seepage interception systems is provided in Section 9.4.4, above.

These systems will be upgraded to reduce or eliminate seepage bypass. The upgrade to the Outfall 002 system includes installation of new ground water extraction wells across the Dam No. 1 arroyo just downgradient of the location of the existing lower 002 seepage barrier. The upgrade to the Outfall 003 system includes the replacement of the upper 003 seepage barrier with a new seepage barrier that extends approximately 30 feet below the existing barrier. Geotechnical data will be collected along the proposed barrier alignments to support design of the upgrade.

New extraction wells will be constructed at CMI's downgradient property boundary in the Dam No. 1 arroyo to reduce or eliminate off-site and downward migration of tailing seepage contaminants (primarily molybdenum and sulfate). It is estimated that four wells will be placed along a 250-foot wide transect across the Dam No. 1 arroyo, with each well pumping at 30 gpm. Each well will have a depth of approximately 100 feet, with a screened interval of 60 to 100 feet.

The new upper 003 seepage barrier is estimated to be 50-feet in length, and will be excavated to a depth of approximately 50 feet to collect seepage that may be migrating beneath the existing barrier. The barrier will be approximately 10 feet wide with a nominal 10-inch diameter perforated drain pipe in the bottom. The drain will be connected to the existing pipeline and the water will flow via gravity to the Outfall 002 manhole. The upgraded seepage barrier is estimated to produce 180 gpm, an increase of 120 gpm compared to the existing 003 seepage barrier. It is estimated that the existing and upgraded systems combined will produce 790 gpm of seepage and impacted ground water (Table 9-14).

Approximately 400 gpm of water is currently discharged to the Red River via Outfall 002 under the NPDES Best Management Practices. The disposal method for this 400 gpm of water will be determined by the EPA NPDES Program. The remaining 390 gpm of estimated water flow will be piped to the water treatment plant and treated as part of the CERCLA response action.

Pipe Unused Irrigation Water in the Eastern Diversion Channel to Prevent Infiltration through Historic Buried Tailing

Infiltration and water contact with the historic buried tailing northwest of the Change House will be reduced by constructing piping in the eastern diversion channel. Water in the diversion channel will be directed into the pipe and discharged south near Dam No. 1, thereby by-passing the area of historic buried tailing.

A concrete dam will be constructed in the bottom the diversion channel to prevent unused irrigation water from continuing to flow in the channel. The dam will extend across the channel and will be keyed into the bottom of the channel. The height of the dam will be approximately 1 foot above the channel bottom and the low height will not interfere with the channel's ability to convey storm water as originally designed. The dam will be constructed with a notch in the center where the pipe will be connected. Water behind the dam will enter the pipe and be conveyed approximately 6,000 feet past the historic buried tailing and discharged near Dam No. 1.

Install and Operate Ground Water Extraction Well System in Alluvial Aquifer Southeast of Dam No. 1 and Downgradient of Historic Buried Tailing; Treat Water

Ground water extraction will be performed southeast of Dam No. 1 to capture contamination in the alluvial aquifer. It is assumed that five extraction wells will be installed in the area of monitoring wells MW-4 and MW-17 along an east-west line, approximately 240 feet apart, to create a continuous zone of ground water capture over the 1,200 feet of potentially affected aquifer. For conceptual-level design, each well is assumed to be pumped at 10 gpm for a total extraction rate of 50 gpm. The depth to the water table in MW-17 ranges from 130 to 150 feet; therefore, the extraction wells will be installed to a depth of approximately 200 feet with 60-foot screens to extract ground water from the upper 60 feet of the alluvial aquifer. Boreholes for each well will be drilled 10 to 12 inches in diameter to accommodate 6-inch-diameter casings and screens, with 4-inch-diameter submersible pumps.

Source containment is included through the use of piping to bypass the unused irrigation water in the diversion channel, which addresses the source of infiltration that reaches the historic buried tailing.

Refurbish Existing Ion Exchange Plant and/or Construct New Water Treatment Plant at Year 0 Construction of the Remedial Action and Operate to Treat Water

Water treatment will be performed at the tailing facility as described in Section 12.1.2, above. The estimated total flow of water from the upgraded seepage collection systems (seepage barriers and extraction wells) and the five additional extraction wells to be located in the area of MW-4 and MW-17) will be 840 gpm, of which 400 gpm will be discharged to the Red River through the Outfall 002 (Table 9-14) as authorized under the NPDES permitting program. Following collection, the remaining water (approximately 440 gpm) will be treated at the existing ion exchange treatment plant and/or new treatment plant located south of Dam No. 4 and discharged via an NPDES-permitted outfall, rather than being pumped back to Dam No. 5A.

Piping associated with conveyance of water from the various collection and extraction systems at the tailing facility is included with this remedial component. Influent water to the treatment plant will include water collected from the Outfall 002 and Outfall 003 seepage barriers and extraction wells, which is currently pumped back to Dam No. 5, to capture tailing seepage from Dam No. 1 and Dam No. 4 impoundments.

Construction of a water treatment plant at the tailing facility will begin at the start of the remedial action (*i.e.,* Year 0 Construction). Once construction is complete, the water treatment plant will be tested and operated as specified in Section 12.1.2, above. NPDES authorization for discharging treated effluent will be required and a pre-construction draft NPDES permit application will be prepared. The existing ion exchange treatment plant is located south of Dam No. 4 and will be used for treatment of extracted ground water. A new treatment facility will also be constructed if necessary. Modifications may be necessary if contaminants in ground water, in addition to molybdenum, require removal (*e.g.,* uranium). Reverse osmosis will be included for additional treatment if needed. The extracted ground water will be adjusted to a low pH (3.5 to 4.0) using acid reagents. The water will then flow into the ion exchange column and move up-flow through four stages, subsequently overflowing through a resin trap and into a tank. Overflow from the tank will flow to a baffled launder where powdered lime will be added by one or two screw feeders connected to the lime storage silo to control the pH of the water to between pH 6.0 to 9.0 prior to it being discharged. A conceptual process flow diagram for water treatment at the tailing facility is depicted on Figure 12-27.

When the resin in the first stage of the column becomes loaded with molybdenum, the resin will require regeneration using a sodium hydroxide solution. The regenerated solution will require treatment prior to discharge. Precipitation using calcium chloride or evaporation may be needed. Conveyance of water (*i.e.,* pipelines, ditches, pumps, etc.) will be included with the water treatment and use existing infrastructure. If the existing infrastructure is not adequate at the time water treatment begins, EPA will require new or additional infrastructure. A discharge point for the treated water has not been determined and will be evaluated during the remedial design phase.

Either an evaporator will be installed in conjunction with the water treatment system or an evaporation pond constructed at the tailing facility for treatment of the reverse osmosis reject, if required. Suitable areas will be relatively flat, a few acres in size, and accessible year round. If a solid residual is generated during the treatment process, it will be disposed of at an appropriate location. Cover placement and limited excavation near the dry/maintenance area south of the Change House will be performed.

Temporary Well Drilling Restrictions will be Imposed by the New Mexico Office of the State Engineer

Temporary well drilling restrictions will be sought from the New Mexico Office of the State Engineer to limit use of ground water at the Tailing Facility Area until ground water cleanup levels are attained. The restriction will only apply to new requests for water well permits, not to existing water well permit holders.

Other government controls contemplated for the Selected Remedy after remedial construction is complete include local (village or county) ordinances, permits, and/or zoning to protect source control and water collection and treatment remedy components.

Provide Temporary Alternate Water Supply or Point-of-Use Treatment System until Attainment of Ground Water Cleanup Levels

Temporary actions will be taken to protect any persons using ground water as a drinking water supply in areas where Site-related contaminant levels in ground water exceed federal or New Mexico drinking water standards (MCLs) or EPA health-based criteria. Such action may be provision of an alternate water supply to the affected homes or businesses, or installation and maintenance of point-of-use treatment systems (*e.g.*, filter at tap) in the homes or businesses. The actions will continue until ground water cleanup levels have been attained.

At this time, EPA is not aware of human exposure to ground water contamination above such standards or criteria. The residences south of Dam No. 1, in the area of ground water contamination, are connected to the Village of Questa municipal water supply system. Molybdenum concentrations in ground water at the Red River State Fish Hatchery are just below the EPA health-based criterion of 0.08 mg/L for molybdenum. However, the trend in molybdenum concentrations over time has been increasing. If concentrations of molybdenum or other COCs increase to levels which exceed the health-based criterion, an alternate water supply will be provided, or a point-of-use treatment system will be installed, at the hatchery until ground water cleanup levels are attained. Currently, at the request of hatchery personnel, CMI provides bottled water to the facility.

Control Access to the Site, including use of an Exclusion Fence to Restrict Access by Deer and Elk; Provide Wildlife Drinkers

Access to the tailing facility will be controlled by fencing and signage for the remaining operating life of the facility to protect the public and wildlife. Limited fencing and restrictive entry to the tailing facility are currently in place to control access. However, the current three-wire barbwire fence surrounding the tailing facility is not effective in restricting access by deer and elk. Therefore, an exclusion fence (high fence) will be installed around the perimeter of the tailing facility to prevent deer and elk from gaining access to the tailing impoundments prior to closure of the facility and placement of final cover. The height of the fence will be determined during remedial design, but will be anywhere from 8 feet to 10 feet, as determined by EPA. The fence will also have one-way gates at intervals around its perimeter to allow animals to get out should they become trapped within the fenced area.

In combination with the exclusion fence, wildlife drinkers will be constructed along the western perimeter of the tailing facility on the eastern flank of the Guadalupe Mountains to replace the water supply (tailing ponds) that will be unavailable to the herds. The source of the wildlife drinking water will be supplied by precipitation capture, and the catchments will be sized to provide water continuously through drought conditions. EPA estimates a total of four drinkers will be constructed. However, the actual number of drinking facilities, as well as the design specifications, will be determined during remedial design based on field conditions and as approved by EPA, in consultation with the New Mexico Department of Game and Fish. In addition to being a water supply to the deer and elk, these drinkers may help control animal movements in terms of keeping them from moving around the fence to undesired or unanticipated locations (crop fields and highways).

Continue Tailing Dust Control Measures

CMI uses several different operational methods to control dust at the tailing facility. Tailing is deposited into small cells of approximately 100 acres in size and a water cover is used to the extent practicable. In addition, soil binders (*i.e.,* emulsion/tackifiers), soil cover, and straw mulch are used in areas where water cover cannot be maintained. Snow fencing is also used to disrupt the wind currents and reduce windblown dust. These dust control measures will continue for the remaining operating life of the facility.

Perform Air Monitoring

Air monitoring will be performed at the tailing facility. Currently, CMI conducts a voluntary air monitoring program (PM_{10} monitoring) at six air monitoring stations located along the perimeter of the CMI property boundary. This ongoing monitoring program will be reassessed and modified during the remedial design and incorporated into the remedy. Air monitoring will include PM_{10} and $PM_{2.5}$ monitoring, as well as chemical monitoring if deemed appropriate by EPA. Air monitoring stations will include those that are currently operated and any additional air monitoring stations to be located along the perimeter of the tailing facility and/or beyond the perimeter of the facility as required by EPA. A contingency plan for dust suppression will be developed and implemented in the event of mining-related exceedances of ambient air quality standards beyond the property boundary that threaten human health.

Monitor Water Quality at Red River State Fish Hatchery

NMED is monitoring water quality at the Red River State Fish Hatchery residential taps or other structures. A monitoring program will be implemented during the remedial action. It will be developed during the remedial design and shall include, at a minimum, analysis of molybdenum, sulfate, uranium, and other COCs.

Monitor Remedy Performance to Assess Effectiveness in Achieving Ground Water Cleanup Levels Southeast and Downgradient of Dam No. 1

Performance monitoring will be conducted downgradient of the historic tailing spill area (southeast of Dam No. 1) to assess the effectiveness that piping of irrigation water in the eastern diversion channel has on reducing COC concentrations in ground water to cleanup levels in the area of monitoring wells MW-4 and MW-17. The performance monitoring program will be developed during remedial design.

Monitor Remedy Performance to Assess Effectiveness in Achieving Ground Water Cleanup Levels Downgradient of Dam No. 4 and Dam No. 1 in the Alluvial and Bedrock Aquifers

Performance monitoring will be conducted downgradient (south and west) of Dam No. 4 and (south) Dam No. 1 to assess the effectiveness of the remedial actions on reducing COC concentrations in ground water to cleanup levels in the alluvial and basal bedrock aquifers. Monitoring will include all seeps and springs in these areas. The performance monitoring program will be developed during remedial design.

Monitor Performance of Store and Release/Evapotranspiration Cover System to Assess Effectiveness in Reducing Infiltration to Levels that allow Dewatering of Tailing Piles and Attainment of Ground Water Cleanup Levels

Performance monitoring will be conducted to assess if the store and release/ evapotranspiration cover system has the capacity to limit net percolation by storing precipitation solely within the non-acid generating cover system for a period long enough for water to be removed by evaporation and transpiration and that any net percolation will not cause an exceedance of ground water standards.

A performance criterion will be developed during the remedial design phase for the store and release/evapotranspiration cover system to achieve the remedial action objectives for the Tailing Facility Area. This criterion will focus on reducing net percolation through the non-acid generating cover system to a level that would allow attainment of ground water remediation goals and be protective of ground water.

Monitor Metals Uptake in Plant Tissue

Monitoring will be conducted to quantify and qualify metals uptake (including molybdenum uptake) by plants growing on the cover material at the tailing facility. Such monitoring will include measuring concentrations of metals in plant tissue co-located with media samples (*e.g.,* soil, tailing). Such monitoring will be performed at least once every five years for evaluation as part of the CERCLA five-year review. Metals uptake to plants shall not be at levels such that inhibits attainment of revegetation success standards, inhibit the success of the store and release/evapotranspiration cover, or exceeds risk-based concentrations for herbivorous native wildlife. Examples of some parameters likely to require field monitoring on a five-year basis include cover material molybdenum concentrations, plant molybdenum concentrations, and revegetation success.

Monitor Tailing Piles to Provide Early Detection of Acid Generation and Metals Leaching

An early detection monitoring program will be performed within and at the margins of the tailing piles to provide early detection of any potential acid generation and metal leaching. These monitoring programs will be developed during the remedial design.

Perform Monitoring and Maintenance of Tailing Dams

The collection of quarterly piezometer data and performance of annual inspections of the tailing facility dams to meet requirements of the New Mexico Office of the State Engineer will be part of the Selected Remedy until it is demonstrated that the tailing dams have been dewatered.

Continue Ground Water Monitoring and General Site Maintenance

Ground water monitoring and general site maintenance will continue. However, the monitoring program will be reassessed during the remedial design and modified if required by EPA. The ground water monitoring program will, at a minimum, be consistent with the monitoring requirements of Ground Water Discharge Permit DP-933 and include all wells at the Tailing Facility Area. The ground water monitoring program may include additional monitoring wells if deemed appropriate by EPA. Seeps and springs will also be monitored. Radionuclides (*e.g.*, uranium, thorium) will be added to the list of analytical parameters to be monitored. General maintenance of the tailing facility will be continued during operation and after closure. This will consist of grading of roads and maintenance of structures, including the dams, as appropriate.

12.2.4 Red River and Riparian and South of Tailing Facility Area

The Selected Remedy includes the following alternative for the Red River, Riparian, and South of Tailing Facility Area:

- **Subalternative 3B** – Removal of Soil and Tailing Spill Deposits and On-Site Disposal

The major components of the response action are described in detail below. Response actions to address contamination in the Red River are being conducted as part of the Mine Site Area component of the Selected Remedy.

Excavate Soil Contaminated with Molybdenum South of Tailing Facility and Tailing Spill Deposits along the Red River Riparian Corridor, including Large Tailing Pile at Lower Dump Sump

Tailing spill deposits will be excavated to a depth where tailing is no longer visible. The estimated total area containing tailing spill deposits is approximately 3 acres. The volume of tailing spill deposits requiring excavation is estimated to be 3,800 yd^3, the majority of which is located at the Lower Dump Sump. For the smaller individual tailing deposit locations, excavation will be conducted by hand (*i.e.,* using a shovel). For larger areas, excavation will include the use of a frontend loader. Due to the location of the tailing deposits along the Red River riparian corridor, site-to-site relocation (*i.e.,* mobilization and demobilization) may be required in order to move and setup between deposit locations.

For the area south of the tailing facility, approximately 8 acres will be excavated and backfilled with clean alluvial soil. The area requiring excavation is depicted on Figure 12-29. Contaminated soil will be removed initially to a depth of approximately 2 feet. Confirmation soil sampling will be conducted to determine if cleanup levels have been attained. If not, additional soil will be excavated until cleanup levels are met or an EPA acceptable depth has been reached. Based on an excavation depth of 2 feet, the estimated volume of soil requiring excavation is approximately 26,000 yd^3.

Administrative coordination with private landowners will be performed to obtain the necessary access approvals for the area south of the tailing facility, and with federal land management agencies (*e.g.,* U.S. Forest Service) and land owners along the riparian corridor. Coordination will also be performed with the New Mexico Department of Game and Fish during design and construction to establish and implement best management practices for ensuring minimal physical damage or destruction of native riparian vegetation by dewatering and soil removal activities.

Dewater Soil in Area South of the Tailing Facility and Stabilize Excavated Soil

Removal of contaminated soil will require site preparation prior to construction because of the shallow water table and boggy nature of the area. The area may have to be dewatered using shallow trenches.

Due to the wet nature of the excavated soil, dewatering will be performed. Excavation may be performed with a dragline and soil stockpiled in a temporary bermed area lined with a geosynthetic liner and allowed to dewater. Soil stabilizers may be added to the excavated material to aid in handling, loading, and transport.

Transport and Dispose Excavated Soil and Tailing at the Tailing Facility

The excavated and dewatered soil/tailing will be transported and placed in an impoundment at the tailing facility. On-site disposal at the tailing facility must occur prior to cover placement at the facility.

Backfill Excavation with Alluvial Soil

The source of fill material is the alluvial borrow area in the northern portion of the tailing facility. The alluvial fill will be appropriately screened prior to transport to the area south of the tailing facility where it will be placed and revegetated.

The tailing spill excavations will also be backfilled with clean alluvial soil and revegetated, if needed.

Any woody riparian vegetation that is removed or damaged during construction activities will be replaced at a ratio that will restore the native riparian area to pre-impacted and pre-construction conditions.

Perform Physical, Chemical and Biological Monitoring of Red River to Assess Effectiveness of Response Actions at Mine Site Area on Improving Red River Surface Water Quality and Protecting Aquatic Life

The physical, chemical and biological characteristics of the Red River will be monitored periodically (at least once every five years) to assess the effectiveness of response actions to be performed at the Mine Site Area on improving Red River surface water quality and protecting aquatic life.

12.2.5 Eagle Rock Lake

The Selected Remedy includes the following alternative for Eagle Rock Lake:

- **Subalternative 3B** – Inlet Storm Water Controls; Dredge Sediment and On-Site Disposal

The major components of the response action are described in detail below. Coordination will be performed with the U.S. Forest Service and New Mexico Department of Game and Fish on all remedial design and construction activities for Eagle Rock Lake. . In light of the ongoing plans to re-construct the dam at Cabresto Lake, also located within the Questa Ranger District, the remedial actions at Eagle Rock Lake will be timed and coordinated with the Ranger District, if at all possible, such that one of the lakes remains available to the public for recreational use. These two lakes provide the only flat water fishing opportunities easily accessible to local residents and visitors alike.

Install Inlet Controls to Manage Storm Water Entering the Lake

Inlet controls will be installed to manage storm water entering the lake. Engineering controls will be included on the inlet structure to the lake to reduce the sediment load from entering the lake during storm events or other high-flow conditions that entrain sediment in the river. Flows into Eagle Rock Lake range from approximately 100 to 400 gpm. Storm events generate a considerable sediment load in the river that originates from drainages upstream of the mine site, and controls on the inlet will be designed to close the headgate if the sediment load increases. Closing the headgate will be accomplished through the use of specific conductance and turbidity probes that monitor the river water and close the headgate if prescribed values are exceeded.

The source of water for the lake is a headgate that diverts water from Red River. The headgate is located approximately 300 feet east (upstream) of the lake inlet (Figure 12-30). The headgate consists of a 24-inch-diameter slide gate that is manually operated. The headgate is fastened to a concrete diversion structure on the north side of the river. The existing headgate will be replaced with a new slide gate with an electronic actuator and motor to operate the gate. The electronic actuator operates on 110 volts. The nearest electrical power source is a light pole that is approximately 600 feet west of the headgate. If this power source is utilized, an electrical cable will likely be installed from the light pole to the headgate and connected to the motor through an aboveground electrical control box.

Specific conductance and turbidity probes will be installed in a stilling well near the headgate to continuously monitor the river water. If values that are indicative of high sediment load in the river are reached, the headgate will be activated and closed to prevent the sediment-laden water from entering the lake.

Specific conductance values of the river near Eagle Rock Lake generally range from 200 to 300 microSiemens per centimeter (µS/cm). Sampling of the river during storms reveals that the specific conductance can increase from 400 µS/cm to as much as 700 µS/cm. The turbidity of the river water is another measure of the sediment load that will be used in combination with the specific conductance. Review of the historical turbidity values of the river near the lake shows that the turbidity generally ranges from 5 to 20 nephelometric turbidity units (NTUs) during typical low-flow conditions. The turbidity of the river water during storm events was measured to be as high as 300 NTU. Based on the available measurements, a specific conductance greater than 400 µS/cm and/or turbidity greater than 30 NTU are indicative of high sediment load in the river and are selected as preliminary "trigger" values to activate and close the headgate to prevent sediment-laden water from entering the lake. Final trigger values will be determined in the remedial design phase.

Dredge and Dewater Sediment

Dredging and dewatering of lake-bottom sediment will be performed. Two types of dredging are available: (1) hydraulic dredging from a barge, or (2) drainage of the lake to allow the sediments to dewater, followed by excavation of the sediment. Hydraulic dredging is selected because it will have less impact to the lake and recreational use of the lake. Additionally, this type of dredging will be quicker than draining and excavating sediment, since the sediment may take several months to naturally dry to a point where it can be excavated.

Hydraulic dredging to remove the sediment will be performed from a barge. The depth of sediment dredging will be approximately three feet. The sediment will be pumped to a staging area near the lake. The staging area will need to be of sufficient size to temporarily impound the dredged sediment. A temporary berm will be constructed around the staging area to contain the sediment. The sediment will then be mechanically dewatered by a hopper in the staging area to facilitate drying. Excess water will be temporarily impounded then allowed to flow back into the lake. Sediment will be allowed to dry in the staging area until an appropriate moisture is reached that will allow for haulage and disposal.

Coordination will be performed with the New Mexico Department of Game and Fish and the Red River State Fish Hatchery prior to the start of dredging activities for possible fish salvage and/or opportunities for potential enhancements to fish habitat.

Transport and Dispose Excavated Sediment at an Appropriate On-Site Facility

Once dewatered, the dredged sediment will be transported to and disposed of in an appropriate on-Site facility. Approximately 15,000 yd^3 of dewatered sediment, based on a 3-foot depth of dredging over the 3-acre lake, will be disposed. Cells similar to the ones to be constructed at the mine site for the water treatment plant filter cake and sludge will be used to contain this sediment. It is estimated that each cell would contain approximately 7,500 yd^3. Therefore, two cells would be needed for the sediment.

Perform Physical, Chemical and Biological Monitoring to Assess Long-Term Effectiveness of Eagle Rock Lake Remediation

Physical, chemical and biological monitoring will be performed to assess the long-term effectiveness of the sediment remediation and inlet storm water controls at Eagle Rock Lake to reduce levels of contamination in lake sediment and protect the benthic macroinvertebrate population. Monitoring will include macroinvertebrate diversity and abundance. It will also include monitoring the continuing performance and integrity of the inlet storm water controls in preventing contamination from entering the lake during storm and other high-flow events.

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Shaw® Shaw Environmental, Inc.

Subject: **Draft Final Minutes, Monthly Managers Meeting, Longhorn Army Ammunition Plant (LHAAP)**

Location of Meeting: Region 6, USEPA, Dallas, Texas
Date of Meeting: October 25, 2006, 1:30 – 4:30 PM

Meeting Participants:

BRAC:	Rose M. Zeiler
USACE-Tulsa:	Cliff Murray, Rick Smith
USACE – Fort Worth:	Beverly Post
USAEC:	Jeff Armstrong (phone)
USFWS:	Paul Bruckwicki
Shaw Environmental:	Praveen Srivastav
	Phone: Dave Cobb, John Elliot, Kay Everett, Greg Jones, Van Vangala, Susan Watson, Tarek Ladaa
USEPA Region 6:	Chris Villarreal, Scott Harris, George Malone (EPA Legal)
TCEQ:	Fay Duke, Dale Vodak (phone)

Prior to the meeting Shaw and Army had distributed copies of the meeting agenda, minutes of September 26, 2006 Monthly Managers' Meeting, and document status tables for the TERC and PBC work via e-mail.

Rose Zeiler opened the meeting and welcomed those in attendance and those joining on the phone. There was a review of the September Meeting Minutes and Action Items.
Dr. Zeiler went through the list of action items from the previous monthly managers' meeting. Below are the highlights of this discussion:

- **Army – Provide MMRP report to EPA when available** - Beverly Post indicated MMRP report should be available for EPA review any day.
- **EPA – Provide input on the use of TCRA for remedial action at LHAAP-50 and similar sites:** Chris Villarreal invited George Malone, EPA Legal, to discuss the use of TCRA for remedial action at LHAAP-50. The summary of the discussion is as follows:
    - The Army is the lead agency and can conduct removal actions under the DOD CERCLA Removal Authority with EPA in an observatory role.

  - Factors considered while implementing a removal action include: (a) administrative record; (b) length of time available before removal action, i.e. urgency of the situation; (c) action memorandum documenting need for removal action; (d) EE/CA, TCRA action memorandum, and TCRA execution do not require approval by EPA, however, sampling and analysis plan (SAP) will need EPA approval; (e) a No Action ROD will be required to delist the site from NPL
  - Groundwater responses are typically considered long-term remedial responses that are not suited for removal actions. They require traditional CERCLA response with RI/FS and ROD
  - To a question from Jeff Armstrong regarding the use of treatability study to remediate perchlorate sites, GM replied that treatability studies are typical not considered remedial actions and would still require RI/FS and ROD before the site is de-listed.
  - JA stated that AEC attorneys may want to discuss with EPA attorneys. JA asked if they could contact GM. GM provided his contact information.

- **Shaw –Provide chromium results for LHAAP-12 and LHAAP-48, perimeter well sampling results, and MNA sampling results at the next monthly managers' meeting.** These action items refer to material presented during the October 25 meeting.

Defense Environmental Restoration Program (DERP) PBC Update (Dave Cobb)

Field Activities Update. Shaw completed the field work in September 2006 at LHAAP-03, -04, -06, -07, -29, -51, -55, -64, and -68. Data is coming in. Shaw is currently providing documentation to the USACE for completion of field activities. Sampling for the BERA was completed in the first part of October 2006. Samples are currently being analyzed. Toxicity tests are underway. A first draft to Army is planned for the first week of December 2006.

Document Status. PBC document status table was provided to the participants. The GWTP optimization memorandum is in comment resolution stage.

GWTP. Van Vangala provided an update on the GWTP operation. The plant is performing as usual. 936,000 gallons of groundwater from LHAAP-18/24 were treated. 20,000 gallons of groundwater from LHAAP-16 were treated. The drought-like conditions are affecting operations. In August 2006, 26,000 pounds of waste were shipped off site. In August 2006, perchlorate exceeded discharge parameters. A nutrient feed pump failed on Saturday (October 22) and was replaced. System took a couple days to restabilize. Perchlorate exceeded daily maximum because of the pump failure. The water was sprinkled at the burning ground on the days of exceedance. Shaw will estimate the volume of water discharged during the time of exceedance and report in the next monthly report. A new tractor is available and kept on site to assist in moving sludge and drums around, for bush-hogging, and mowing grass. Freeboard is about 2 feet. No rain, so in last quarter no water was discharged to Harrison Bayou.

BERA. Shaw is planning to submit the BERA report in two parts. The first part will cover the sections up to Step 3 and the second part will present field and toxicity data and steps beyond.

Shaw® Shaw Environmental, Inc.

Subject: **Draft Final Minutes, Monthly Managers Meeting, Longhorn Army Ammunition Plant (LHAAP)**

Location of Meeting: Shaw offices, Houston, Texas
Date of Meeting: **April 4, 2007, 08:00 PM – 11:30 PM**
Post IAP Work Shop

Meeting Participants:

BRAC:	Rose M. Zeiler
USACE-Tulsa:	Cliff Murray, John Lambert, Rick Smith
USAEC	Jeff Armstrong
Shaw Environmental:	Dave Cobb, Praveen Srivastav, John Elliott, Van Vangala, Kay Everett, Greg Jones, Frank Eidson, Amar Bumb (phone)
USEPA Region 6:	Steve Tzhone, Scott Harris (phone), Raji Josiam (phone)
TCEQ:	Fay Duke
USFWS:	Paul Bruckwicki, Barry Forsythe

Prior to the start of the meeting, Jeff Armstrong led a discussion on some funding issues regarding TERC and MMRP. He mentioned that the AEC has earmarked money for MMRP for this fiscal year. Rose Zeiler stated that Shaw's rate adjustment on the TERC task order has resulted in the overall cost for the task order to be higher than previously known. This may make it difficult to complete the scope of work with available funds. Rick Smith said that money can be added to the Longhorn TERC task order with a modification as long as the scope of work does not change.

Rose Zeiler asked Steve Tzhone if a NFA ROD can be submitted for the MMRP sites following an NTCRA Action Memorandum without having to go through a proposed plan. Steve Tzhone said he would check on this. He further added that while the Action Memo can normally be the final decision document, LHAAP is an NPL site and may require a ROD because of that. Rose said that Army requires a ROD after a removal action for NPL sites. Praveen Srivastav asked how the use of a non-TCRA was justified for MMRP work. Rose responded that UXO was a safety issue, especially with the public asking for access. It is within DOD's removal authority. Praveen asked if Army legal may foresee a problem using non-TCRA. Jeff Armstrong replied that this approach can be used in other places if successful and they were moving very carefully through this process.

Shaw® Shaw Environmental, Inc.

Subject: **Draft Minutes, Monthly Managers Meeting,
Longhorn Army Ammunition Plant (LHAAP)**

Location of Meeting: Teleconference
Date of Meeting: May 15, 2007, 01:00 PM – 4:30 PM

Meeting Participants:

BRAC:	Rose M. Zeiler
USACE-Tulsa:	John Lambert
USAEC	Jeff Armstrong
Shaw Environmental:	Dave Cobb, Praveen Srivastav, John Elliott, Van Vangala, Kay Everett, Greg Jones, Jon Lindberg, Amar Bumb
USEPA Region 6:	Steve Tzhone, Scott Harris, Mike Overbay, Gary Miller
TCEQ:	Fay Duke, Dale Vodak
USFWS:	Paul Bruckwicki
USGS:	Kent Becher, Phil Harte

Action Items from April 2007 Manager's Meeting

Army Action Items

- **Forward MMRP report to EPA and TCEQ when available.** The MMRP report was forwarded to EPA and TCEQ.
- **Utility easement transfer status.** The utility easement transfer status was discussed. Army indicated that the easement would be transferred to FWS when details are worked out.

Shaw Action Item

- **Provide additional information on LHAAAP-16 to TCEQ.** Shaw provided additional information on LHAAP-16 to TCEQ.

EPA Action Item

- **Steve Tzhone to determine if a proposed plan and public comment period is required with an NFA ROD that follows implementation of an Action Memorandum and EE/CA that had already undergone public review.** Steve indicated that an NFA ROD will still need to have a proposed plan with public review, but that those do not have to be complicated.

Army Response
EPA Region 6 Legal Comments dated August 31, 2011
LHAAP-001-R and LHAAP-003-R Draft Final ROD (August 2011)

1) The ROD needs to be specific that it is an institutional controls/LUCs ROD, and not imply that it is a no action ROD. As written, the draft ROD does not purport to select LUCs as the selected remedy, but instead, selects no action when it is fairly clear that the long-term implementation of LUCs is the selected remedy for the LHAAP MMRP Sites. It is not permissible to use the removal program to circumvent compliance with remedial action selection requirements. In other words, long-term LUCs are remedial actions, not removal actions. Thus, long-term LUCs should be selected remedial actions to be properly documented in the ROD (see below comments) so that EPA, if necessary, can take an enforcement action against the Army for failure to properly implement and enforce LUCs.

Response: Section 1.3 of the document clearly describes the remaining remedy as LUCs and limited groundwater monitoring. The document also makes clear that a removal action has already occurred. The document will clarify that the selected remedy is a removal action with LUCs and limited groundwater monitoring. The statutory determination in Section 1.4 will be corrected to state that the ROD selects the stated remedy and that the selection is statutorily compliant. The EE/CA fulfilled the statutory requirement for an FS because it evaluated the risks posed, identified, compared, and contrasted remedies and selected the removal action with LUCs. Army solicited public comment and coordinated repeatedly on the removal action approach at these sites and the type of documentation that would be required by EPA. Please see attached meeting minutes – 2 documented instances – in which EPA Region VI (George Malone and Steve Tzhone) stated that a no (further) action ROD would be appropriate after a removal action – a removal action conducted under Army's CERCLA Removal Action Authority. However, at this late date and in an attempt to move forward with this document, Army agrees to EPA's requested change and will edit the terminology used in the ROD to indicate that it is NOT a no action ROD, but is a ROD with LUCs.

2) This draft ROD states "this decision presents the continued land use controls (LUCs) already in place as a result of removal actions at ... in 2008." However, the LUCs at the Site do not appear to be incorporated into an enforceable mechanism (*although the Army could enforce a LUC per a future property transfer agreement, EPA has no mechanism to take an enforcement action against Army for failure to implement and enforce LUCs

under a removal action). Also, the LUCs have not been recorded in the deed records for the Site per the language provided in the draft ROD.

Response: The LUCs were presented in the Removal Action work plan and included the LUC design and LUC plan that were approved by EPA. The recordation is that of a notice, rather than a use restriction. There is no deed because there is no change in ownership with transfer of administrative control from one federal agency to another. The letter of transfer includes the environmental protection provisions of the Environmental Condition of Property (ECP), a document that will be provided to EPA for review prior to transfer. Per GSA regulations, the United States cannot place encumbrances upon federal property. Even if such were allowed, both the servient estate subject to the restriction and the dominant estate with the right to enforce the restriction would be the same estate – the United States. Such are void as restrictions. Therefore the LUCs will not be "enforceable" in manner desired by the commenter, unless the property encumbered by the restrictions is transferred into private ownership, an occurrence that is not reasonably foreseeable.

Although it was Army's intention to record the LUC notice after finalization of the Removal Action Report, EPA Region 6 stated that the recordation should wait until after the ROD was signed.

In response to this change in EPA's position, Army will undertake recordation of the LUC notice in the county on the 15th of September 2011.

3) In light of the fact that institutional controls are basically the sole remedy here (*note: 40 C.F.R. § 300.430(a)(1)(iii)(D) makes it clear that, while not preferred, institutional controls may serve as the sole remedial action selection under certain circumstances (e.g., active measures are determined impracticable)) , the Army's ROD should include language clearly identifying the LUCs/institutional controls; clearly identifying the purposes of the controls or why they are needed; clearly delineating who is responsible for implementing, enforcement, monitoring, reporting on, and notifying stakeholders concerning the LUCs in place, and events that impact the LUCs; and address the LUC/IC checklist items 1-9 (*see recent comments from EPA HQ LUC team on LHAAP-16, LHAAP-17, LHAAP-29). The ROD should also include language stating that the details and description of the LUCs and the roles/responsibilities will be included in the remedial design workplan.

Response: LUCs are not the sole remedial action (removal action) at these sites. MEC clearance was conducted and signs were installed at both

sites, visible one to the next. Because it was determined that a guarantee of 100% clearance cannot be made in the event a single MEC item remains, LUCs were selected by Army and such selection was approved by EPA.

The ROD will be revised to include language stating that the details and description of the LUCs and roles/responsibilities can be found in the approved LUC design and plan.

4) This draft ROD does not include the necessary analysis required under the NCP to constitute a CERCLA remedial action decision. The no action alternative, and nine remedy selection criteria analysis will have to be addressed in the ROD in order to satisfy the CERCLA remedy selection and decision document requirements found in the NCP. As such, the following sections should be included in this ROD: Assessment of the Site; ROD Data Certification Checklist; Remedial Action Objectives; Description of Alternatives; Comparative Analysis of Alternatives; Principle Threat Waste; Selected Remedy; and Statutory Determinations. Also, the long-term and permanent use of ICs/LUCs require compliance with the remedial action selection criteria (i.e., Threshold, Primary, and Modifying Criteria). The long-term effectiveness and permanence of ICs and LUCs are included under the Primary Criteria.

Response: See response to Comment 1. The document will be revised to include the nine selection criteria along with the no action alternative and the format of the ROD will be changed accordingly.

5) The administrative record should reflect that an RI/FS or a munitions constituents (MC), debris (MD) and munitions and explosives of concern (MEC) investigation, and a Risk Hazard Assessment for MEC and MC were conducted. The above information should be found in the administrative record which forms the basis for the selection of the selected remedy. A Risk Hazard Assessment should provide important insight concerning the risks presented by the Site if no remedial action, including institutional controls, is applied to the Site.

Response: The EECA containing this information is in the Administrative Record – 2008.

6) The remedy seems like it should also include engineered controls/engineered LUCs such as fencing. Pursuant to the removal action performed, it is clear signs have been installed to warn people that explosive hazard materials and unexploded ordnance (UXO) may remain in certain areas. Although MEC and explosive hazard materials were located

and removed from the Sites, these areas should be fenced because MEC and explosive hazard materials may remain at the LHAAP MMRP Sites. Any fencing should also have a plan (i.e., an O&M Plan) establishing a process for the protection and maintenance of the fencing in light of the fact that this property will more likely than not be transferred to the U.S. Fish and Wildlife Service.

Response: Because a clearance has been completed, DoD considers the probability of encountering additional MEC items at the site to be low. The signs, while not required after a removal action, have been provided as an additional layer of protection. Coordination among stakeholders, including EPA, was conducted at all phases of the MMRP work. Considerable discussion on the LUC approach at Longhorn was undertaken by EPA at all levels. The LUCs presented in the Action Memorandum were followed up in the Removal Action work plan that included the LUC design and a LUC plan and these did not include fencing. These documents have undergone EPA review and approval.

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DEPARTMENT OF THE ARMY
HEADQUARTERS, U.S. ARMY ARMAMENT, MUNITIONS AND CHEMICAL COMMAND
ROCK ISLAND, ILLINOIS 61299-6000

REPLY TO
ATTENTION OF

AMSMC-GCS (R) (27-1a) 11 September 1991

MEMORANDUM FOR Commander, Longhorn Army Ammunition Plant, ATTN:
SMCLO-EN, Marshall, TX 75671-2462

SUBJECT: Final CERCLA 120 Agreement for Longhorn Army Ammunition Plant

1. Forwarded herewith is the Final CERCLA Section 120 Agreement which has been executed by Deputy Assistant Secretary Walker. Please proceed, as soon as possible, in obtaining the signatures of the remaining parties. Please note that the signature block for the Commander must be corrected.

2. After all parties have executed this Agreement, please return a completed copy to this office.

3. The points of contact are Piper Fuhr and Joe Kang, AMSMC-GCS (R), DSN 793-4051.

FOR THE COMMANDER:

Don E. Lappin

Encl

DON E. LAPPIN
Chief, General Law/
Congressional Affairs Division

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 6
AND THE
UNITED STATES DEPARTMENT OF THE ARMY
AND THE
STATE OF TEXAS

IN THE MATTER OF:

The U.S. Department
of the Army

LONGHORN ARMY AMMUNITION PLANT

FEDERAL FACILITY AGREEMENT UNDER CERCLA SECTION 120

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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 6
AND THE
UNITED STATES DEPARTMENT OF THE ARMY
AND THE
STATE OF TEXAS

IN THE MATTER OF:	)	FEDERAL FACILITY AGREEMENT
	)	
The U.S. Department of the Army	)	PURSUANT TO CERCLA §120
	)	
	)	ADMINISTRATIVE DOCKET
LONGHORN ARMY AMMUNITION PLANT	)	NUMBER: CERCLA VI-
	)	

Based on the information available to the United States Environmental Protection Agency (EPA), the United States Department of the Army (the Army) and the State of Texas (by the Texas Water Commission [TWC]) (the Parties) on the effective date of this Federal Facility Agreement (Agreement), and without trial or adjudication of any issues of fact or law, the Parties agree as follows:

I. DETERMINATIONS

These Determinations are not admissions by any Party and they are not legally binding on any Party as to claims which are unrelated to this Agreement or claims of any persons not a party to this Agreement.

The Parties have determined that:

A. The Longhorn Army Ammunition Plant constitutes a "facility" as that term is defined in Section 101(9) of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), 42 U.S.C. §9601 (9).

B. The Longhorn Army Ammunition Plant constitutes a "federal facility" within the meaning of CERCLA Section 120, 42 U.S.C. §9620 and is subject to the rules and regulations specified therein.

C. The Army constitutes a "person" as that term is defined in CERCLA Section 101(21), 42 U.S.C. §9601(21).

D. The Army is an "owner or operator" as that term is defined in CERCLA Section 101 (20), 42 U.S.C.§9601 (20), and the Army "owns or operates" the Longhorn Army Ammunition Plant within the meaning of CERCLA Section 107 (a)(2), 42 U.S.C §9607 (a)(2).

E. The presence of "hazardous substances" as that term is defined in CERCLA Section 101 (14), 42 U.S.C. §9601 (14), in the groundwater at the Longhorn Army Ammunition Plant constitutes a "release" as that term is defined in CERCLA Section 101 (22), 42 U.S.C. §9601 (22).

F. The actions to be taken pursuant to this Agreement are reasonable and necessary to protect the public health, welfare and the environment.

II. SCOPE OF AGREEMENT

A. This Agreement is intended to cover the investigation, development, selection, and implementation of response actions for all releases or threatened releases of hazardous substances, contaminants, hazardous wastes, hazardous constituents, or pollutants from the Longhorn Army Ammunition Plant. This Agreement covers all phases of remediation for these releases, bringing together into one agreement the requirements for remediation as well as the process to be used to determine and accomplish remediation, ensuring the necessary and proper level of participation by each Party. To accommodate remediation of any undiscovered releases, the Parties will establish timetables and deadlines as necessary and as information becomes available and, if required, amend this Agreement as needed.

B. This Agreement is intended to address the corrective action obligations, that are required under The Resource Conservation and Recovery Act (RCRA), 42 U.S.C §§6901, et. seq., which relate to the release(s) of hazardous wastes, from the Longhorn Army Ammunition Plant. This Agreement is not intended to limit any requirements under RCRA or any other law or regulation pertaining to obtaining permits or performing corrective action for hazardous or solid waste management units not specifically addressed by this Agreement. This Agreement is not intended to encompass response to spills of hazardous substances from on-going operations unless those spills occur in conjunction with CERCLA response actions conducted pursuant to this Agreement.

C. The EPA and the State agree to provide the Army with guidance and to timely respond to requests for guidance in order to assist the Army in the performance of the requirements under this Agreement.

III. PARTIES BOUND

A. This Agreement shall apply to and be binding upon the Army, all subsequent owners and operators of the Longhorn Army

Ammunition Plant , the EPA, the TWC, their successors and assigns. Each Party will notify the other Parties of the identity of contractors performing work pursuant to this Agreement. Each Party shall provide copies of this Agreement to its contractors who are performing any work pursuant to this Agreement. The Army shall notify EPA and TWC of the identity and assigned tasks of the contractors and subcontractors performing work under this Agreement in advance of their involvement in such work. The Army shall require compliance with this Agreement in any contracts that it executes pertaining to work to be performed under this Agreement.

B. The Parties are each bound by the actions of their respective employees, officers, agents, and authorized representatives, and in the case of the Army, its contractors and its subcontractors, when any of those are acting within the scope of their official duties or authority, as the case may be.

C. This section shall not be construed as an agreement to indemnify any person.

IV. PURPOSE

A. The general purposes of this Agreement are to:

1. Ensure that the environmental impacts associated with past and present activities at the Longhorn Army Ammunition Plant are thoroughly investigated and appropriate remedial action taken as necessary to protect the public health, welfare and the environment;

2. Establish a procedural framework and schedule for developing, implementing and monitoring appropriate response actions at the Longhorn Army Ammunition Plant in accordance with CERCLA, as amended, 42 U.S.C. §§9601, _et_. _seq_.; the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), 40 CFR Part 300; CERCLA guidance and policy, RCRA, as amended, 42 U.S.C. §§6901, _et_. _seq_.; EPA guidance and policy; and applicable State law; and,

3. Facilitate cooperation, exchange of information and participation of the Parties in such actions.

B. Specifically, the purposes of this Agreement are to:

1. Identify the response action alternatives for the Operable Units (OUs), which are appropriate at Longhorn Army Ammunition Plant ("LHAAP" or "the Site"), prior to the implementation of final remedial action(s) for the Site. Response action alternatives for OUs shall be identified and proposed by the Army to the other Parties as early as possible prior to the formal proposal of OUs pursuant to CERCLA, and applicable State law. This process is designed to promote cooperation among the Parties in identifying response action alternatives for each OU prior to selection of final response action(s).

2. Establish requirements for the performance of a Remedial Investigation (RI) to determine fully the nature and extent of the threat to the public health or welfare or the environment caused by the release or threatened release of hazardous substances, pollutants or contaminants at the Site; and

to establish requirements for the performance of a Feasibility Study (FS) for the Site in order to identify, evaluate, and select alternatives for the appropriate remedial action(s) to prevent, mitigate, or abate the release or threatened release of hazardous substances, pollutants or contaminants at the Site, in accordance with CERCLA and applicable State law.

3. Identify the nature, objective and schedule of response actions to be taken at the Site. Response actions at the Site shall attain that degree of cleanup of hazardous substances, pollutants or contaminants mandated by CERCLA, and applicable State law.

4. Implement the selected OU and final remedial action(s) in accordance with CERCLA and applicable State law and meet the requirements of CERCLA §120(e)(2), 42 U.S.C. §9620(e)(2), for an interagency agreement among the Parties.

5. Ensure compliance, through this Agreement, with RCRA and other applicable federal and state laws and regulations for matters covered herein.

6. Coordinate response actions at the Site with the mission and support activities at Longhorn Army Ammunition Plant.

7. Expedite the cleanup process to the extent that it is consistent with protection of human health and the environment.

8. Provide State involvement in the initiation, development, selection and enforcement of remedial actions to be undertaken at Longhorn Army Ammunition Plant, including the review of all applicable data as it becomes available and the development

of studies, reports, and action plans; and to identify and integrate State ARARs into the remedial action process.

9. Provide for operation and maintenance of any remedial action selected and implemented pursuant to this Agreement.

V. JURISDICTION

Each Party is entering into this Agreement pursuant to the following authorities:

A. The U.S. Environmental Protection Agency, Region 6 (EPA) enters into those portions of this Agreement that relate to the remedial investigation/feasibility study (RI/FS) pursuant to Section 120(e)(1) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), Pub. L. 99-499 (hereinafter jointly referred to as CERCLA), 42 U.S.C. §9620(e) (1), and Sections 6001, 3008(h) and 3004(u) and (v) of the Resource Conservation and Recovery Act (RCRA), 42 U.S.C. §§6961, 6928(h) and 6924 (u) and (v), as amended by the Hazardous and Solid Waste Amendments of 1984 (HSWA), (hereinafter jointly referred to as RCRA) and Executive Order (E.O.) 12580;

B. EPA enters into those portions of this Agreement that relate to operable units and final remedial actions pursuant to CERCLA §120(e)(2), 42 U.S.C. §9620(e)(2), RCRA §§6001, 3008(h) and 3004(u) & (v), 42 U.S.C. §§6961, 6928(h), 6924(u) & (v) and E.O. 12580;

C. The Army enters into those portions of this Agreement that relate to the RI/FS pursuant to CERCLA §120(e)(1), 42 U.S.C. §9620 (e)(1), RCRA §§6001, 3008(h) and 3004(u) & (v), 42 U.S.C. §§6961, 6928(h), 6924(u) & (v), the National Environmental Policy Act, 42 U.S.C. §4321, and the Defense Environmental Restoration Program (DERP), 10 U.S.C. §2701, <u>et seq.</u>;

D. The Army enters into those portions of this Agreement that relate to operable units and final remedial actions pursuant to CERCLA §120(e) (2), 42 U.S.C. §9620(e)(2), RCRA §§6001, 3004(u) and (v) & 3008(h), 42 U.S.C. §§6961, 6928(h), 6924(u) & (v), E.O. 12580 and the DERP, 10 U.S.C. §§2701, <u>et seq</u>.; and

E. The State of Texas, represented by the Texas Water Commission (TWC), enters into this Agreement pursuant to CERCLA §§120(f) and 121(f), 42 U.S.C. §§ 9620(f) and 9621(f), RCRA §3006, 42 U.S.C. § 6926, and the Texas Solid Waste Disposal Act, Chapter 361, Texas Health Safety Code Ann. Subchapter M, (Vernon Supp 1990). The TWC was designated the lead State agency on CERCLA matters for the State of Texas by Governor Clements by letter dated February 8, 1982 to Dick Whittington, Regional Administrator, U.S. Environmental Protection Agency, Region 6.

VI. DEFINITIONS AND ACRONYMS

A. <u>Definitions</u>:

The terms used in this Agreement shall have the same definitions as in CERCLA §101, 42 U.S.C. §9601, RCRA §1004, 42 U.S.C. §6903, 40 C.F.R. Parts 260-302, and Section 361.003 of the

Texas Health and Safety Code (Vernon Supp. 1990). If there is a conflict among the statutory definitions, the definition in CERCLA shall control. Additionally, the following terms used in this Agreement are defined as follows:

1. "Administrative record" shall mean all documents which comprise the basis for the selection of the proposed remedial action(s) pursuant to CERCLA Section 113(k), 42 U.S.C. §9613(k), and the NCP.

2. "Administrator" shall mean the Administrator of the United States Environmental Protection Agency.

3. "Army" shall mean the United States Department of the Army, including its authorized representatives, agents, successors in interest and assigns.

4. "Authorized representative" shall mean a person designated to act on behalf of a Party to this Agreement for a specific purpose, including, if so designated, contractors retained by EPA or TWC to perform work at or relating to the Longhorn Army Ammunition Plant. No contractor shall be considered an authorized representative of the Army.

5. "Community Relations Plan" shall mean a plan prepared by Longhorn Army Ammunition Plant which shall be based on community interviews, and other relevant information, specifying the interactive community relations activities that Longhorn Army Ammunition Plant intends undertaking during response actions.

6. "Construction quality assurance plan" shall mean the plan which describes the quality assurance/quality control procedures

for all remedial activities and establishes the procedures that ensure the completed remedial action satisfies all remedial design criteria, plans and specifications.

7. "Days" shall mean calendar days, unless otherwise noted.

8. "Deadline" shall be the time limitation applicable to a discrete portion of the RI/FS and RD/RA specifically established under the terms of this Agreement. If a deadline falls on Saturday, Sunday or a federal holiday, the due date shall be the next day which is not a Saturday, Sunday or a federal holiday.

9. "Document(s)" shall mean any records, reports, correspondence, or retrievable information of any kind relating to the treatment, storage, disposal, investigation, analysis, and remediation of hazardous substances, contaminants, pollutants, or hazardous constituents at or migrating from the Facility. Such terms shall be construed broadly to reflect a clear preference to share and disclose information concerning this Agreement among all Parties hereto.

10. "EPA" shall mean the United States Environmental Protection Agency, its employees and authorized representatives.

11. "Facility" shall mean the property and fixtures known as the Longhorn Army Ammunition Plant.

12. "Federal Facility Agreement" or "Agreement" shall mean this document and shall include all attachments and amendments hereto, said attachments and amendments being incorporated herein as if fully set out.

13. "LHAAP" shall mean the Longhorn Army Ammunition Plant located in Karnack, Harrison County, Texas.

14. "Operable Unit" shall mean a discrete action that comprises an incremental step toward comprehensively addressing site problems. This discrete portion of a remedial response manages migration, or eliminates or mitigates a release, threat of a release, or pathway of exposure.

15. "Parties" shall mean the Army, EPA, and the State of Texas.

16. "Proposed Plan" shall mean that document which describes the evaluation of proposed remedial action alternatives and the preferred alternative.

17. "Responsiveness Summary" shall mean the summary of oral and/or written public comments received during comment period(s) on key remedial documents, and the responses to such public comments.

18. "Schedule" shall mean the time limitations established for the completion of remedial action(s) at the Site.

19. "Site" shall mean LHAAP and all contiguous property affected by the migration of hazardous substances, pollutants, contaminants or hazardous constituents which may have been released from LHAAP.

20. "State" shall mean the State of Texas.

21. "TWC" shall mean the Texas Water Commission, its successor in interest and assigns.

22. "Timetable" shall be the collective term for all the "deadlines" established for the RI/FS and RD/RA.

B. Acronyms:

The acronyms used in this Agreement are as follows:

1. "ARAR" means a legally applicable, or relevant and appropriate requirement as that term is used in CERCLA §121(d)(2), 42 U.S.C. §9621(d)(2).

2. "CERCLA" means Comprehensive Environmental Response, Compensation and Liability Act of 1980, 42 U.S.C. §§9601, et seq., as amended.

3. "DERP" - Defense Environmental Restoration Program, 10 U.S.C. §§2701, et seq.

4. "DRC" = Dispute Resolution Committee.

5. "NCP"

6. "OU" = Operable Unit

7. "RCRA" = Resource Conservation and Recovery Act of 1976, 42 U.S.C. §§9601, et seq.

8. "RD/RA" = Remedial Design/Remedial Action.

9. "RI/FS" = Remedial Investigation/Feasibility Study.

10. "ROD" = Record of Decision.

11. "SEC" = Senior Executive Committee.

12. "TRC" = Technical Review Committee.

VII. FINDINGS OF FACT

For the purposes of this Agreement, the following summary presents facts upon which this Agreement is based. None of the facts related herein shall be considered admissions by any Party, and they are not legally binding on any party as to claims which are unrelated to this Agreement or claims of any person not a party to this Agreement.

A. The Longhorn Army Ammunition Plant (LHAAP) located in Karnack, Harrison County, Texas is owned by the United States Department of the Army.

B. LHAAP was proposed for inclusion on the National Priorities List (NPL) on July 14, 1989, 54 Fed. Reg. 29824. LHAAP became final on the NPL on August 30, 1990, 55 Fed. Reg. 35509.

C. LHAAP is an 8,493-acre tract of land located between the southwest shore of Caddo Lake and the town of Karnack, Harrison County, Texas.

D. The following areas located at LHAAP have been identified as having threatened releases of hazardous substances or pollutants or contaminants:

Unit No.	
11	Suspected TNT Burial Site at Ave.s P&Q
13	Suspected TNT Burial Site between Old and Active Landfills/Acid Dump
14	Area 54 Burial Ground
16	Old Landfill
17	Burning Ground No. 2/Flashing Area (BG2)
18	Burning Ground No. 3
24	Unlined Evaporation Pond/Rocket Motor Washout Lagoon (BG3)
29	Former TNT Production Area
12	Active Landfill
32	Former TNT Waste Disposal Plant
1	Inert Burning Grounds
	Ground Signal Test Area
27	South Test Area

E. The following hazardous substances, pollutants, or contaminants have been identified as being released or potentially released from the areas identified in paragraph D, above:

1,3 dinitrobenzene
1,3,5 trinitrobenzene
arsenic
barium
chromium
lead
methylene chloride
2,4,6 trinitrotoluene
nitrobenzene
2,4 dinitrobenzene
2,6 dinitrotoluene
zinc
1,1,1 trichloroethylene

These are hazardous substances as that term is defined in CERCLA; 40 CFR Part 302.4; pollutants as defined in 40 CFR Part 401.15 and/or 40 CFR Part 261.33; or pollutants or contaminants, as those terms are defined in CERCLA.

VIII. CONSULTATION WITH EPA AND TWC

A. Review and Comment Process for Draft and Final Documents

1. Applicability: The provisions of this Section establish the procedures that shall be used by the Army, EPA and TWC, to provide the Parties with appropriate notice, review, comment, and response to comments regarding RI/FS and RD/RA documents, specified herein as either primary or secondary documents. In accordance with CERCLA §120, 42 U.S.C. §9620, and DERP 10 U.S.C. §2705, the Army will normally be responsible for issuing primary and secondary documents to EPA and TWC. As of the effective date of this Agreement, all draft and final reports for

any deliverable document identified herein shall be prepared, distributed and subject to dispute in accordance with paragraphs B. through J. below.

The designation of a document as "draft" or "final" is solely for purposes of consultation with EPA and TWC in accordance with this Section. Such designation does not affect the obligation of the Parties to issue documents, which may be referred to herein as "final", to the public for review and comment as appropriate and as required by law.

B. General Process for RI/FS and RD/RA documents:

1. Primary documents include those reports that are major, discrete portions of RI/FS or RD/RA activities. Primary documents are initially issued by the Army in draft, subject to review and comment by EPA and TWC. Following receipt of comments on a particular draft primary document, the Army shall respond to comments received and issue a draft final primary document, subject to dispute resolution. The draft final primary document shall become the final primary document thirty (30) days after issuance, if dispute resolution is not invoked or thirty (30) days after issuance of the result of the dispute resolution process that modifies the draft final primary document.

2. Secondary documents include those reports that are discrete portions of the primary documents and are typically input or feeder documents. Secondary documents are issued by the Army in draft subject to review and comment by EPA and TWC. Although the Army shall respond to comments received, the draft secondary

documents may be finalized in the context of the corresponding primary documents. A secondary document may be disputed at the time the corresponding draft final primary document is issued.

C. Primary Reports:

1. The Army shall complete and transmit draft reports for the following primary documents to EPA and TWC for review and comment in accordance with the provisions of this Part:

(a) RI/FS Work Plan
(b) Risk Assessment
(c) RI Report
(d) Initial Screening of Alternatives
(e) FS Report
(f) Proposed Plan
(g) Record of Decision (ROD)
(h) ROD Responsiveness Summary
(i) RD Work Plan
(j) Remedial Design
(k) Remedial Action Work Plan
(l) Community Relations Plan

2. Only the draft final reports for the primary documents identified above shall be subject to dispute resolution.

3. The Army shall complete and transmit draft primary documents in accordance with the timetable and deadlines established in Section XVI (Deadlines) of this Agreement.

D. Secondary Documents:

1. The Army shall complete and transmit draft reports for the secondary documents to EPA and TWC for review and comment in accordance with the provisions of this Section. These documents specifically include the following reports and may also include such other reports as the Parties may subsequently agree to or as may be required by the ROD:

(a) Initial Remedial Action/Data Quality Objectives
(b) Site Characterization Summary
(c) Detailed Analysis of Alternatives discussion
(d) Post-Screening Investigation Work Plan
(e) Treatability Studies
(f) Sampling and Data Results
(g) 30%, 60%, 90% Draft Remedial Designs

2. Although EPA and TWC may comment on the draft reports for the secondary documents listed above, such documents shall not be subject to dispute resolution except as provided by paragraph B of this Section. The Parties shall agree to target dates for the completion and transmission of draft secondary documents.

E. <u>Meetings of the Project Managers on Development of Reports</u>: The Project Managers shall meet approximately every thirty (30) days, except as otherwise agreed by the Parties in writing, to review and discuss the progress of work being performed at the Site on the primary and secondary documents. Upon written agreement by all of the Project Managers and preparation of a written record by the LHAAP Project Manager, a teleconference may constitute the monthly meeting of Project Managers. Prior to preparing any draft report specified in paragraphs C and D above, the Project Managers shall meet to discuss the report results in an effort to reach a common understanding, to the maximum extent practicable, with respect to the results to be presented in the draft report.

F. Identification and Determination of Potential ARARs:

1. For those primary reports or secondary documents that consist of or include ARAR determinations, prior to the issuance of a draft report, the Project Managers shall meet to identify and propose, to the best of their ability, all potential ARARs pertinent to the report being addressed. TWC shall identify all potential state ARARs as early in the remedial process as possible consistent with the requirements of CERCLA §121 and the NCP. The Army shall consider any written interpretation of ARARs provided by the State. Draft ARAR determinations shall be prepared by the Army in accordance with CERCLA §121(d)(2), 42 U.S.C. §9621(d)(2), the NCP, and pertinent guidance issued by EPA and TWC, that is consistent with CERCLA and the NCP.

2. In identifying potential ARARs, the Parties recognize that actual ARARs can be identified only on a site-specific basis and that ARARs depend on the specific hazardous substances, pollutants and contaminants at a site, the particular actions proposed as a remedy and the characteristics of the site. The Parties recognize that ARAR identification is necessarily an

iterative process and that potential ARARs must be re-examined throughout the RI/FS process until a ROD is issued.

G. <u>Review and Comment on Draft Reports</u>:

1. The Army shall complete and transmit each draft primary report to EPA and TWC on or before the corresponding deadline established for the issuance of such reports established pursuant to Section XVI (Deadlines) of this Agreement.

2. Unless the Parties mutually agree to another time period in writing, all draft reports shall be subject to a thirty (30) day period for review and comment. Review of any document by EPA and TWC may concern all aspects of the report, including completeness, and include, but not be limited to, technical evaluation of any aspect of the document, and its consistency with CERCLA, the NCP and any pertinent guidance or policy issued by EPA and with applicable State law. Comments by EPA and TWC shall be provided with adequate specificity so that the Army may respond to the comment and, if appropriate, make changes to the draft report. Comments will refer to any pertinent sources of authority or references upon which the comments are based, and, upon request of the Army, EPA and/or TWC will provide a copy of the cited authority or reference. In cases involving complex or unusually lengthy reports, EPA and/or TWC may extend the thirty (30) day comment period for an additional twenty (20) days by written notice to the Army prior to the end of the thirty (30) day comment period. In appropriate circumstances, this time period may be extended an additional twenty (20) days by giving the Army, EPA and/or TWC

written notification prior to the end of the first extension period. On or before the close of the comment period, EPA and/or TWC will transmit their written comments to the Army.

3. Representatives of the Army shall make themselves readily available to EPA and TWC during the comment period for purposes of informally responding to questions and comments on draft reports. Oral comments made during such discussions need not be the subject of a written response by the Army on the close of the comment period.

4. In commenting on a draft report which contains a proposed ARAR determination, EPA and/or TWC will include a reasoned statement of whether it objects to any portion of the proposed ARAR determination. To the extent that EPA and/or TWC objects, it will explain the basis for its objection in detail and will identify any ARARs which it believes were not properly addressed in the proposed ARAR determination.

5. Following the close of the comment period for a draft report, the Army shall give full consideration to all written comments on the draft report submitted during the comment period. Within thirty (30) days of the close of the comment period on a draft secondary document, the Army shall transmit to EPA and TWC its written response to comments received within the comment period. Within thirty (30) days of the close of the comment period on a draft primary report, the Army shall transmit to EPA and TWC a draft final primary report, which shall include the Army's response to all written comments received within the comment

period. While the resulting draft final report shall be the responsibility of the Army, it shall be the product of consensus to the maximum extent possible.

6. The Army may extend the thirty (30) day period for either responding to comments on a draft report or for issuing the draft final primary report for an additional twenty (20) days by providing written notice to EPA and TWC. In appropriate circumstances, this time period may be further extended in accordance with Section XVII (Extensions).

H. <u>Availability of Dispute Resolution for Draft Final Primary Documents</u>:

1. Dispute resolution shall be available to the Parties for draft final primary reports as set forth in Section XV (Dispute Resolution).

2. When dispute resolution is invoked on a draft primary report, work may be stopped in accordance with the procedures set forth in Section XV (Dispute Resolution).

I. <u>Finalization of Reports</u>:

The draft final primary report shall serve as the final primary report if no Party invokes dispute resolution regarding the document or, if invoked, at completion of the dispute resolution process should the Army's position be sustained. If the Army's determination is not sustained in the dispute resolution process, the Army shall prepare, within not more than twenty-one (21) days, a revision of the draft final report which conforms to the results of dispute resolution. In appropriate circumstances, the time period for this revision period may be extended in accordance with Section XVII (Extensions).

J. Subsequent Modification of Final Reports:

1. Following finalization of any primary report pursuant to paragraph I. above, EPA, TWC or the Army may seek to modify the report, including seeking additional field work, pilot studies, computer modeling or other supporting technical work, only as provided in subparagraphs 2. and 3. below.

2. Any party may seek to modify a report after finalization if it determines, based on new information (i.e., information that became available, or conditions that became known, after the report was finalized) that the requested modification is necessary. A party may seek such a modification by submitting a concise written request to the Project Managers of the other Parties. The request shall specify the nature of the requested modification and how the request is based on new information.

3. In the event that a consensus is not reached by the Project Managers on the need for a modification, any party may invoke dispute resolution to determine if such modification shall be conducted. Modification of a report shall be required only upon a showing that:

(a) The requested modification is based on significant new information; and

(b) The requested modification could be of significant assistance in evaluating impacts on the public health or the environment; in evaluating the selection of remedial alternatives; or in protecting human health and the environment.

4. Nothing in this section shall alter EPA's or TWC's ability to request the performance of additional work at the Site which was not contemplated by this Agreement. The Army's obligation to perform such work must be established by either a modification of a report or document or by amendment to this Agreement.

IX. PROJECT MANAGERS AND COMMITTEES

A. Project Managers

1. On or before the effective date of this Agreement, the Army, EPA, and TWC shall each designate a Project Manager. The Project Managers shall be responsible on a daily basis for assuring proper implementation of the terms of this Agreement. In addition to the formal notice provisions set forth in Section XIV (Notification) hereof, communications among the Army, EPA and TWC on all documents, including reports, comments, and other correspondence concerning the activities performed pursuant to this Agreement, shall be directed through the Project Managers.

2. The Army, EPA, and TWC may change their respective Project Managers. Such change shall be accomplished by notifying the other Parties in writing no later than ten (10) days prior to the effective date of the change.

3. The Project Managers may meet or confer informally as often as necessary, consistent with their duties. Although the

Army has ultimate responsibility for meeting its respective deadlines or schedule, the Project Managers shall endeavor to assist in this effort by scheduling meetings to address documents, reviewing reports, overseeing the performance of all environmental monitoring at the Site, reviewing RI/FS or RD/RA progress, attempting to resolve disputes informally, and making necessary and appropriate adjustments to deadlines or schedules.

4. The Army Project Manager shall submit to the EPA and the TWC on the twentieth (20th day) of every month, for the preceding month, a monthly progress report. At a minimum, the reports shall: (1) include a summary of all results of sampling, tests, and other data received and verified by the Army during the reporting period; (2) provide a summary of all activities completed pursuant to this Agreement during the previous month as well as such actions and plans which are scheduled for the next month; and (3) describe any delays or problems that arose in the execution of the work plan during the reporting period and any steps that were or will be taken to alleviate the problems or delays. Upon mutual written agreement, the Parties may change the due date for these monthly progress reports.

5. The authority of the Project Managers shall include, but is not limited to:

(a) Taking samples and ensuring that the type, quantity and location of the samples taken by the Army are done in accordance with the terms of any final work plan;

(b) Observing, and taking photographs and making such other report on the progress of the work as the Project Managers deem appropriate subject to the limitations set forth in Section XI (Access) hereof; and

(c) Reviewing records, files and documents relevant to the work performed.

6. The Army's Project Manager or his designee shall make himself available during normal business hours to the other Project Managers. The EPA and TWC Project Managers or their designees, shall be reasonably available during normal business to each other and the Army Project Manager.

7. Each Project Manager shall be responsible for disseminating communications generated by its representative party and which pertain to response actions at the site to the other Project Managers and for distributing communications received from the other Project Managers to its respective Party.

B. Emergency Cessation of Work due to Imminent and Substantial Endangerment to Public Health or Welfare or the Environment.

The EPA or TWC Project Managers may direct the Army Project Manager to stop work whenever the EPA or TWC determines, after discussion with the Army Project Manager, that response activities covered by this Agreement may create an imminent and substantial endangerment to public health or welfare or the environment. EPA or TWC will, within twenty-four (24) hours of directing an emergency cessation of work due to imminent and substantial endangerment to public health, welfare or the environment, present the reasons therefore, in writing, to the Army. Within seventy-two (72) hours of a written request by the Army for review of any directed work stoppage, the EPA Director, Hazardous Waste Management Division, Region 6, shall determine, in writing, whether continued work stoppage is necessary to protect public health or welfare, or the environment, after meeting with the Army to discuss the potential danger to public health or welfare, or the environment and possible measures to abate or mitigate the danger. Any schedule affected by a directed work stoppage shall be extended for a period equal to the delay caused by the directed work stoppage.

C. Technical Review Committee (TRC)

1. Pursuant to 10 U.S.C. §2705(c), the Army shall establish and chair a TRC, which shall include EPA and TWC representatives, and shall invite representatives from the following organizations to serve as members of the TRC:

(a) A Local government representative; and

(b) A public representative of the local community.

2. The purpose of the TRC is to afford a forum for communication between the Parties and concerned local officials and citizens and provide a meaningful opportunity for the members of TRC to become informed and to express their opinion about significant aspects of the RI/FS and the RD/RA.

3. The chairperson shall be the Army representative to the TRC who shall schedule regular meetings of the TRC approxi-

mately every three (3) months. Regular meetings of the TRC shall be for the purpose of reviewing progress under the RI/FS or the RD/RA and discussing other matters of interest to the TRC.

X. QUALITY ASSURANCE

Subject to Section VIII, (Consultation), the following quality assurance procedures shall apply.

A. The Army shall use quality assurance, quality control, and chain of custody procedures throughout all field investigation, sample collection and laboratory analysis activities. The Army shall inform and obtain the approval of EPA and TWC in planning all sampling and analysis. The Army shall develop an operable unit or element specific Quality Assurance Project Plan (QAPP), as necessary, for review and comment as to substantive protocol equivalency by EPA and the TWC. The QAPP shall be prepared in accordance with EPA document QAMS-005/80 and applicable EPA guidance, and any and all TWC requirements.

B. In order to provide quality assurance and maintain quality control regarding all samples collected pursuant to this Agreement, the Army shall obtain the approval of EPA for methods deemed satisfactory to EPA, and shall submit all protocols to be used for sampling and analysis to EPA and the TWC for review and comment as to substantive equivalency with EPA and TWC established protocol. The Army shall also ensure that any laboratory used for analysis is a participant in a quality assurance/quality control program that is consistent with EPA and TWC guidance. Further evaluation by EPA and TWC Quality Assurance Office personnel may entail, upon request by EPA or TWC, the analysis of performance evaluation samples to demonstrate the quality of each laboratory's analytical data.

C. The Army shall also ensure that appropriate EPA and TWC personnel or their authorized representatives will be allowed access to any laboratory used by the Army in implementing this Agreement. Such access shall be for the purpose of validating sample analyses, protocols and procedures required by the RI and QAPP.

XI. ACCESS

A. Without limitation on any authority conferred on EPA and TWC by statute or regulation, EPA, TWC, or their authorized representatives, shall have the authority to enter LHAAP at all reasonable times for purposes consistent with the provisions of this Agreement, CERCLA, RCRA, and applicable State environmental law, subject to any statutory and regulatory requirements as may be necessary to protect national security. Such authority shall include, but is not limited to: inspecting records, operating logs or contracts related to the investigative and remedial work at LHAAP; reviewing the progress of the Army in carrying out the terms of this Agreement; conducting such tests as the Project Managers deem necessary; and verifying the data submitted to EPA and TWC by the Army. The Parties agree that to facilitate access to LHAAP, the Army shall provide an escort whenever EPA or TWC require access to restricted areas of LHAAP for purposes consistent with the provisions of this Agreement. EPA and TWC shall provide reasonable notice to the Army Project Manager to request any necessary escorts. EPA and TWC shall not use any camera, sound recording or other electronic recording device at LHAAP without the permission of the Army Project Manager. The Army shall not unreasonably withhold such permission. When permission is reasonably withheld, the Army shall be responsible for making alternate arrangements for any work utilizing a camera, sound recording, or other electronic device, if practicable.

B. The right to access by EPA and TWC granted in paragraph A. of this section shall be subject to those regulations as may be necessary to protect national security. Upon denying any aspect of access, the Army shall provide a written explanation, including reference to the applicable statute, within forty-eight (48) hours of the reason for the denial and, to the extent possible, provide a recommendation for accommodating the requested access in an alternate manner. The Parties agree that this Agreement is subject to CERCLA §120(j), 42 U.S.C. §9620(j), regarding the issuance of Site Specific Presidential Orders as may be necessary to protect national security.

C. All Parties with access to LHAAP pursuant to this section shall comply with the most stringent provisions of any health and safety plan developed for and applied to the Site. This specifically includes Occupational Safety and Health Administration (OSHA) and Army safety regulations. Any Party may dispute the application of any safety and health plan to the Site, pursuant to Section XV (Dispute Resolution).

D. To the extent that activities pursuant to this Agreement must be carried out on property not owned, leased, or controlled by the Army, the Army shall use its best efforts to obtain access agreements from the owners which shall provide reasonable access for the Army, EPA, and TWC and their representatives. In the event that the Army is unable to obtain such access agreement, the Army shall promptly notify EPA and TWC regarding both the lack of agreements and the Army's efforts to obtain access agreements.

XII. DATA AND DOCUMENT AVAILABILITY

A. Each Party will make all sampling results, test results or data and documents that it generates through the implementation of this Agreement available, upon request, to the other Parties, unless withholding is authorized or determined appropriate by law. If a Party withholds requested data or documents, the Party will identify the data or documents and the basis for withholding them. Sampling data will not be withheld under any circumstances.

B. At the request of EPA or TWC, the Army shall allow, to the extent practicable, split or duplicate samples to be taken by EPA or TWC or their authorized representatives of any samples collected by the Army pursuant to the implementation of this Agreement. The Army shall notify the EPA and TWC Project Managers not less than ten (10) days in advance of any scheduled sample collection activity conducted pursuant to this Agreement.

XIII. EMERGENCY ACTIONS

A. Notwithstanding any other provision of this Agreement, the Army retains the right, consistent with E.O. 12580, to conduct such emergency actions as may be necessary to alleviate immediate threats to health or welfare or the environment from the release or threat of release of hazardous substances, pollutants or contaminants at or from the Facility. Such actions may be conducted at any time, either before or after the issuance of the ROD.

B. The Army shall provide the other Parties with oral notice as soon as possible after the Army determines that an emergency action is necessary. Within seven (7) days of initiating such an action, the Army shall provide written notice to the other Parties explaining why such action is or was necessary. The notice shall contain the written bases (factual, technical, and scientific) for such action and any available documents supporting such action. Upon completion of an emergency action, the Army shall furnish written notification to EPA and TWC that the emergency action is completed. Such notice shall state to what extent, the emergency action varied from the emergency action described in the initial written notification of emergency action.

XIV. NOTIFICATION

A. All Parties shall transmit primary and secondary documents, and all notices required herein by any of the following methods: certified mail, return receipt requested; next day mail;

hand delivery; or facsimile or any other method that provides proof of delivery. If facsimile is used, the original shall be mailed within twenty-four (24) hours by any other prescribed method of sending notice. Any relevant time limitations for the receiving Party shall commence upon receipt of the document or notice by the receiving Party.

B. Notice to the individual Parties shall be provided under this Agreement at the following addresses:

1. For the Army:
Project Manager
Longhorn Army Ammunition Plant
Attn: SMCLO-EN
Marshall, Texas 75671-1059

2. For the EPA:
Project Manager
Longhorn Army Ammunition Plant
U. S. Environmental Protection Agency
1445 Ross Avenue
Dallas, Texas 75202

3. For the TWC:
Texas Water Commission
Longhorn Army Ammunition Plant-
Project Manager
Hazardous and Solid Waste Division
P. O. Box 13087
Capital Station
1700 N. Congress Avenue
Austin, Texas 78711-3087

C. Any Party may change the address for notification by giving all other parties ten (10) days prior written notification.

XV. DISPUTE RESOLUTION

A. Except as specifically set forth elsewhere in this Agreement, if a dispute arises under this Agreement, the procedures of this Section shall apply. All Parties to this Agreement shall make reasonable efforts to informally resolve disputes at the

Project Manager or immediate supervisor level. If resolution cannot be achieved informally, the procedures of this Section shall be implemented to resolve a dispute.

B. Within thirty (30) days after: (1) issuance of a draft final primary document pursuant to Section VIII (Consultation), or (2) any action which leads to or generates a dispute, the disputing Party shall submit to the Dispute Resolution Committee (DRC) a written statement of dispute setting forth the nature of the dispute, the work affected by the dispute, the disputing Party's position with respect to the dispute and the technical, legal or factual information the disputing Party is relying upon to support its position.

C. Prior to any Party's issuance of a written statement of dispute, the disputing Party shall engage the other Parties in informal dispute resolution among the Project Managers and/or their immediate supervisors. During this informal dispute resolution period the Parties shall meet as many times as are necessary to discuss and attempt resolution of the dispute.

D. The DRC will serve as a forum for resolution of disputes for which agreement has not been reached through informal dispute resolution. The Parties shall each designate one (1) individual and an alternate to serve on the DRC. The individuals designated to serve on the DRC shall be employed at the policy level (Senior Executive Service (SES) or equivalent) or be delegated the authority to participate on the DRC for the purposes of dispute resolution under this Agreement. The EPA representative on the

DRC is the Hazardous Waste Management Division Director of EPA Region 6. The Army's designated member is the Commander of LHAAP. The State representative on the DRC is the Director of the Hazardous and Solid Waste Division of the TWC. Written notice of any delegation of authority from a Party's designated representative on the DRC shall be provided to all other Parties pursuant to the procedures of Section XIV (Notification).

E. Following elevation of a dispute to the DRC, the DRC shall have twenty-one (21) days to resolve unanimously the dispute and issue a written decision signed by all parties. If the DRC is unable to resolve unanimously the dispute within this twenty-one (21) day period, the written statement of dispute shall be forwarded to the Senior Executive Committee (SEC) for resolution, within seven (7) days after the close of the twenty-one (21) day resolution period.

F. The SEC will serve as the forum for resolution of disputes for which agreement has not been reached by the DRC. The EPA representative on the SEC is the Regional Administrator of EPA Region 6. The Army's representative on the SEC is the Deputy Assistant Secretary of the Army, Environment, Safety and Occupational Health. The State's representative on the SEC is the Executive Director of the TWC. The SEC members shall, as appropriate, confer, meet and exert their best efforts to resolve the dispute and issue a written decision signed by all parties. If unanimous resolution of the dispute is not reached within twenty-one (21) days, the Regional Administrator of EPA Region 6 shall issue a written position on the dispute. The Army or TWC may, within fourteen (14) days of the Regional Administrator's issuance of EPA's position, issue a written notice elevating the dispute to the Administrator of EPA for resolution in accordance with all applicable laws and procedures. In the event that neither the Army nor the TWC elects to elevate the dispute to the Administrator within the designated fourteen (14) day escalation period, both the Army and TWC shall be deemed to have agreed with the Regional Administrator's written position with respect to the dispute.

G. Upon escalation of a dispute to the Administrator of EPA pursuant to paragraph F. above, the Administrator will review and resolve the dispute within twenty-one (21) days. Upon request, and prior to resolving the dispute, the EPA Administrator shall meet and confer with the Army's Secretariat Representative and TWC's representative to discuss the issue(s) under dispute. Upon resolution, the Administrator shall provide the Army and TWC with a written final decision setting forth resolution of the dispute. The duties of the Administrator set forth in this Section shall not be delegated.

H. The pendency of any dispute under this Section shall not affect the Army's responsibility for timely performance of the work required by this Agreement, except that the time period for completion of work affected by such dispute shall be extended for a period of time usually not to exceed the actual time taken to resolve any good faith dispute in accordance with the procedures specified herein. All elements of the work required by this Agreement which are not affected by the dispute shall continue and be completed in accordance with the applicable schedule.

I. When dispute resolution is in progress, work affected by the dispute will immediately be discontinued if the Hazardous Waste Management Division Director, EPA Region 6 (Division Director) requests, in writing, that work related to the dispute be stopped because, in EPA's opinion, such work is inadequate or defective, and such inadequacy or defect is likely to yield an adverse affect on human health or the environment, or is likely to have a substantial adverse effect on the remedy selection or implementation process. To the extent possible, EPA will consult with the other Parties prior to initiating a work stoppage request. After stoppage of work, if a Party believes that the work stoppage is inappropriate or may have potential significant adverse impacts, the Party may meet with the Division Director to discuss the work stoppage. Following this meeting, and further consideration of the issues, the Division Director will issue, in writing, a final decision with respect to the work stoppage. The final written decision of the Division Director may immediately be subjected to formal dispute resolution. Such dispute may be brought directly to either the DRC or the SEC, at the discretion of the Party requesting dispute resolution.

J. Within twenty-one (21) days of resolution of a dispute pursuant to the procedures specified in this Section, the Army shall incorporate the resolution and final determination into the appropriate plan, schedule or procedures and proceed to implement this Agreement according to the amended plan, schedule or procedures.

K. Resolution of a dispute pursuant to this Section of the Agreement constitutes a final resolution of any dispute arising under this Agreement. All Parties shall abide by all terms and conditions of any final resolution of dispute obtained pursuant to this Section of this Agreement.

XVI. DEADLINES

A. Within twenty-one (21) days of the effective date of this Agreement, the Army shall propose deadlines for completion of the following draft primary documents:

(1) RI/FS Work Plan
(2) Risk Assessment
(3) RI Report
(4) Initial Screening of Alternatives
(5) FS Report
(6) Proposed Plan
(7) Record of Decision
(8) Remedial Design Workplan
(9) Remedial Design
(10) Remedial Action Work Plan
(11) Community Relations Plan

B. Within fifteen (15) days of receipt, EPA, in conjunction with TWC, shall review and provide comments to the Army regarding the proposed deadlines. Within fifteen (15) days following receipt of the comments the Army shall, as appropriate, make revisions and reissue the proposal. The Parties shall meet as necessary to discuss and finalize the proposed deadlines. If the Parties agree on proposed deadlines, the finalized deadlines shall be incorporated into the appropriate Work Plans. If the Parties fail to agree within thirty (30) days on the proposed deadlines, the matter shall immediately be submitted for dispute resolution pursuant to Section XV of this Agreement. The final deadlines established pursuant to this paragraph shall be published by EPA, in conjunction with TWC.

C. Within twenty-one (21) days of issuance of the Record of Decision, the Army shall propose target dates for completion of draft secondary comments and deadlines for completion of the following draft primary documents:

(1) R/D Work Plan
(2) Remedial Design
(3) Remedial Action Work Plan

These target dates and deadlines shall be proposed, finalized and published utilizing the same procedures set forth in paragraph B above.

D. The deadlines set forth in this section, or to be established as set forth in this section, may be extended pursuant to Section XVII (Extensions) of this Agreement. The Parties recognize that one possible basis for extension of the deadlines for completion of the RI/FS Reports is the identification of significant new Site conditions during the performance of the remedial investigation.

XVII. EXTENSIONS

A. Either a timetable and deadline or a schedule shall be extended upon receipt of a timely request for extension and when good cause exists for the requested extension. Any request for extension by the Army shall be submitted in writing and shall specify:

1. The timetable and deadline or the schedule that is sought to be extended;
2. The length of the extension sought;
3. The cause(s) for the extension; and
4. Any related timetable and deadline or schedule that would be affected if the extension were granted.

B. Good cause exists for an extension when sought in regard to:

1. an event of <u>force majeure</u>;
2. a delay caused by another Party's failure to meet any requirement of this Agreement;
3. a delay caused by the good faith invocation of dispute resolution or the initiation of judicial action;
4. a delay caused, or which is likely to be caused, by the grant of an extension in regard to another timetable and deadline or schedule; and

5. any other event or series of events mutually agreed to by the Parties as constituting good cause.

C. Absent agreement of the Parties with respect to the existence of good cause, the Army may seek and obtain a determination through the dispute resolution process that good cause exists.

D. Within seven (7) days of receipt of a request for an extension of a timetable and deadline or a schedule, EPA and TWC shall advise the Army in writing of their respective positions on the request. Any failure by EPA or TWC to respond within the seven (7) day period shall be deemed to constitute concurrence in the request for extension. If EPA or TWC does not concur in the requested extension, it shall include in its statement of nonconcurrence an explanation of the basis for its position.

E. If there is consensus among the Parties that the requested extension is warranted, the Army shall extend the affected timetable and deadline or schedule accordingly. If there is no consensus among the Parties as to whether all or part of the requested extension is warranted, the timetable and deadline or schedule shall not be extended except in accordance with a determination resulting from the dispute resolution process.

F. Within seven (7) days of receipt of a statement of nonconcurrence with the requested extension, the Army may invoke dispute resolution.

G. A timely and good faith request for an extension shall toll any assessment of stipulated penalties or application for judicial enforcement of the affected timetable and deadline or schedule until a decision is reached on whether the requested extension will be approved. If dispute resolution is invoked and the requested extension is denied, stipulated penalties may be assessed and may accrue from the date of the original timetable, deadline or schedule. Following the grant of an extension, an assessment of stipulated penalties or an application for judicial enforcement may be sought only to compel compliance with the timetable and deadline or schedule as most recently extended.

XVIII. FORCE MAJEURE

A <u>force</u> <u>majeure</u> shall mean any event arising from causes beyond the control of a Party that causes a delay in or prevents the performance of any obligation under this Agreement, including, but not limited to, acts of God; fire; war; insurrection; civil disturbance; explosion; unanticipated breakage or accident to machinery, equipment or lines of pipe despite reasonably diligent maintenance; adverse weather conditions that could not be reasonably anticipated; unusual delay in transportation; restraint by court order or order of public authority; inability to obtain, at reasonable cost and after exercise of reasonable diligence, any necessary authorizations, approvals, permits or licenses due to action or inaction of any governmental agency or authority other than the Army; delays caused by compliance with applicable statutes or regulations governing contracting, procurement or acquisition procedures, despite the exercise of reasonable diligence; and insufficient availability of appropriated funds, if the Army shall have made timely request for such funds as part of the budgetary process as set forth in Section XXVIII (Funding). A <u>force majeure</u> shall also include any strike or other labor dispute, whether or not within the control of the Parties affected thereby. A <u>force majeure</u> shall not include increased costs or expenses of Response Actions, whether or not anticipated at the time such Response Actions were initiated.

XIX. SELECTION, DESIGN AND IMPLEMENTATION OF REMEDIAL ACTIONS

A. The Parties agree to perform the tasks, obligations and responsibilities described in this Section in accordance with CERCLA and CERCLA guidance and policy; the NCP; pertinent provisions of RCRA and RCRA guidance (consistent with Section XX, "Statutory Compliance/RCRA-CERCLA Integration"); Executive Order 12580; applicable State laws and regulations; and all terms and conditions of this Agreement including documents prepared and incorporated in accordance with Section VIII, (Consultation).

B. Following finalization of the RI/FS, the Army shall submit to EPA and the TWC a Proposed Plan, which describes the preferred remedial action and reviews the screening of alternatives. Following consultation with EPA and TWC, the Proposed Plan is subject to public comment in accordance with Section XXX (Public Comment).

C. Within thirty (30) days of the close of public comment, the Army shall submit to EPA and TWC a Responsiveness Summary and a draft Record of Decision (ROD). Following consideration of any comments by TWC, the ROD will be finalized jointly by the Army and EPA, or if they are unable to reach agreement about the selection of the remedial action, by the EPA Administrator.

D. Upon finalization of the ROD, the Army shall submit the remedial design schedule to EPA and TWC in accordance with Section XVI (Deadlines). The remedial design schedule shall propose timeframes for completion of the Remedial Design Work Plan and the final Remedial Design Documents.

E. The Army shall submit the Remedial Design Work Plan to EPA and the TWC for review and comment in accordance with Section XVI (Deadlines). The Remedial Design Workplan shall include, but not be limited to:

1. Health and Safety Plan
2. Spill/Release Contingency Plan
3. Quality Assurance Project Plan
4. Sampling and Analysis Plan
5. Preliminary Inspection, Maintenance and Monitoring Plan

F. After consultation with EPA and TWC about the Remedial Design Work Plan, the Army shall submit 30%, 60%, and 90% Draft Remedial Designs and a Final Draft Remedial Design to EPA and TWC for review and comment in accordance with Section XVI (Deadlines).

G. The final design document shall include the implementation schedule for the remedial action. The Army must implement substantial, continuous, physical onsite remedial action within fifteen (15) months of finalization of the ROD. The Final Draft Remedial Design will become the Final Remedial Design (final design document).

H. The Army shall submit the Remedial Action Work Plan to EPA and TWC for review and comment in accordance with Section XVI (Deadlines). The Remedial Action Work Plan shall provide for construction of the remedy, as set forth in the design plans and specifications in the final design submittal. The Remedial Action Work Plan shall include, but shall not be limited to:

1. Health and Safety Plan
2. Spill/Release Contingency Plan
3. Construction Quality Assurance Project Plan
4. Operation and Maintenance Plan

The Remedial Action Work Plan shall also include a schedule for implementation of all Remedial Action tasks identified in the final design submittal.

I. During the Remedial Action, monthly meetings shall be held between the Project Managers regarding the progress and details of the design. The Project Managers may make schedule changes for the performance of the Remedial Action in accordance with the provisions of Section XVII (Extensions).

J. When the Army determines that the Remedial Action has been completed in accordance with the requirements of the Agreement, it shall submit to the EPA and TWC a Construction Report. The Construction Report shall include: all data collected during the site remediation; a narrative description summarizing major activities conducted and problems addressed during the remediation; as-built plans and modifications from the specifications of the Remedial Design; documentation of compliance with the QA/ QC plan; and certification by a Professional Engineer that the work has been completed in compliance with the terms of this Agreement. Within one hundred-eighty (180) days of the receipt of the report, the EPA after consideration of TWC's comments shall provide the Army written notice approving or rejecting the Report. If the Report is approved, the EPA shall issue to the Army a Certification of Completion. If EPA rejects the Report, a basis for the rejection will be provided, and the Army may invoke dispute resolution concerning the EPA determination.

K. The Army shall perform the long-term operation and maintenance for the selected remedial action(s).

XX. ASSESSMENT AND SELECTION OF SUPPLEMENTAL RESPONSE ACTIONS

A. The Parties recognize that subsequent to finalization of the ROD, a need may arise for one or more supplemental response actions to remedy continuing or additional releases or threats of releases of hazardous substances, pollutants or contaminants at or from the Site. If such a release or threat of release presents an immediate threat to human health or the environment, it shall be addressed pursuant to Section XIII, (Emergency Actions). If such release or threat of release does not present an immediate threat to human health or the environment, it shall be addressed pursuant to paragraphs A through F of this Section, regardless of whether the determination of the need for such supplemental response action is based on a periodic review conducted pursuant to Section XXII (Periodic Review), hereof or on some other source of information.

B. A supplemental response action shall be undertaken only when:

1. A determination is made that as a result of the release or threat of release of a hazardous substance, pollutant or contaminant at or from the Site an additional response action is necessary and appropriate to ensure the protection of human health and the environment; and

2. Either of the following conditions is met for any determination made pursuant to subparagraph XX.B.1. :

(a) For supplemental response actions proposed after finalization of the ROD, but prior to EPA Certification, the determination must be based upon information received in whole or in part by EPA following finalization of the ROD; or

(b) For supplemental response actions proposed after EPA Certification, the determination must be based upon conditions that were unknown at the time of EPA Certification.

C. If, after finalization of the ROD, any Party concludes that a supplemental response action is necessary, based on the criteria set forth in subparagraph XX.B.2, such Party may promptly notify the others of its conclusion in writing. The Project Managers shall confer and attempt to reach consensus on the need for such an action within forty-five (45) days of the receipt of such notice. If at the end of the forty-five (45) day period, the Project Managers have failed to reach consensus, any Party may notify the other Parties in writing that it intends to invoke dispute resolution. If the Project Managers are still unable to reach consensus within fourteen (14) days of the issuance of such notice, the question of the need for the supplemental response action shall be resolved through dispute resolution.

D. If the Project Managers agree or if it is determined through dispute resolution that a supplemental response action is needed based on the criteria set forth in paragraph B above, the Army shall prepare a draft supplemental response action plan that shall include supplemental RI/FS deadlines. Supplemental RI/FS deadlines may be extended pursuant to Section XVII (Extensions). The Army shall provide the draft supplemental response action plan to the other Parties. The other Parties will have thirty (30) days in which to comment. The Army shall respond to those comments within thirty (30) days after close of the comment period. Any Party may then invoke dispute resolution pursuant to Section XV (Dispute Resolution) to resolve a dispute with respect to the supplemental response action plan. After any disagreements with respect to the supplemental response action plan have been resolved, the Army shall supplement the administrative record with the supplemental RI/FS deadlines.

E. Following resolution of any disputes concerning a supplemental response action, the Army shall conduct a supplemental RI/FS and issue a supplemental ROD in accordance with the supplemental response action plan. The provisions in Section VIII (Consultation) and Section XIX (Design and Implementation of Remedial Actions) shall govern the planning and selection of supplemental response actions to the same extent they govern the planning and selection of final response actions, unless it is the written consensus of all of the Parties that a particular provision does not apply. The supplemental ROD shall include the design schedule that shall govern completion of the design work for the supplemental response action.

F. Following issuance of the supplemental response action ROD, the supplemental response action shall be implemented pursuant to that ROD and this Section.

XXI. STATUTORY COMPLIANCE/RCRA-CERCLA INTEGRATION

A. The Parties intend to integrate the Army's CERCLA response obligations and RCRA corrective action obligations which relate to the release(s) of hazardous substances, hazardous wastes, pollutants or contaminants covered by this Agreement into this comprehensive Agreement. Therefore, the Parties intend that activities covered by this Agreement will achieve compliance with CERCLA, 42 U.S.C. §§9601, et seq.; satisfy the corrective action requirements of RCRA §§3004(u) & (v), 42 U.S.C. §§6924(u) & (v), for a RCRA permit, and RCRA §3008(h), 42 U.S.C. §6928(h), for interim status facilities; and meet or exceed all ARAR's and comply with all Federal and State laws and regulations, to the extent required by CERCLA §121, 42 U.S.C. §9621, and any other applicable State law.

B. Based upon the foregoing, the Parties intend that any remedial action selected, implemented and completed under this Agreement will be protective of human health and the environment such that remediation of releases covered by this Agreement shall obviate the need for further corrective action under RCRA (i.e., no further corrective action shall be required). The Parties agree that with respect to releases of hazardous wastes covered by this Agreement, RCRA shall be considered an applicable or relevant and appropriate requirement pursuant to CERCLA §121, 42 U.S.C. §9621. Releases or other hazardous waste activities not covered by the Agreement remain subject to all applicable State and Federal requirements.

C. The Parties recognize that the requirement to obtain permits for response actions undertaken pursuant to this Agreement shall be as provided for in CERCLA and the NCP. The Parties further recognize that on-going hazardous waste management activities at LHAAP may require the issuance of permits under Federal and State laws. This Agreement does not affect the requirements, if any, to obtain such permits. However, if a permit or TWC Compliance Plan is issued to the Army for on-going hazardous waste management activities at the Site, EPA and TWC will incorporate by reference any appropriate provisions, including appropriate schedules (and the provision for extension of such schedules), of this Agreement into such permit and in the case of

TWC, any Compliance Plan. The Parties intend that judicial review of any permit conditions which reference this Agreement shall, to the extent review is authorized by law, only be reviewed under the provisions of CERCLA.

D. Nothing in this Agreement shall alter the Army's authority with respect to removal actions conducted pursuant to CERCLA §104, 42 U.S.C. §9604.

XXII. PERIODIC REVIEW

A. Subject to paragraph B. of this Section, the Army shall conduct a periodic review of any final and supplemental response action taken at the Site to determine whether and to what extent any additional remedial action is necessary. The periodic review shall be conducted in accordance with CERCLA §121 (c), 42 U.S.C. §9621(c), and any pertinent regulation or guidance issued by EPA that is not inconsistent with CERCLA and the NCP. Upon completion, the Army shall provide the assessment report to the Parties for review and comment.

B. The periodic review for each operable unit shall be conducted at a minimum every five (5) years after initiation of the final response action for that operable unit, as long as hazardous substances, pollutants or contaminants remain within the area covered by that operable unit.

C. The assessment and selection of any additional response action determined to be necessary by EPA in the course of a periodic review shall be in accordance with Section XX (Assessment and Selection of Supplemental Response Actions). Except for emergency actions, which shall be governed by Section XIII (Emergency Actions) hereof, such response action(s) shall be implemented by the Army as a supplemental response action in accordance with Section XX (Assessment and Selection of Supplemental Response Actions) hereof.

XXIII. ENFORCEABILITY

A. The Parties agree that:

1. Upon the effective date of this Agreement, any standard, regulation, condition, requirement or order which has become effective under CERCLA and is incorporated into this Agreement is enforceable by any person pursuant to CERCLA §310(a), and any violation of such standard, regulation, condition, requirement or order will be subject to civil penalties under CERCLA §§109 and 310(c), 42 U.S.C. 9609 and 9659(c); and

2. All timetables or deadlines associated with the RI/FS shall be enforceable by any person pursuant to CERCLA §310(a), and any violation of such timetables or deadlines will be subject to civil penalties under CERCLA §§109 and 310(c), 42 U.S.C. 9609 and 9659(c);

3. All terms and conditions of this Agreement which relate to operable units or final remedial actions, including corresponding timetables, deadlines or schedules, and all work associated with the operable units or final remedial actions, shall be enforceable by any person pursuant to CERCLA §310(c), and any

violation of such terms or conditions will be subject to civil penalties under CERCLA §§310(c) and 109; and

4. Any final resolution of a dispute pursuant to Section XV of this Agreement which establishes a term, condition, timetable, deadline or schedule shall be enforceable by any person pursuant to CERCLA §310(c), and any violation of such term, condition, timetable, deadline or schedule will be subject to civil penalties under CERCLA §§310(c) and 109.

B. Nothing in this Agreement shall be construed as authorizing any person to seek judicial review of any action or work where review is barred by any provision of CERCLA, including CERCLA §113(h).

C. The Parties agree to exhaust their rights under Section XV (Dispute Resolution) prior to exercising any rights to judicial review that they may have.

D. The Parties agree that all Parties shall have the right to enforce the terms of this Agreement.

XXIV. STIPULATED PENALTIES

A. In the event that the Army fails to submit a primary document (i.e., RI/FS Work Plan, Risk Assessment, RI Report, Initial Screening of Alternatives, FS Report, Proposed Plan, Record of Decision, Remedial Design, Remedial Action Work Plan) to EPA and TWC pursuant to the appropriate timetable or deadline in accordance with the requirements of this Agreement, or fails to comply with a term or condition of this Agreement which relates to an operable unit or final remedial action, EPA may assess a stipulated penalty against the Army. A stipulated penalty may be assessed in an amount not to exceed $5,000 for the first week (or part thereof), and $10,000 for each additional week (or part thereof) for which a failure set forth in this paragraph occurs.

B. Upon determining that the Army has failed in a manner set forth in paragraph A., EPA shall so notify the Army in writing. If the failure in question is not already subject to dispute resolution at the time such notice is received, the Army shall have fifteen (15) days after receipt of the notice to invoke dispute resolution on the question of whether the failure did in fact occur. The Army shall not be liable for the stipulated penalty assessed by EPA if the failure is determined, through the dispute resolution process, not to have occurred. No assessment of a stipulated penalty shall be final until the conclusion of dispute resolution procedures related to the assessment of the stipulated penalty.

C. The annual reports required by CERCLA §120(e)(5), 42 U.S.C. §9620 (e)(5), shall include, with respect to each final assessment of a stipulated penalty against the Army under this Agreement, each of the following:

1. The facility responsible for the failure;

2. A statement of the facts and circumstances giving rise to the failure;

3. A statement of any administrative or other corrective action taken at the relevant facility, or a statement of why such measures were determined to be inappropriate;

4. A statement of any additional action taken by or at the facility to prevent recurrence of the same type of failure; and

5. The total dollar amount of the stipulated penalty assessed for the particular failure.

D. Stipulated penalties assessed pursuant to this Section shall be payable to the Hazardous Substance Superfund only in the manner and to the extent expressly provided for in Acts authorizing funds for, and appropriations to, the DOD.

E. In no event shall this Section give rise to a stipulated penalty in excess of the amount set forth in CERCLA §109, 42 U.S.C. §9609.

F. This Section shall not affect the Army's ability to obtain an extension of a timetable, deadline or schedule pursuant to Section XVII (Extensions).

G. Nothing in this Agreement shall be construed to render any officer or employee of the Army personally liable for the payment of any stipulated penalty assessed pursuant to this Section.

XXV. OTHER CLAIMS

A. Subject to Section XXI (Statutory Compliance), nothing in this Agreement shall restrict EPA or TWC from taking any action under CERCLA, RCRA, state law, or other environmental statutes for any matter not specifically addressed by this Agreement.

B. Nothing in this Agreement shall constitute or be construed as a release from any claim, cause of action or demand in law or equity against any person, firm, partnership, or corporation not a signatory to this Agreement for any liability it may have arising out of or relating to any way to the generation, storage, treatment, handling, transportation, release, or disposal of any hazardous substance, hazardous waste, pollutants, or contaminants found at, taken to, or taken from LHAAP.

XXVI. TRANSFER OF PROPERTY

A. No change in ownership or conveyance of any property interest in LHAAP shall in any way alter the status of the Parties under this Agreement. The Army agrees to include notice of this Agreement in any document transferring ownership of any portion of the Site in accordance with CERCLA Section 120(h), 42 U.S.C. 8620(h) and shall furnish EPA and TWC with notice of any such change or transfer at least ninety (90) days prior to such sale or transfer. Notice pursuant to CERCLA Section 120(h)(3)(B), 42 U.S.C. 9620(h)(3)(B), of any transfer of ownership or property interest shall not relieve the Army of its obligation to perform under this Agreement.

XXVII. RESERVATION OF RIGHTS

A. The Army reserves the right to raise or assert any defense, whether procedural or substantive, in law or equity, or to raise any issue as to jurisdiction, or standing of any Party, or any other matter in a proceeding related to this Agreement, which the Army might otherwise be entitled to raise or assert.

B. Notwithstanding compliance with the terms of this Agreement, including the completion of a RI/FS and the remedial action(s) selected and approved by EPA, the Army and LHAAP are not released from any liability which they may have pursuant to any provisions of Federal or State laws and regulations, and the EPA expressly reserves the right to pursue the Army and LHAAP for violations not covered in this Agreement.

C. The State of Texas reserves the right to take any action to the extent provided by law and after exhausting its remedies under this Agreement, pursuant to RCRA and/or any other available legal authority, including, but not limited to, the right to challenge the selection of a remedial action that does not attain an ARAR standard, requirement, criteria or limitation; the right to implement remedial action it deems appropriate; and to seek injunctive relief, monetary penalties, punitive damages, natural resource damages, and other damage claims for any violation of law. Nothing in this Agreement shall limit the State's rights as described in CERCLA §121(f)(3), 42 U.S.C. §9621(f)(3).

D. Nothing in this Agreement shall be construed as a restriction or waiver of any rights EPA or TWC may have under

CERCLA, including but not limited to any rights under Sections 113 and 310, 42 U.S.C. §§9613 and 9659. The Army does not waive any rights it may have under CERCLA §§120, 211, 42 U.S.C. §§9620, and Executive Order 12580.

E. Nothing in this Agreement should be deemed to constitute a waiver on the part of the TWC of its authority to require, issue, modify, revoke or enforce a RCRA permit or enforce its authority pursuant to applicable Federal and State law to regulate interim status RCRA units which may be located at the facility or solid waste management units which may be located at the LHAAP and which are not subject to this Agreement.

XXVIII. FUNDING

A. It is the expectation of the Parties to this Agreement that all obligations of the Army arising under this Agreement will be fully funded. The Army agrees to seek sufficient funding through the DOD budgetary process to fulfill its obligations under this Agreement.

B. In accordance with CERCLA §120(e)(5)(B), 42 U.S.C. §9620(e)(5)(B), the Army shall include in its annual report to Congress the specific cost estimates and budgetary proposals associated with the implementation of this Agreement.

C. Any requirement for the payment or obligation of funds, including stipulated penalties, by the Army established by the terms of this Agreement shall be subject to the availability of appropriated funds, and no provision herein shall be interpreted to require obligation or payment of funds in violation of the Anti-Deficiency Act, 31 U.S.C. §1341. In cases where payment or obligation of funds would constitute a violation of the Anti-Deficiency Act, the dates established requiring the payment or obligation of such funds shall be appropriately adjusted.

D. If appropriated funds are not available to fulfill the Army's obligations under this Agreement, EPA and TWC reserve the right to initiate an action against any other person, or to take any response action, which would be appropriate absent this Agreement.

E. Funds authorized and appropriated annually by Congress under the "Environmental Restoration Defense" appropriation in the Department of Defense Appropriation Act and allocated by the Deputy Assistant Secretary of Defense (Environment) (DASD(E)) to the Army will be the source of funds for activities required by this Agreement consistent with Section 211 of SARA, 10 U.S.C. Chapter 160. However, should the Environmental Restoration Defense appropriation be inadequate in any year to meet the total Army CERCLA implementation requirements, the DOD shall employ and the Army shall follow a standardized DOD prioritization process which allocates that year's appropriations in a manner which maximizes the protection of human health and the environment. A standardized DOD prioritization model shall be developed and utilized with the assistance of EPA and the states.

XXIX. COMMUNITY RELATIONS

A. The parties agree that response actions at the Site arising from this Agreement shall comply with the Administrative Record and public participation requirements of CERCLA Sections 113(k) and 117, 42 U.S.C. Section 9313(k) and 9617, relevant community relations provisions in the NCP, national and regional EPA policy and guidance (including, but not limited to EPA OSWER Directive 9203.0-3B, Community Relations in Superfund: A Handbook, dated June 1988 and any modifications thereto), and, to the extent they may apply, State statutes, regulations and guidance. The State agrees to inform LHAAP and EPA of all State requirements which it believes pertain to public participation. Community involvement must be conducted by the Army in consultation with EPA and TWC. The provisions of this Section shall be carried out in a manner consistent with, and shall fulfill the intent of, Section XVII (Statutory Compliance-RCRA/CERCLA Integration).

B. The Army shall, based on community interviews, develop and implement a Community Relations Plan (CRP) addressing community concerns and involvement in environmental activities and elements of work undertaken by the Army pursuant to this Agreement. Implementation of the CRP shall be done in consultation with EPA and is subject to review and approval by EPA. All informational materials produced by the Army in the implementation of the CRP are subject to review and comment by EPA and the State, where applicable.

C. The Army shall notify the community when disputes between Army, the EPA and/or the State are taken to the SEC level for resolution. The Army shall also notify the public of the resolutions of such disputes.

D. The Army shall establish and maintain an administrative record at a place, at or near the Site which is freely accessible to the public, in accordance with CERCLA §113(k), 42 U.S.C. §9613(k). The administrative record shall be established and maintained in accordance with relevant provisions in CERCLA, the NCP, and EPA policy and guidance. A copy of each document placed in the administrative record, not already provided, will be provided by the Army to the other Parties. The administrative record developed by the Army shall be updated and new documents supplied to the other Parties on at least a quarterly basis. An index of documents in the administrative record shall accompany each update of the administrative record. Public access to the administrative record shall not be contingent upon facility staff availability or limited access to the facility.

E. Except in case of an emergency, any Party issuing a press release with reference to any of the work required by this Agreement shall advise the other Parties of such press release at least two (2) working days prior to issuance. Other documents prepared by the Army pursuant to the Community Relations Plan (and which are not primary or secondary documents pursuant to this Agreement), or documents prepared by TWC for community involvement purposes related to the site, will be submitted by the Army and TWC to the other Parties for review and comment at least seven (7) working days prior to finalization and release.

XXX. PUBLIC COMMENT

A. This Agreement shall be subject to public comment as follows:

1. On or about ten (10) calendar days after executing this Agreement the Army shall publish a notice in at least one (1) major newspaper of general circulation within Harrison County that this Agreement is available for a forty-five (45) day period of public review and comment. 9 [illegible] 91

2. Promptly upon completion of the public comment period, the Army shall transmit to the other Parties copies of all comments received within the comment period.

3. Within thirty (30) days after the close of the public comment period, any Party may seek to have this Agreement amended, in accordance with Section XXXV (Amendment or Modification of Agreement) hereof, in response to the comments received.

B. The Parties agree that this Agreement and any subsequent proposed plan or alternative proposals considered for remedial action at the Site arising out of this Agreement shall comply with public participation requirements of CERCLA §117, 42 U.S.C. §9617.

C. The Army agrees it shall establish and maintain an Administrative Record at or near LHAAP in accordance with CERCLA §113(k), 42 U.S.C. §9613(k). The Administrative Record must be compiled before the proposed plan is issued for public comment.

XXXI. PRESERVATION OF RECORDS

A. Despite any document retention policy to the contrary, the Parties shall preserve, during the pendency of this Agreement and for a minimum of seven (7) years after its termination, all records and documents in their possession which relate to the actions carried out pursuant to this Agreement. After this seven (7) year period, each Party shall notify the other Parties at least thirty (30) days prior to destruction of any such documents. Upon request by any Party, the requested Party shall make available such records or copies of any such records, unless withholding is authorized and determined appropriate by law.

XXXII. EPA COST REIMBURSEMENT

The Parties agree to amend this Agreement at a later date in accordance with any subsequent national resolution of the issue of cost reimbursement.

XXXIII. STATE COST REIMBURSEMENT

State cost reimbursement shall be governed by the terms and conditions of the Department of Defense-State (of Texas) Memorandum of Agreement dated ____________, 1991.

XXXIV. TERMINATION AND SATISFACTION

The provisions of this Agreement shall be deemed satisfied upon a consensus of the Parties that the Army has completed its obligations under the terms of this Agreement. Following EPA Certification of the remedial actions at the Site pursuant to Paragraph J. of Section XIX (Selection, Design and Implementation of Remedial Actions), any Party may propose in writing the termination of this Agreement upon a showing that the objectives of this Agreement have been satisfied. A Party opposing termination of this Agreement shall serve its objection upon the proposing Party within thirty (30) days of receipt of the proposal. Without prejudice to the Army's obligation for periodic review under Section XXII (Periodic Review), no Party shall unreasonably withhold or delay termination of this Agreement.

XXXV. AMENDMENT OR MODIFICATION OF AGREEMENT

This Agreement can be amended or modified solely upon written consent of all Parties. Such amendments or modifications shall have as the effective date that date on which they are signed by all Parties and notice thereof is provided to each signatory pursuant to Section XIV (Notification).

XXXVI. EFFECTIVE DATE

The effective date of this Agreement shall be the date on which EPA issues its notice of effective date to the Parties. Such notice shall be issued after the implementation of Section XXX

(Public Comment). All provisions of this Agreement shall be in full force and effect as of the effective date.

THIS AGREEMENT CAN BE EXECUTED IN COUNTERPART.

IT IS SO AGREED:

United States Department of the Army

By: ______________________ Date: ____________
Lewis D. Walker, Deputy Assistant
Secretary of the Army for the
Environment, Safety and Occupational Health

By: ______________________ Date: ____________
Lieutenant Col. Jeffrey Russell
Commander, Longhorn Army Ammunition Plant

Texas Water Commission

By: ______________________ Date: ____________
Allen P. Beinke
Executive Director

U.S. Environmental Protection Agency

By: Robert E. Layton Jr. Date: 10/16/91
Robert E. Layton Jr., P.E.
Regional Administrator, Region 6

(Public Comment). All provisions of this Agreement shall be in full force and effect as of the effective date.

THIS AGREEMENT CAN BE EXECUTED IN COUNTERPART.

IT IS SO AGREED:

United States Department of the Army

By: Lewis D Walker Date: 9/6/91
Lewis D. Walker, Deputy Assistant
Secretary of the Army for the
Environment, Safety and Occupational Health

By: Robt W Bringman Date: 9/19/91
Lieutenant Col. ROBERT W. BRINGMAN
Commander, Longhorn Army Ammunition Plant

Texas Water Commission

By: ________________ Date: ________
Allen P. Beinke
Executive Director

U.S. Environmental Protection Agency

By: ________________ Date: ________
Robert E. Layton Jr., P.E.
Regional Administrator, Region 6

(Public Comment). All provisions of this Agreement shall be in full force and effect as of the effective date.

THIS AGREEMENT CAN BE EXECUTED IN COUNTERPART.

IT IS SO AGREED:

United States Department of the Army

By: ______________________ Date: ____________

Lewis D. Walker, Deputy Assistant
Secretary of the Army for the
Environment, Safety and Occupational Health

By: ______________________ Date: ____________

Lieutenant Col. Jeffrey Russell
Commander, Longhorn Army Ammunition Plant

Texas Water Commission

By: Bobbie Barker Date: 9-2-91

Allen P. Beinke
Executive Director

U.S. Environmental Protection Agency

By: ______________________ Date: ____________

Robert E. Layton Jr., P.E.
Regional Administrator, Region 6

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Review Timeline for LHAAP-16, -17, -R-001 and -R-003 RODs

ACTION	**LHAAP-16**	**LHAAP-17**	**LHAAP-001-R-01 and LHAAP-003-R-01**
Army Submits Draft ROD	**6/21/2011**	**1/26/2011**	**8/19/2011**
Draft ROD Comment Dues Dates	**7/21/2011**	**2/25/2011**	**9/18/2011**
Region 6 RPM Comments Submitted	7/18/2011	3/7/2011*	8/31/2011
(Days beyond submittal deadline)	*(timely)*		*(timely)*
Army Responses Submitted	7/29/2011		9/6/2011
EPA Region Concurrence	**8/3/2011**	**3/7/2011***	**9/7/2011**
Region 6 Legal Comments Submitted	8/17/2011	4/1/2011	
(Days beyond submittal deadline)	*(28 days)*	*(36 days)*	
Army Responses Submitted	9/23/2011	6/8/2011	
Region 6 Legal Concurrence	**9/26-27/2011**	**7/20/2011** **7/27/2011**[2]	
EPA Region 6 concurs with Army's Responses to All EPA Comments	**9/16/2011**	**9/16/2011**	
EPA HQ LUC Comments Submitted	8/29/2011	8/29/2011	
(Days beyond submittal deadline)	*(39 days)*	*(185 days)*	
Army Responses Submitted	9/12/2011 ------	9/12/2011 ------	
EPA HQ LUC Noncurrence with Follow-on Comment on Army's Reponses	9/19/2011	9/19/2011	
(Days beyond submittal deadline)	*(60 days)*	*(206 days)*	
Army Responses Submitted	9/28/2011	9/28/2011	
EPA HQ MNA Comments Submitted[3]	9/20/2011	9/20/2011	
(Days beyond submittal deadline)	*(62 days)*	*(207 days)*	
Second set EPA HQ MNA Additional Comments Submitted[3]	9/29/2011	9/29/2011	
(Days beyond submittal deadline)	*(70 days)*	*(216 days)*	
Army Submits Draft Final ROD at Region's Request	**9/29/2011**	**9/29/2011**	**9/27/2011**

1. Comment received after submission of the Draft Final ROD.

Review Timeline for LHAAP-16, -17, -R-001 and -R-003 RODs

2. Concurrence included approval of the draft ROD submitted on 7/26/2011 to Region 6 for signature as a Final ROD. An unexecuted copy of the Final ROD was provided to EPA on 8/4/2011.
3. These comments were submitted too close to 30 September to allow an official response. A two-week extension was requested, but no response to the request was received.

* The email from Steve Tzhone dated March 7, 2011 states: "The EPA has reviewed the Draft ROD for LHAAP-17 (Burning Ground No. 2, Flashing Area, Group 2) and has no additional technical comments, besides the two submitted by TCEQ. Please re-submit a revised Draft ROD for final legal review." Previously, in an email dated February 25, 2011, TCEQ provided the following comments:

"1. ARARs: The selected remedy includes extraction of groundwater, discharge of the effluent to surface water. While we acknowledge that the discharges from the GWTP must meet the NPDES discharge criteria as stipulated as an ARAR in the LHAAP-18/24 ROD, to ensure that each ROD is a stand alone ROD, we recommend that the NPDES (now TPDES) be included as an ARAR in this ROD.

2. GWTP Capacity: On Page 2-22, it states that the groundwater treatment plant operates a fraction of its maximum capacity and thereby, has adequate capacity to accommodate the increase in volume from the LHAAP-17 extraction. While we do not completely disagree with this statement, we are concerned that water storage problems encountered in recent events where the conditions of the Harrison Bayou prohibits the discharge of the treated water may affect treatment plant's capacity. The inability to discharge and insufficient capacity to store water may inhibit the effectiveness of the extraction. We recommend that this issue be addressed in the ROD and evaluation of alternatives to resolve this issue be required as part of the remedial design."

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Subject	Re: Rose: I'm not sure where LHAAP-17 ROD is at within the Army, but the EPA HQ LUC comments on 29 should apply to 16 and 17 as well.
From	<rose.zeiler@us.army.mil>
Date	Monday, August 22, 2011 15:47
To	Tzhone.Stephen@epamail.epa.gov
Cc	"Lambert, John R SWT" <John.R.Lambert@SWT03.usace.army.mil> , "Williams, Aaron" <Aaron.williams@swt03.usace.army.mil> , Fay Duke <Fay.Duke@tceq.texas.gov>

This is way late, Steve. It is already routed.

Rose M. Zeiler, Ph.D.,
Site Manager
Longhorn Army Ammunition Plant
479-635-0110 (0112 – fax)

----- Original Message -----
From: Tzhone.Stephen@epamail.epa.gov
Date: Monday, August 22, 2011 15:18
Subject: Rose: I'm not sure where LHAAP-17 ROD is at within the Army, but the EPA HQ LUC comments on 29 should apply to 16 and 17 as well.
To: "Zeiler, Rose Ms CIV USA OSA" <rose.zeiler@us.army.mil>, "Lambert, John R SWT" <John.R.Lambert@SWT03.usace.army.mil>, "Williams, Aaron" <Aaron.williams@swt03.usace.army.mil>
Cc: Fay Duke <Fay.Duke@tceq.texas.gov>

Subject Re: Rose: I'm not sure where LHAAP-17 ROD is at within the Army, but the EPA HQ LUC comments on 29 should apply to 16 and 17 as well.
From <rose.zeiler@us.army.mil>
Date Monday, August 22, 2011 16:06
To Tzhone.Stephen@epamail.epa.gov
Cc "Lambert, John R SWT" <John.R.Lambert@SWT03.usace.army.mil> , "Williams, Aaron" <Aaron.williams@swt03.usace.army.mil> , Fay Duke <Fay.Duke@tceq.texas.gov>

Steve,
Please provide specific comments on the RODs for 16 and 17. After I receive these, I will pass to legal to see what we can do. I suggest you look at 17 first - it is already through one office and should be through ESOH and MEDCOM this week.
Thanks,
Rose

Rose M. Zeiler, Ph.D.,
Site Manager
Longhorn Army Ammunition Plant
479-635-0110 (0112 – fax)

----- Original Message -----
From: Tzhone.Stephen@epamail.epa.gov
Date: Monday, August 22, 2011 15:18
Subject: Rose: I'm not sure where LHAAP-17 ROD is at within the Army, but the EPA HQ LUC comments on 29 should apply to 16 and 17 as well.
To: "Zeiler, Rose Ms CIV USA OSA" <rose.zeiler@us.army.mil>, "Lambert, John R SWT" <John.R.Lambert@SWT03.usace.army.mil>, "Williams, Aaron" <Aaron.williams@swt03.usace.army.mil>
Cc: Fay Duke <Fay.Duke@tceq.texas.gov>

Fw: LUC Team Comments on Longhorn LHAAP -16 and LHAAP-17 RODs

Stephen Tzhone to Zeiler, Rose Ms CIV USA OSA, 'Lambert, John R SWT', Williams, Aaron K SWT, Srivastav, Praveen, Watson, Susan, 08/29/2011 10:04 AM

Cc Fay Duke, "Dale Vodak", Terry Burton, Forsythe.Barry, kdbecher

From: Stephen Tzhone/R6/USEPA/US
To: "Zeiler, Rose Ms CIV USA OSA" <rose.zeiler@us.army.mil>, "'Lambert, John R SWT'" <John.R.Lambert@SWT03.usace.army.mil>, "Williams, Aaron K SWT" <Aaron.K.Williams@usace.army.mil>, "Srivastav, Praveen"
Cc: Fay Duke <Fay.Duke@tceq.texas.gov>, "Dale Vodak" <Dale.Vodak@tceq.texas.gov>, Terry Burton/R6/USEPA/US@EPA, Forsythe.Barry@epamail.epa.gov, kdbecher@usgs.gov

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Allison Abernathy   Dear Steve: Thank you for sending up your RO...   08/29/2011 08:45:02 AM

From: Allison Abernathy/DC/USEPA/US
To: Stephen Tzhone/R6/USEPA/US@EPA
Cc: Sally Dalzell/DC/USEPA/US@EPA, Monica McEaddy/DC/USEPA/US@EPA, Gracie Pendleton/DC/USEPA/US@EPA
Date: 08/29/2011 08:45 AM
Subject: Longhorn 16 & 17 RODs

Dear Steve:

Thank you for sending up your ROD to headquarters for the LUC Team's review.

The following are our comments on LHAAP -17

1. On page 1-1, under 1.2, 3rd full paragraph, last sentence. Please make the following changes to account for EPA's statutory role in selecting (not concurring with) the remedy:

The USEPA and the Army jointly select the remedy and TCEQ concurs with the selected remedy in this Record of Decision (ROD).

2. Checklist Item I, the maps do not contain an item in the key indicating the LUC boundary. Please add it to one of the map keys; otherwise the reader is guessing that the "site boundary" is the same as the LUC boundary (and it may not be). Also, please clarify whether the whole of LHAAP-29 is owned by the USFWS. On P. 2-9 it notes that most, but not all of LHAAP was transferred to the USFWS to become the Caddo Lake National Wildlife Refuge yet in Section 2.9.2, p. 2-20, it refers into a future transfer but does not name the transferee.

3. Page 1-3, 2nd to the last bullet, last sentence, please modify as follows because the ROD seems imply that the LUC will be terminated automatically and you may want additional sampling to confirm the answer or EPA may disagree that the level has been "achieved:"

- When EPA and the Army determine that the cleanup level is achieved, the LUC will be terminated.

4. Checklist item 2. Site risks and land uses. Please see section 2.6.3, p. 2-10. We are concerned

about the unclear analysis of the site risks and groundwater use. In section 2.6.3, in the first paragraph, there are a number of statements about active wells and depths, but the average reader will not know at what depth the wells are completed and also the aquifer and overlying GW zone may vary in depth. Also, the depths given are inconsistent as they are not always "bgs" and its not clear whether that is an oversight or intentional. In the second paragraph, a number of active wells are discussed but in this case the depths are not given and instead lateral distances are given. This section should be clarified with the reference to each well clearly stating whether the well is completed in the aquifer or the contaminated deep GW. Also,

5. Checklist Item 4, page 2-20 and 2-33, please modify the gw objective to make it clear that except for monitoring and testing groundwater use is prohibited until cleanup levels are met: This will be more clear than "restricted." Also, please add a LUC objective to preserve the groundwater monitoring system and prohibit residential, etc., uses as suggested below.

- **LUC for ~~restriction~~ prohibition of groundwater use (except for monitoring and testing) until the cleanup levels are attained.**

o LUC to maintain the integrity of any current and/or future groundwater monitoring system such as monitoring wells.

o LUC to prohibit the development and use of the property for residential housing, elementary and secondary schools, and child care facilities and playgrounds.

completing the wells to different depths may not be sufficient to ensure no cross contamination. Please clarify in the text that there is no connectivity between the contaminated zone and the aquifer.

6. Checklist item 5. It is not clear what the LUC will be. Part of the confusion is that its not clear who owns the property-- see our comment #2 about property ownership. This need to be clarified and the LUC must be identified.

7. Checklist item 6. Duration. We see that the duration is listed on p. 2-34 for the GW LUC objective, but as noted in our comment above, we think you need to provide other objectives, so please use the following language which would apply to all the objectives: : "Land Use Controls will be maintained until the concentration of hazardous substances in the soil and groundwater are at such levels to allow for unrestricted use and exposure."

8. Checklist Item 7, please modify the following statement from page 1-3, 3rd paragraph, 5th sentence (this will make it consistent with the ROD language that shows up on page 2-33) in the first sentence following the last bullet. We have already experienced attempts to limit a military service's responsibility to "report" to EPA and the state:

The U.S. Army will be responsible for implementation, maintenance, periodic inspection, reporting on and enforcement of the LUC in accordance with the RD.

9. Checklist Item 8, please use the checklist language and delete the listing that shows up on page 1-3, conclusion of the last full paragraph, and 2-33, at the end of the last full paragraph. This listing makes it very complicated and it is also troublesome and inconsistent with EPA's

authority. For example, the Army seems to be forgetting that it does NOT have independent authority to modify a remedy. The Army does not have the authority referenced in number (4) to reserve. This was not the only problem with the listing, but we provide it to give you an idea of what we observed.

10. On page 1-4, top of the page, and on page 2-34, under 2.12.2, top of the page, the Army must get EPA concurrence on the modification and termination of LUCs as stated above. The Army should not be able to determine if a proposed modification is "significant" as EPA may not agree. There should be no qualifier as EPA, by law, selects or modifies a chosen remedy (not just significant or insignificant changes to a remedy). EPA relies on the land use restriction found in the ROD to find that the remedy is protective. The Army cannot independently decide whether a land use change will be inconsistent with the LUC objectives and industrial use assumptions of the remedy. EPA may disagree. Finally, the way the Army has structured the language, the Army never has to tell us of the change (if the Army deems the change insignificant) and such change could result in a huge environmental problem. EPA cannot allow that. Please delete the second and third sentences and substitute the following language as seen below:

The U.S. Army shall consult with TCEQ and obtain USEPA concurrence prior to termination or ~~significant~~ modification of a LUC, or in the highly unlikely event of a land use change ~~inconsistent with the LUC objectives and industrial use assumptions of the remedy~~.

11. Page 2-20, 1st full paragraph, page 2-34, 2nd paragraph, please make it clear that it is the Amy who notifies the county and insert a deadline. ~~If it's the Army (and it seems like it would be better to have the Army do it rather than request Texas to do it), please make the following change:~~

In addition, within 90 days of signature of this ROD, the Army shall: 1) request the Texas Department of Licensing and Regulation ~~will be requested~~ to notify well drillers of groundwater restrictions; and 2) ~~the Army shall~~ notify the ~~a notification of the LUC with the~~ Harrison County Courthouse of the LUC to include ~~would include~~ a map showing the areas of groundwater restriction at the site, in accordance with 30 TAC 335.565.

The following are our comments on LHAAP -16

1. On page 1-1, under 1.2, 3rd full paragraph, last sentence. Please make the following changes to account for EPA's statutory role in selecting (not concurring with) the remedy:

The USEPA and the Army jointly select the remedy and TCEQ concurs with the selected remedy in this Record of Decision (ROD).

2. Please clarify whether the whole of LHAAP-29 is owned by the USFWS. In Section 2.6.2, p. 2-11 it notes that most, but not all of LHAAP was transferred to the USFWS to become ethe Caddo Lake National Wildlife Refuge yet in Section 2.9.2, p. 2-26, it refers into a future transfer but does not name the transferee.

3. Checklist item 2. Site risks and land uses. Please see section 2.6.3, p. 2-11. We are concerned about the unclear analysis of the site risks and groundwater use. In section 2.6.3, in the first paragraph, there are a number of statements about active wells and depths, but the average reader will not know at what depth the wells are completed and also the aquifer and overlying GW zone may vary in depth. Also, the depths given are inconsistent as they are not always "bgs" and its not clear whether that is an oversight or intentional. In the second paragraph, a number of active wells are discussed but in this case the depths are not given and instead lateral distances are given. This section should be clarified with the reference to each well clearly stating whether the well is completed in the aquifer or the contaminated deep GW. Also, completing the wells to different depths may not be sufficient to ensure no cross contamination. Please clarify in the text that there is no connectivity between the contaminated zone and the aquifer.

4. Checklist Item 4, page page 2-22 (top of page) and page 2-49, 2nd bullet. Please modify the gw objective to make it clear that except for monitoring and testing groundwater use is prohibited until cleanup levels are met: This will be more clear than "restricted." Also, please add a LUC objective to preserve the groundwater monitoring system and prohibit residential, etc., uses as suggested below. Also, we are not clear on p. 2-50 about the LUC objective for release to surface water. How will a LUC prevent release to surface water?

- **LUC for ~~restriction~~** **prohibition** **of groundwater use** **(except for monitoring and testing)** **until the cleanup levels are attained.**

o **LUC to maintain the integrity of any current and/or future groundwater monitoring system such as monitoring wells.**

  - LUC to **maintain the integrity** of the landfill cap.

o **LUC to prohibit the development and use of the property for residential housing, elementary and secondary schools, and child care facilities and playgrounds.**

  - **Is a LUC objective needed for release to surface water?**

5. Checklist item 5. It is not clear what the LUC will be. Part of the confusion is that its not clear who owns the property-- see our comment #2 about property ownership. This need to be clarified and the LUC must be identified.

6. Checklist item 6. Duration. We see that duration language is Section 1.4, p. 1-3, next to the last bullet, however, we believe that additional LUCs are needed (see our comment #4).Therefore it would be simpler to use the standard checklist language because it will address all possible LUC objectives: "Land Use Controls will be maintained until the concentration of hazardous substances in the soil and groundwater are at such levels to allow for unrestricted use and exposure." Additionally, there is another duration listed on p. 2-50, 1st paragraph, 3rd sentence, for releases into surface water.

7. Checklist Item 7, please modify the following statement from page 1-3, 2nd paragraph, 5th sentence from the top of the page. We have already experienced attempts to limit a military service's responsibility to "report" to EPA and the state:

The U.S. Army will be responsible for implementation, maintenance, periodic inspection, reporting on and enforcement of the LUC in accordance with the RD.

8. Checklist Item 8, please use the checklist language and delete the listing that shows up on page 1-4, second paragraph, line 9, conclusion of the 2nd paragraph, and 2-49, last paragraph. This listing makes it very complicated and it is also troublesome and inconsistent with EPA's authority. For example, the Army seems to be forgetting that it does NOT have independent authority to modify a remedy. The Army does not have the authority referenced in number (4) to reserve. This was not the only problem with the listing, but we provide it to give you an idea of what we observed.

9. Page 2-26, 1st paragraph, last sentence and page 2-50 1st paragraph,4th sentence, please make it clear that it is the Amy who notifies the county and insert a deadline. ~~If it's the Army (and it seems like it would be better to have the Army do it rather than request Texas to do it), please make the following change:~~

In addition, within 90 days of signature of this ROD, the Army shall: 1) request the Texas Department of Licensing and Regulation ~~will be requested~~ to notify well drillers of groundwater restrictions; and 2) ~~the Army shall~~ notify the ~~a notification of the LUC with the~~ Harrison County Courthouse of the LUC to include ~~would include~~ a map showing the areas of groundwater restriction at the site, in accordance with 30 TAC 335.565.

10. Please also modify the following sentence on page 1-4, second full paragraph (towards the end of the paragraph) and on page 2-26, under 2.9.2, 2nd full paragraph, second to last sentence as shown below. The Army must get EPA concurrence on the modification and termination of LUCs as stated above. The Army should not be able to determine if a proposed modification is "significant" as EPA may not agree. There should be no qualifier as EPA, by law, selects or modifies a chosen remedy (not just significant or insignificant changes to a remedy). EPA relies on the land use restriction found in the ROD to find that the remedy is protective. The Army cannot independently decide whether a land use change will be inconsistent with the LUC objectives and industrial use assumptions of the remedy. EPA may disagree. Finally, the way the Army has structured the language, the Army never has to tell us of the change (if the Army deems the change insignificant) and such change could result in a huge environmental problem. EPA cannot allow that. Please delete the second and third sentences and substitute the following language as seen below:

The U.S. Army shall consult with TCEQ and obtain USEPA concurrence prior to termination or ~~significant~~ modification of a LUC, or in the highly unlikely event of a land use change ~~inconsistent with the LUC objectives and industrial use assumptions of the remedy~~.

Allison Abernathy
phone 703-603-0052
Fax 703-603-0043
Website: http://www.epa.gov/fedfac

Subject	Recent MNA comments
From	<rose.zeiler@us.army.mil>
Date	Thursday, September 29, 2011 12:48
To	"Tzhone.Stephen@epa.gov" <Tzhone.Stephen@epa.gov>

Steve,
To address recent verbal comments made by the Region, particularly with respect to MNA, Longhorn will require an additional two weeks to respond. Otherwise they can not be addressed at this late date.
Thanks,
Rsoe

Rose M. Zeiler, Ph.D.,
Site Manager
Longhorn Army Ammunition Plant
479-635-0110 (0112 – fax)

Subject	Re: Fwd: FW: LHAAP-16 ROD
From	Tzhone.Stephen@epamail.epa.gov
Date	Thursday, September 29, 2011 15:53
To	"Zeiler, Rose Ms CIV USA OSA" <rose.zeiler@us.army.mil> , "Lambert, John R SWT" <John.R.Lambert@SWT03.usace.army.mil> , "Williams, Aaron K SWT" <Aaron.K.Williams@usace.army.mil>
Cc	Fay Duke <Fay.Duke@tceq.texas.gov>

From: Timothy Mott/DC/USEPA/US
To: Stephen Tzhone/R6/USEPA/US@EPA
Date: 09/29/2011 03:46 PM
Subject: Re: Fwd: FW: LHAAP-16 ROD

Steve,
This is much better. After consultation with OSRTI, I have the following comments:

1) Be more comprehensive about all the CoCs for which MNA is considered (e.g., especially the chlorinated solvents since the document only mentions chlorinated ethene) and which were studied for MNA.

2) Be more specific about the concentration decreases (e.g., concentrations have gone from what to what)?

3) For the increases in other well locations, are there any additional sources that need to be addressed? Also if the plume is still migrating to Harrison Bayou, will the proposed remedy stop it from reaching the Bayou?

4) 280 years is a long time - can you enhance the bio portions of the remedy or the other active remedies at this site to increase degradation?

From: Stephen Tzhone/R6/USEPA/US
To: Timothy Mott/DC/USEPA/US@EPA
Date: 09/29/2011 12:35 PM
Subject: Re: Fwd: FW: LHAAP-16 ROD

From: "Zeiler, Rose Ms CIV USA OSA" <rose.zeiler@us.army.mil>
To: Stephen Tzhone/R6/USEPA/US@EPA
Date: 09/29/2011 11:31 AM
Subject: Fwd: FW: LHAAP-16 ROD

[attachment "In Section 12.docx" deleted by Timothy Mott/DC/USEPA/US]
Draft language for your consideration.

Rose M. Zeiler, Ph.D.,
Site Manager
Longhorn Army Ammunition Plant
479-635-0110 (0112 - fax)

----- Original Message -----

From: "Jones, Greg N" <Greg.Jones2@shawgrp.com>
Date: Thursday, September 29, 2011 11:17
Subject: FW: LHAAP-16 ROD
To: "Williams, Aaron K SWT" <Aaron.K.Williams@usace.army.mil>
Cc: Rose Ms CIV USA OSA Zeiler <rose.zeiler@us.army.mil>, "Lambert, John R SWT" <John.R.Lambert@SWT03.usace.army.mil>, "Srivastav, Praveen" <Praveen.Srivastav@shawgrp.com>, "Mayila, Agnes" <Agnes.Mayila@shawgrp.com>, "Chan, Vincent" <vincent.chan@shawgrp.com>, "Watson, Susan" <Susan.Watson@shawgrp.com>

> Aaron,
>
> #1) Please see attachment concerning MNA text.
>
> #2) From Agnes' regarding the 6:33 pm version from John yesterday ...
>
> It appears that one of the relevant and appropriate post-closure requirement citations sent by the Army needs to be changed:
>
> 40 CFR 264.228(b)(2) is not relevant to the LHAAP-16 landfill cap,
>
> instead 264.228(b)(4)is relevant.
>
> If it is OK with the Army we will go ahead and change it in the revised text and in the ARARs Table 2-4.
>
> The following are the requirements from 264.228(b):
>
> (2) Maintain and monitor the leak detection system in accordance with §§264.221(c)(2)(iv) and (3) and 264.226(d), and comply with all other applicable leak detection system requirements of this part -NOT RELEVANT to the landfill cap
>
> (4) Prevent run-on and run-off from eroding or otherwise damaging the final cover - RELEVANT to the landfill cap.
>
> Please consider both these and get back to us as soon as you can.
>
> Thanks,
> Gregary N. Jones, PhD, PE
> Senior Environmental Engineer
> Applied Science & Engineering
> Shaw Environmental & Infrastructure Group
> 7741 Sandpiper Road
> Huntsville, AL 35808
> 256/213-2197 direct
> 256/213-2200 main office
> 256/714-0267 cell
>
> Shaw(tm) a world of Solutions(tm)
> www.shawgrp.com<http://www.shawgrp.com/>
>
> [http://shawnetv2.shawgrp.com/weekly/PublishingImages/GoGreenIcon_rev1.gif]Please consider the environment before printing this e-mail.

>
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[attachment "image001.gif" deleted by Timothy Mott/DC/USEPA/US]

16

Executive Office of the President
Office of Management and Budget

Executive Office of the President
Council on Environmental Quality

Dear Secretary/Administrator:

Consistent with the President's focus on sound stewardship of our natural resources, we are committed to improving environmental governance through constructive and timely approaches to addressing challenges that arise over the use, conservation, and restoration of the environment, natural resources, and public lands.

To achieve better governance, the Administration calls for department and agency commitment to the goals identified in the Memorandum on Environmental Collaboration and Conflict Resolution, and the goals identified in related policy guidance. This approach supports other transparency and good government initiatives including the Memorandum on Transparency and Open Government (January 21, 2009), the Memorandum on Tribal Consultation (November 5, 2009), and the Executive Order on Improving Performance of Federal Permitting and Review of Infrastructure Projects (March 22, 2012) which encourage early collaboration among agencies, project sponsors, and affected stakeholders in order to incorporate and address their interests and minimize delays in making informed and timely Federal permitting and review decisions.

The Memorandum on Environmental Collaboration and Conflict Resolution expands and builds on the November 28, 2005, Environmental Conflict Resolution Memorandum. This Memorandum directs departments and agencies to increase the appropriate and effective use of third-party assisted environmental collaboration as well as environmental conflict resolution to resolve problems and conflicts that arise in the context of environmental, public lands, or natural resources issues, including matters related to energy, transportation, and water and land management. With the magnitude of environmental challenges facing the nation, coupled with the need for careful stewardship of tax dollars and budgets, Federal departments and agencies should leverage all environmental collaboration and conflict management techniques to improve environmental governance.

This Memorandum, issued by the Office of Management and Budget and the Council on Environmental Quality, applies to all executive branch agencies as they carry out their responsibilities under their organic acts and enabling legislation, the National Environmental Policy Act (NEPA), and other laws in effect to manage and conserve our environment, natural resources, and public lands.

Jeffrey D. Zients
Acting Director
Office of Management and Budget

Date: 9/7/12

Nancy H. Sutley
Chair
Council on Environmental Quality

Date: 9/6/12

Executive Office of the President
Office of Management and Budget

Executive Office of the President
Council on Environmental Quality

Office of Management and Budget and President's Council on Environmental Quality

MEMORANDUM ON ENVIRONMENTAL COLLABORATION AND CONFLICT RESOLUTION

SECTION 1. PREAMBLE

To advance the successful integration of multiple use, conservation, and restoration of the environment and natural resources Federal agencies need to foster collaboration to build relationships, enhance public engagement, minimize or prevent conflicts, and manage and resolve conflicts when they arise. Environmental and natural resource conflicts, including matters related to energy, transportation, and water and land management, represent serious governance challenges with significant budget, management, and public service implications. Federal departments and agencies should strive to avoid unnecessarily lengthy planning processes, delayed implementation of projects, contentious relationships among stakeholders, and protracted and costly litigation. Doing so is critical to each department and agency, both when its core mission is explicitly environmental and when environmental issues may impact other core missions.

The challenge of implementing Federal policies and programs can often be met with collaborative, constructive, and timely approaches to identify and address affected interests, consider alternatives, and reach solutions before different positions or opinions result in conflict. Collaborative efforts involving the public and policy and program coordination within and across multiple levels of government are important for addressing these challenges. Managed correctly, the decision-making process should result in timely, practical, cost-effective, and resilient solutions. When conflicts do arise over the use, conservation, and restoration of the environment and natural resources, those conflicts must be managed proactively.

This Memorandum supersedes the November 28, 2005, Memorandum on Environmental Conflict Resolution. It broadens the efforts called for under the 2005 Memorandum by explicitly encouraging appropriate and effective upfront environmental collaboration to minimize or prevent conflict and strengthen the focus on environmental conflict resolution developed under the 2005 Memorandum. This Memorandum emphasizes the value of collaboration in policy making, conflict prevention and management, and conflict resolution in meeting mission responsibilities when managing and conserving our environment, natural resources, and public lands.

To build on those efforts to achieve better governance, this Memorandum calls for a department and agency commitment to employ collaboration to minimize and potentially avoid environmental and natural resource conflicts as well as to enhance the use of environmental conflict resolution to manage and resolve conflicts that arise. This approach supports other transparency and good government initiatives such as the Executive Order on Improving Performance of Federal Permitting and Review of Infrastructure Projects which encourage early collaboration among agencies, project sponsors, and affected stakeholders to incorporate and address their interests and minimize delays in making informed and timely Federal permitting and review decisions.

With the magnitude of environmental challenges facing the nation, coupled with the need for careful stewardship of tax dollars and budgets, all Federal departments and agencies should leverage environmental collaboration and conflict management approaches to minimize and resolve environmental conflicts.

SECTION 2. DEFINITION OF ENVIRONMENTAL COLLABORATION AND CONFLICT RESOLUTION

Under this policy, Environmental Collaboration and Conflict Resolution is defined as third-party assisted collaborative problem solving and conflict resolution in the context of environmental, public lands, or natural resources issues or conflicts, including matters related to energy, transportation, and water and land management.

The term Environmental Collaboration and Conflict Resolution encompasses a range of assisted collaboration, negotiation, and facilitated dialogue processes and applications. These processes directly engage affected interests and Federal department and agency decisionmakers in collaborative problem solving and conflict resolution.

Multi-issue, multi-party environmental disputes or controversies often take place in high conflict and low trust settings, where the assistance of impartial facilitators or mediators can be instrumental to reaching agreement and resolution. Such disputes range broadly from policy and regulatory disputes to administrative adjudicatory disputes, civil judicial disputes, intra- and interagency disputes, and disputes with non-Federal persons and entities.

Environmental Collaboration and Conflict Resolution can be applied during policy development or planning in the context of a rulemaking, administrative decision-making, enforcement, or litigation, with appropriate attention to the particular requirements of those processes. These contexts typically involve situations where a Federal department or agency has ultimate responsibility for decision-making and there may be disagreement or conflict among Federal, Tribal, State, and local governments and agencies, public interest organizations, citizens groups, and business and industry groups.

Although Environmental Collaboration and Conflict Resolution refers specifically to collaborative and conflict resolution processes aided by third-party neutrals, there is a broad array of partnerships, cooperative arrangements, and unassisted negotiations that Federal departments and agencies may pursue with non-Federal entities to plan, manage, and implement department and agency programs and activities. The Basic Principles for Agency Engagement in Environmental Collaboration and Conflict Resolution are presented in Attachment B. The Basic Principles provide guidance that applies to both Environmental Collaboration and Conflict Resolution and unassisted collaborative problem solving and conflict resolution. This policy recognizes the importance and value of the appropriate use of all forms of collaborative problem solving and conflict resolution.

SECTION 3. APPLICABILITY OF THE ENVIRONMENTAL COLLABORATION AND CONFLICT RESOLUTION POLICY MEMORANDUM

This Memorandum applies to all executive branch departments and agencies (as defined by Title 5 U.S.C. § 105) responsible for complying with the National Environmental Policy Act (42 U.S.C. § 4321 et seq.) and executing other laws in effect to manage and conserve our environment, natural resources, and public lands. Independent agencies are also requested to comply with the provisions of this Memorandum.

SECTION 4. POLICY DIRECTION

a. Federal departments and agencies should ensure they effectively explore opportunities for collaboration in their planning and decisionmaking processes to address different perspectives and potential conflicts, consistent with the Basic Principles of Environmental Conflict Resolution and Collaborative Problem Solving in Attachment B.

b. Given possible cost savings through improved outcomes, fewer appeals and less litigation, department and agency leadership should identify and support upfront investments in collaborative processes and conflict resolution, and demonstrate those savings in performance and accountability measures.

c. Several mechanisms, strategies, and resources exist to aid departments and agencies in this effort and to build internal department and agency capacity, including those presented in Section 5, and each department and agency should draw on them as appropriate.

d. Departments and agencies should give careful consideration to the use of assisted negotiations through Environmental Conflict Resolution when addressing environmental conflicts, using their own Environmental Conflict Resolution (ECR)/Alternative Dispute Resolution (ADR) staffs, the U.S. Institute for Environmental Conflict Resolution, the U.S. Department of Justice (e.g., for litigation matters), or other ECR/ADR organizations, as appropriate.

e. Federal departments and agencies are encouraged to draw on the services of the U.S. Institute for Environmental Conflict Resolution to review internal mechanisms and strategies for increasing the use of Environmental Collaboration and Conflict Resolution and to assist departments and agencies in developing performance and accountability measures consistent with the Environmental Policy and Conflict Resolution Act of 1998 (P.L. 105-156).

f. The Director of the Office of Management and Budget (OMB) and the Chair of the Council on Environmental Quality (CEQ) will convene periodic leadership meetings of departments and agencies to advance progress on this policy. The U.S Institute for Environmental Conflict Resolution shall convene a quarterly interagency forum of senior department and agency staff to provide advice and guidance and facilitate interagency exchange on Environmental Collaboration and Conflict Resolution.

g. Federal departments and agencies shall report at least every year to the Director of OMB and the Chair of CEQ on their use of Environmental Collaboration and Conflict Resolution for these purposes, and on the estimated cost savings and benefits realized through third-party assisted negotiation, mediation, or other processes designed to help parties achieve agreement. Costs savings and benefits realized should be reported using quantitative data to the extent possible. Departments and agencies are encouraged to work toward systematic collection of relevant information that can be useful in on-going information exchange across departments and agencies as fostered by Section 4(e).

SECTION 5. MECHANISMS AND STRATEGIES TO INCREASE THE EFFECTIVE USE OF ENVIRONMENTAL COLLABORATION AND CONFLICT RESOLUTION AND IMPROVE AGENCY CAPACITY

To increase the effective use of Environmental Collaboration and Conflict Resolution and build institutional capacity for collaborative planning processes and problem solving, Federal departments and agencies should draw upon the mechanisms and strategies outlined in Attachment C.

Priority should be given to:

- Integrating Environmental Collaboration and Conflict Resolution objectives and a focus on up-front collaboration as a key principle in agency mission statements and strategic plans;
- Developing internal Environmental Collaboration and Conflict Resolution guidance;
- Coordinating with other departments and agencies to address emerging areas of conflict and cross-cutting challenges;
- Strategizing with other departments and agencies on how to assess the costs and benefits of Environmental Collaboration and Conflict Resolution; and
- Documenting the savings and benefits of Environmental Collaboration and Conflict Resolution where quantitative or qualitative data exist.

Attachment A.
Guidance and Authorities Related to ADR and Environmental Collaboration and Conflict Resolution

- Administrative Dispute Resolution Act of 1996 (ADRA) (available at http://www.adr.gov/pdf/adra.pdf)
- Regulatory Negotiation Act of 1996 (available at http://www.epa.gov/adr/regnegact.pdf)
- Contract Disputes Act of 1978, as amended (available at http://www.law.cornell.edu/uscode/usc_sup_01_41_10_9.html)
- Alternative Dispute Resolution Act of 1998 (available at http://www.epa.gov/adr/adra_1998.pdf)
- Environmental Policy and Conflict Resolution Act of 1998 (available at http://www.ecr.gov/pdf/PL_105-106.pdf)
- Executive Order 12988, "Civil Justice Reform" (February 5, 1996) (available at http://www.archives.gov/federal-register/executive-orders/1996.html)
- Presidential Memorandum, "Designation of Interagency Committee to Facilitate and Encourage Use of Alternative Means of Dispute Resolution and Negotiated Rulemaking" (May 1, 1998) (available at http://govinfo.library.unt.edu/npr/library/direct/memos/disputre.html)
- Environmental Policy and Conflict Resolution Advancement Act of 2003 (available at http://www.ecr.gov/pdf/PLAW-108publ160.pdf)
- Executive Order 13352, "Facilitation of Cooperative Conservation" (August 4, 2004) (available at http://ceq.hss.doe.gov/nepa/regs/Executive_Order_13352.pdf)
- Office of Management and Budget and Council on Environmental Quality Memorandum on Environmental Conflict Resolution (November 28, 2005) (available at http://georgewbush-whitehouse.archives.gov/ceq/joint-statement.html)
- Presidential Memorandum, "Transparency and Open Government" (January 21, 2009) (available at http://www.whitehouse.gov/the_press_office/TransparencyandOpenGovernment)
- OMB Memorandum, "Open Government Directive" (December 8, 2009) (available at http://www.whitehouse.gov/sites/default/files/omb/assets/memoranda_2010/m10-06.pdf)
- Presidential Memorandum, "Tribal Consultation" (November 5, 2009) (available at http://www.whitehouse.gov/the-press-office/memorandum-tribal-consultation-signed-president)

Attachment B.
Basic Principles for Agency Engagement in Environmental Collaboration and Conflict Resolution

Informed Commitment - Confirm willingness and availability of appropriate department and agency leadership and staff at all levels to commit to principles of engagement; and ensure commitment and availability to participate in good faith and be open to new perspectives.

Balanced, Voluntary Representation - Ensure balanced inclusion of affected and concerned interests, recognizing that all parties should be willing and able to participate and select their own representatives.

Group Autonomy - Engage all participants in developing (through a situation assessment) and conducting a process; include a choice of consensus-based decision rules; and seek assistance as needed from an impartial third-party facilitator or mediator selected by and accountable to all parties.

Informed Process - Seek agreement on how to share, test, and apply relevant information (scientific, cultural, technical, etc.) among participants; and ensure relevant information is accessible and understandable to all participants.

Accountability - Participate in the process directly, fully, and in good faith; and be accountable to all participants, as well as to department and agency representatives and the public.

Openness - Ensure all participants and the public are fully informed in a timely manner of the purpose and objectives of the process; communicate department and agency authorities, requirements, and constraints; and uphold confidentiality rules and agreements as required for particular proceedings.

Timeliness - Ensure timely decisions and outcomes.

Implementation - Ensure decisions are implementable and consistent with Federal law and policy by commiting to: identify the parties' roles and responsibilities necessary to implement agreement; agree in advance on the consequences of a party being unable to provide necessary resources or implement agreement; and ensure parties will take steps to obtain resources necessary to implement agreement.

Attachment C.
Mechanisms and Strategies to Increase the Effective Use of Environmental Collaboration and Conflict Resolution and Improve Agency Capacity

The following mechanisms and strategies are among those that can be of use in building institutional capacity for pursuing the effective use of Environmental Collaboration and Conflict Resolution:

(a) Departments and Agencies with Existing or Developing Environmental Collaboration and Conflict Resolution Programs

(1) Integrate Environmental Collaboration and Conflict Resolution objectives into department and agency mission statements, Government Performance and Results Act (GPRA) goals, and strategic planning by:

- Identifying relevant GPRA goals and link to department and agency strategic plans;
- Aligning plans for implementation of Environmental Collaboration and Conflict Resolution with department and agency strategic plan goals;
- Aligning of planning, budgeting, and accountability systems to facilitate collaboration;
- Setting performance goals for increasing use of Environmental Collaboration and Conflict Resolution;
- Exploring why goals may not be met and what steps are necessary to meet them in the future;
- Tracking annual costs or other mission impacts of environmental conflict to the department or agency and setting goals for reduction in such costs;
- Identifying annual resource savings and benefits accrued from collaborative solutions; and
- Estimating the relative costs and benefits of using Environmental Collaboration and Conflict Resolution compared to other decision-making processes, and set goals to increase the use of Environmental Collaboration and Conflict Resolution in those situations where Environmental Collaboration and Conflict Resolution is superior to other decision-making processes.

(2) Ensure that department and agency infrastructure support Environmental Collaboration and Conflict Resolution by:

- Drawing on dispute resolution specialists and existing ADR resources pursuant to the Administrative Dispute Resolution Act of 1996 and other legal authorities and policy guidance;
- Providing leadership support;
- Setting internal policy directives;
- Integrating use of Environmental Collaboration and Conflict Resolution into performance plans;
- Creating incentives to increase appropriate use;
- Supporting staff outreach, education, and training; and

- Documenting other useful forms of collaboration and conflict resolution such as unassisted principled negotiation.

(3) Invest in support of programs by:
- Assigning staff and directing resources to support programs;
- Performing an internal self-audit of priority environmental goals or problems and areas of expanding or challenging conflict and assessing potential value and appropriateness for using Environmental Collaboration and Conflict Resolution;
- Identifying existing program resources and future needs;
- Fostering collaborative leadership at all levels through recruitment and career development;
- Building expert knowledge, skills, and capacity by strengthening intellectual and technical expertise in Environmental Collaboration and Conflict Resolution;
- Documenting demonstration projects and dispute system design results;
- Implementing tracking systems for Environmental Collaboration and Conflict Resolution requests for assistance, cases, and projects;
- Identifying efficient methods to access project funding;
- Fostering open communication early in project or proposal development;
- Building partnerships with other department and agency programs; and
- Supporting early assessment and assistance for Environmental Collaboration and Conflict Resolution.

(4) Focus on accountable performance and achievement by:
- Preparing periodic progress reports;
- Issuing guidance on expected outcomes and resources;
- Conducting program evaluation;
- Conducting Environmental Collaboration and Conflict Resolution case and project evaluation; and
- Responding appropriately to evaluation results to improve appropriate use of Environmental Collaboration and Conflict Resolution.

(b) Departments and Agencies without Environmental Collaboraltion and Conflict Resolution Programs

(1) Draw on any of the above mechanisms in Section 5(a) that may be applicable. For example, perform an internal audit of areas where environmental conflicts are occuring; inventory annual costs of environmental conflict and set goals to reduce those costs; and identify annual savings from using collaborative processes.

(2) Demonstrate increased use of Environmental Collaboration and Conflict Resolution by applying it to cases and under conditions consistent with the Basic Principles for Agency Engagement in Environmental Collaboration and Conflict Resolution in Attachment B.

17

DRAFT FINAL
RECORD OF DECISION
LHAAP-16 LANDFILL
LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS

ON THE LINE

Prepared for

U.S. Army Corps of Engineers
Tulsa District
1645 South 101st Avenue
Tulsa, Oklahoma

Prepared by

Shaw Environmental, Inc.
1401 Enclave Parkway, Suite 250
Houston, Texas 77077

Contract Number W912QR-04-D-0027, Task Order No. DS02
Shaw Project No. 117591

October~~June~~~~November~~ 2012~~1~~

Table of Contents

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Glossary of Terms

Located at the end of this ROD

Acronyms and Abbreviations

µg/L	micrograms per liter
ARAR	applicable or relevant and appropriate requirement
BERA	baseline ecological risk assessment
bgs	below ground surface
BHHRA	baseline human health risk assessment
CDI	chronic daily intake
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CERCLIS	Comprehensive Environmental Response, Compensation, and Liability Information System
CFR	Code of Federal Regulations
cfm	cubic feet per minute
cm/sec	centimeters per second
COC	chemical of concern
COPEC	chemical of potential ecological concern
COPC	chemical of potential concern
CSM	conceptual site model
DCA	dichloroethane
DCE	dichloroethene
DNT	dinitrotoluene
DPT	direct-push technology
ECOP	environmental condition of property
EPC	exposure point concentration
ESD	explanation of significant differences
ESTCP	Environmental Security Technology Certification Program
FFA	Federal Facility Agreement
FS	feasibility study
gpm	gallons per minute
GW-Res	TCEQ groundwater MSC for residential use
HEAST	health effects assessment summary tables
HI	hazard index
HQ	hazard quotient
IRA	interim remedial action
IRIS	Integrated Risk Information System
Jacobs	Jacobs Engineering Group, Inc.
LDR	land disposal restriction
LHAAP	Longhorn Army Ammunition Plant

Acronyms and Abbreviations (continued)

LTM	long-term monitoring
LUC	land use control
MCL	maximum contaminant level
mg/kg	milligrams per kilogram (parts per million [ppm] – soil analyses)
mg/kg-day	milligrams per kilogram per day
MNA	monitored natural attenuation
MOA	Memorandum of Agreement
MSC	medium-specific concentration
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NPL	National Priorities List
O&M	operation and maintenance
PCB	polychlorinated biphenyl
Plexus	Plexus Scientific Corporation
pvc	polyvinyl chloride
RAB	Restoration Advisory Board
RAO	remedial action objective
RCRA	Resource Conservation and Recovery Act
RD	remedial design
RFA	RCRA Facility Assessment
RfD	reference dose
RI	remedial investigation
ROD	Record of Decision
SARA	Superfund Amendments and Reauthorization Act
SDWA	Safe Drinking Water Act
SF	slope factor
Shaw	Shaw Environmental, Inc.
STEP	Solutions to Environmental Problems, Inc.
SVE	soil vapor extraction
SVOC	semivolatile organic compound
TAC	Texas Administrative Code
TCDD	tetrachlorodibenzo-p-dioxin
TCE	Trichloroethene
TCLP	toxicity characterisitc leaching procedure
TCEQ	Texas Commission on Environmental Quality
TNT	Trinitrotoluene
UCL	upper confidence limit

Acronyms and Abbreviations (continued)

U.S. Army	U.S. Department of the Army
USACE	U.S. Army Corps of Engineers
USAEHA	U.S. Army Environmental Hygiene Agency
USATHAMA	U.S. Army Toxic and Hazardous Materials Agency
USC	U.S. Code
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
VC	vinyl chloride
VOC	volatile organic compound

1.0 The Declaration

1.1 Site Name and Location

Longhorn Army Ammunition Plant-16 (LHAAP-16), Landfill

Longhorn Army Ammunition Plant
Karnack, Texas

Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS), U.S. Environmental Protection Agency (USEPA) Identification Number: TX6213820529.

1.2 Statement of Basis and Purpose

This decision document presents the selected remedy for LHAAP-16 Landfill, located at the Longhorn Army Ammunition Plant (LHAAP) in Karnack, Texas. The remedy was chosen in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980, as amended by the Superfund Amendments and Reauthorization Act (SARA) of 1986, and, to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), Code of Federal Regulations (CFR) Title 40 §300.

The remedy selection was based on the Administrative Record for the site, including the remedial investigation (RI) (Jacobs Engineering Group, Inc. [Jacobs], 2000), baseline human health risk assessment (BHHRA) report (Jacobs, 2001a), addendum to the BHHRA (Jacobs, 2001b), installation-wide baseline ecological risk assessment (BERA) report (Shaw Environmental, Inc. [Shaw], 2007a), feasibility study (FS) (Jacobs, 2002), addendum to the FS report (Shaw, 2010), Proposed Plan (U.S. Department of the Army [U.S. Army], 2010) and other related documents contained in the Administrative Record for LHAAP-16.

This document is issued by the U.S. Army, the lead agency for this installation. The U.S. Army, USEPA, and the Texas Water Commission (currently known as the TCEQ) entered into the FFA for remedial activities at LHAAP on December 30, 1991. The USEPA (Region 6) and the Texas Commission on Environmental Quality (TCEQ) are the regulatory agencies providing technical support, project review and comment, and oversight of the LHAAP cleanup program. The USEPA and the U.S Army jointly select the remedy and TCEQ concurs with the selected remedy in this Record of Decision (ROD).

1.3 Assessment of the Site

The response action selected in this ROD is necessary to protect the public health or welfare or the environment from actual or threatened releases of hazardous substances, pollutants, or contaminants into the environment.

1.4 Description of the Selected Remedy

The final selected remedy for LHAAP-16 includes maintenance of the existing cap, enhanced land use controls (LUCs), in situ enhanced bioremediation in a target area, biobarriers, and monitored natural attenuation (MNA). The final remedy also incorporates those LUCs already in place as a result of an early interim remedial action (IRA), a containment presumptive remedy.

The IRA was implemented from 1996 to 1998 at LHAAP-16 to address the landfill waste materials (source area). The containment remedy, a multilayer landfill cap, was necessary to mitigate potential risks posed by buried source material at the site. Placement of a multilayer cap addressed the risks associated with landfill source materials by eliminating the direct exposure pathway to source area waste material, preventing contaminant transport to surface water via surface runoff, and reducing leaching of contaminants to the groundwater. The IRA ROD (U.S. Army and USEPA, 1995) called for warning signage, use restrictions, regular inspections, maintenance and repair of the cover system and five-year reviews. The IRA ROD also noted that a final ROD would be issued when the groundwater investigations and subsequent risk assessment were completed.

The final selected remedy for LHAAP-16 protects human health and the environment by preventing human exposure to the landfill waste and contaminated groundwater, and preventing groundwater contaminated with chemicals of concern (COCs) from migrating into nearby surface water. The human health scenarios evaluated were based on the hypothetical future maintenance worker. In the groundwater, the COCs are trichloroethene [TCE], cis-1,2-dichloroethene [DCE], vinyl chloride [VC]), perchlorate, and five metals (arsenic, chromium, manganese, nickel and thallium). The components of the selected remedy are summarized below.

- Maintenance and repair of the existing landfill cap. Groundwater monitoring activities at select wells also will be conducted to evaluate the effectiveness of the existing landfill cap. The need to continue groundwater monitoring for this purpose will be evaluated at five-year reviews.
- In situ enhanced bioremediation in the most contaminated portion of the shallow and intermediate groundwater zones to reduce contaminant mass and lower the contaminant concentrations. Bioremediation will be implemented in conjunction with phased shut down of the existing groundwater extraction system.

- Installation of a biobarrier in the downgradient portion of the contaminant plume to prevent contaminated groundwater from seeping into Harrison Bayou at concentrations that would cause surface water to exceed Texas Surface Water Quality Standards, the Safe Drinking Water Act (SDWA) maximum contaminant levels (MCLs), and Texas medium-specific concentration (MSC) levels. A second biobarrier will be installed at the edge of the landfill to control potential migration of volatile organic compounds (VOCs) from the landfill. The purpose of the biobarriers in conjunction with natural attenuation will be to reduce groundwater contaminant and by-product contaminant concentrations to levels that will prevent surface water from exceeding surface water standards, to reduce groundwater contaminant and by-product contaminant concentrations to levels that attain groundwater cleanup standards, to reduce the potential migration of contaminants and by-product contaminant from the landfill, and to reduce groundwater contaminant and by-product contaminant mass.

- MNA will be implemented for areas outside the influence of the active remedies to assure protection of human health and the environment by documenting that further reductive dechlorination is occurring within the plume and that contaminant concentrations are being reduced to cleanup levels. MNA monitoring will be initiated immediately following issuance of the remedial design. Groundwater samples will be collected from wells that are determined to be outside any significant influence from the in situ enhanced bioremediation and the biobarriers. If MNA is not successful, a contingency remedy will be implemented. That contingency remedy will comprise injection of bioremediation amendments in locations that are selected based on evaluation of site data available at that time.

- MNA will also be implemented in the areas of active remediation following successful implementation of in situ bioremediation and the biobarriers. The active remedies will significantly reduce contaminant concentrations, and MNA will ultimately restore the groundwater to cleanup levels. MNA monitoring will be initiated at wells within the treatment areas when performance monitoring of the active remedies demonstrates that further amendment injections are not necessary. If MNA is not successful, the active remedies will be re-implemented, in part or in whole, based on evaluation of site data available at that time.

- Groundwater monitoring will be conducted to evaluate inorganic COCs. The need to continue groundwater monitoring for this purpose will be evaluated at five year reviews.

- Groundwater monitoring system maintenance. A groundwater monitoring system will be implemented to demonstrate the active groundwater treatment and MNA remedies are protective of human health and the environment. The groundwater monitoring system will remain in place until the groundwater cleanup levels specified in Table 2-7 are achieved. If any of the elements of the groundwater monitoring system are damaged, destroyed, or become ineffective, they will be repaired or replaced.

- Surface water monitoring will also be conducted to confirm that surface water standards for the contaminants and by-product contaminants are not exceeded in Harrison Bayou, which flows into Caddo Lake. The surface water sampling events will be conducted when groundwater sampling events are conducted for performance monitoring, MNA monitoring, and inorganics monitoring.

- ~~The~~ A LUC performance objective is to prevent human exposure to the landfill waste. The LUC~~s~~ will remain in place as long as the landfill waste materials remain at the site ~~orand until the levels of COCs in soil and groundwater allow for unlimited use and unrestricted exposure~~. In addition, ~~a~~ LUC performance objectives to restrict the potable use of groundwater above the cleanup levels specified in Table 2-7,~~to environmental monitoring and testing only~~ and ~~to~~ restrict land use to nonresidential will remain in place until the levels of COCs in soil and groundwater allow ~~the contaminated groundwater attains groundwater cleanup levels~~ for unlimited use and unrestricted exposure ~~in order to prevent human exposure to the contaminated groundwater~~. ~~The LUC restricting land use to nonresidential will remain in place until it is demonstrated that surface soil and subsurface soil are at levels that allow for unlimited use and unrestricted exposure.~~

- ~~A LUC performance objective to maintain the integrity of any current or future remedial or monitoring systems to prevent the use of groundwater contaminated above cleanup levels as a potable water source. It will remain in place until groundwater cleanup levels are met.~~

- CERCLA five-year reviews and inspections of physical mechanisms at LHAAP-16.

Based on a preliminary natural attenuation evaluation, groundwater cleanup levels in areas without in situ bioremediation are expected to be met through natural attenuation in approximately 280 years (Shaw, 2010). The time-frame will be reevaluated after additional sampling is conducted following shut down of the extraction system and implementation of in situ bioremediation and the biobarriers. MNA will be implemented for the entire site including areas of active remediation and areas outside the influence of active remedies where proper conditions of natural attenuation are established. Natural attenuation will be evaluated in the areas of active remedies 2 years following implementation of the remedies. In the areas outside of the active remedies, natural attenuation will be evaluated for 2 years immediately following issuance of the remedial design. If proper conditions of natural attenuation are established, monitoring for the entire site will continue at a reduced frequency. Otherwise, re-application of bio-amendments (i.e., additional in situ bioremediation) will be implemented.

A LUC Remedial Design (RD) will be finalized as the land use component of the Remedial Design. Within 21 days of the issuance of the ROD~~Record of Decision~~, the Army will propose deadlines for completion of the R~~emedial~~ D~~esign~~ Work Plan, R~~emedial~~ D~~esign~~, and Remedial Action Work Plan. The documents will be prepared and submitted to EPA and TCEQ ~~for Consultation~~ pursuant to the FFA. ~~and~~ T~~t~~he LUC RD~~remedial design that~~ will contain implementation and maintenance actions, including periodic inspections. The long-term groundwater and surface water monitoring and MNA performance monitoring plan will also be presented in the RD. ~~The U.S. Army, USEPA, and the Texas Water Commission (currently~~

~~known as the TCEQ) entered into the FFA for remedial activities at LHAAP on December 30, 1991. The U.S. Army will be responsible for implementation, maintenance, periodic inspection, reporting on and enforcement of the LUCs in accordance with the RD. Although the U.S. Army may transfer these responsibilities to another party through property transfer agreement or other means, the U.S. Army will remain ultimately responsible for: (1) CERCLA §121(c) five-year reviews; (2) notification of the appropriate regulators of any known LUCs deficiencies or violations; (3) access to the property to conduct any necessary response; (4) reservation of the authority to change, modify, or terminate the LUCs and any related transfer or lease provisions; and (5) ensuring the protectiveness of the selected remedy.~~

The Army will implement, maintain, monitor, report on and enforce land use controls at Army-owned property. The Army shall perform those actions related to land use control activities described in this ROD and in the Remedial Design for the ROD. For portions of the Site subject to land use controls that are not owned by the Army, the Army will monitor and report on the implementation, maintenance, and enforcement of land use controls, and coordinate with federal, state, and local governments and owners and occupants of properties subject to land use controls. The Army will provide notice of the groundwater and soil contamination and any land use restrictions referenced in the ROD. The Army will send these notices to the federal, state and local governments involved at this site and the owners and occupants of the properties subject to those use restrictions and land use controls. The Army shall provide the initial notice within 90 days of ROD signature. The frequency of subsequent notifications will be described in the Remedial Design for the ROD. The Army remains responsible for ensuring that the remedy remains protective of human health and the environment. The Army will fulfill its responsibility and obligations under CERCLA and the NCP as it implements, maintains, and reviews the selected remedy.

Upon transfer of Army-owned property, the Army will provide written notice of the land use controls to the transferee of the groundwater and soil contamination and any land use restrictions referenced in the ROD. Within 15 days of transfer, the Army shall provide EPA and TCEQ with written notice of the division of implementation, maintenance, and enforcement responsibilities unless such information has already been provided in the LUC RD. The LUC RD will address the procedures to be used by the Army and the transferee to document compliance with the LUCs described in this ROD. In the event property is transferred out of Federal control, the land use controls relating to property and groundwater restrictions shall be recorded in the deed and shall be enforceable by the United States and the state of Texas.

U.S. Army and regulators will consult to determine appropriate enforcement actions should there be a failure of a LUCs objective at these sites after they have been transferred. ~~The U.S. Army shall consult with TCEQ and obtain USEPA concurrence prior to termination or significant modification of a LUC, or in the highly unlikely event of a land use change inconsistent with the~~

~~industrial/recreational use assumptions of the remedy. (There is no reasonably anticipated use of the property for other than wildlife refuge purposes). In the event that TCEQ and/or EPA and the Army agree with respect to any significant modification of the selected remedy, including the LUCs component of the selected remedy, the remedy will be changed consistent with the FFA and 40 C.F.R. §300.435(c)(2).~~

The management strategy at LHAAP is to approach each site separately to address human health issues and to approach the sites by sub-area to address ecological risk. Thus, the implementation of this remedy at LHAAP-16 is independent of any other remedial action at LHAAP to address human health issues. To address ecological risk, LHAAP-16 was grouped with several other sites as part of the Waste Sub-Area. The final chemicals of potential ecological concern (COPECs) in soil that require remedial action in the Waste Sub-Area are barium, 2,4-dinitrotoluene (DNT), 2,6-DNT, 2,4,6-trinitrotoluene (TNT), and dioxins (Shaw, 2010). Based on the evaluation of soil samples collected during the RI from outside the landfill, the BERA concluded that no action is needed at LHAAP-16 for the protection of ecological receptors. The proposed remedy at LHAAP-17 will be sufficient to address ecological risks for the entire Waste Sub-Area. The proposed remedy at LHAAP-17 is identified in the Proposed Plan (Shaw 2010b) that has been reviewed and approved by the regulatory agencies. The Proposed Plan is in the Administrative Record file for LHAAP.

1.5 Statutory Determinations

The final selected remedy is protective of human health and the environment, complies with Federal and State requirements that are applicable or relevant and appropriate to the remedial action, and is cost-effective. In addition, the remedy offers long-term effectiveness through the long-term inspection and maintenance of the landfill cap (that controls infiltration, contaminant runoff, and contaminant exposure) and implementation of LUCs which will minimize the potential risk to the hypothetical future maintenance worker posed by the landfill waste material and contaminated groundwater. Furthermore, evaluation of natural attenuation (including determination of contaminant reduction rates and routine monitoring of the attenuation until cleanup levels are met) will document the effectiveness of the final selected remedy. The final selected remedy is easily and immediately implementable.

The in situ bioremediation and biobarriers components of the selected remedy satisfy the statutory preference for treatment as a principal treatment element of the remedy. The MNA component does not address the statutory preference for treatment to the maximum extent practicable; MNA is a passive remedial action using natural processes. Although none of the landfill waste will be actively treated, the potential mobility and toxicity of the landfill waste contaminants would be minimized through proper landfill cap maintenance, and the biobarrier near the landfill fence line.

Because hazardous substances, pollutants, or contaminants may remain at the site above levels that allow for unlimited use and unrestricted exposure, reviews will be conducted every 5 years as required under CERCLA §121(c), U.S. Code (USC) Title 42 §9621(c). In accordance with 30 Texas Administrative Code (TAC) §335.566, a notification will be recorded in Harrison County records stating that the site has restrictions against intrusive activities (e.g., digging) as long as landfill waste remains~~ or until the levels of COCs allow for unlimited use and unrestricted exposure~~. It will also be recorded that the site~~, and~~ is suitable for nonresidential use, and that a prohibition of groundwater potable use ~~(except for environmental monitoring and testing)~~ is in place until the levels of COCs in ~~soil and~~ groundwater achieve cleanup levels. Additionally, a restriction against residential land use will remain in place until the levels of COCs in soil and groundwater allow~~the cleanup levels~~ for unlimited use and unrestricted exposure~~ are achieved~~~~and that the integrity of any current or future remedial or monitoring systems to prevent the use of groundwater contaminated above cleanup levels as a potable water source must be maintained until those cleanup levels are met~~. Although the U.S. Army may later pass these procedural responsibilities to the transferee by property transfer agreement, the U.S. Army shall retain ultimate responsibility for remedy integrity, per the FFA and CERCLA §121.

1.6 ROD Data Certification Checklist

The following information is included in the Decision Summary section of this ROD. Additional information can be found in the Administrative Record for this site.

- Current and reasonably anticipated future land use assumptions and current and potential future beneficial uses of groundwater as identified in the baseline risk assessment and ROD (**Section 2.6**).
- Potential land and groundwater use that will be available at the sites as a result of the selected remedy (**Section 2.6**).
- COCs and their concentrations (**Section 2.7**).
- Baseline risk represented by the COCs (**Section 2.7**).
- Cleanup levels established for COCs and the basis for these levels (**Sections 2.7.4** and **2.8**).
- How source materials constituting principal threats are addressed at this site (**Section 2.11**).
- Key factor(s) that led to selecting the remedy (**Section 2.12**).
- Estimated capital, annual operation and maintenance (O&M), and total present worth costs, discount rate, and the number of years over which the remedy cost estimates are projected (**Section 2.12**).

1.7 Authorizing Signatures

As the lead agency, the U.S. Army issues this ROD for LHAAP-16 which documents the final selected remedy. The undersigned is the appropriate approval authority for this decision.

(*Name*) (*Date)*
Thomas E. Lederle
Deputy~~Industrial Branch Chief~~
BRAC~~ase Realignment and Closure~~ Division, ACSIM
U.S. Army

The U.S. Environmental Protection Agency approves the final selected remedy as provided in the ROD for LHAAP-16.

(*Name*) (*Date*)

Samuel Coleman, P.E.
Director
Superfund Division
U.S. Environmental Protection Agency
Region 6

2.0 Decision Summary

2.1 Site Name, Location, and Description

LHAAP-16 Landfill

Longhorn Army Ammunition Plant
Karnack, Texas

Comprehensive Environmental Response, Compensation, and Liability Information System USEPA Identification Number: TX6213820529

Lead Agency: U.S. Army, Department of Defense
Support Agencies: USEPA Region 6, TCEQ

Source of Cleanup Money: U.S. Army, Department of Defense
Site Type: Landfill

The former LHAAP is an inactive, government-owned, formerly contractor operated and maintained, Department of Defense facility located in central east Texas (see **Figure 2-1**) in the northeast corner of Harrison County. LHAAP is approximately 14 miles northeast of Marshall, Texas, and approximately 40 miles west of Shreveport, Louisiana. The former U.S. Army installation occupied 8,416 acres between State Highway 43 at Karnack, Texas, and the southwestern shore of Caddo Lake. The facility can be accessed via State Highways 43 and 134.

LHAAP was placed on the USEPA National Priorities List (NPL) on August 9, 1990. Activities to remediate contamination began in 1990. After its listing on the NPL, the U.S. Army, the USEPA, and the Texas Water Commission (currently known as the TCEQ) entered into a CERCLA §120 FFA for remedial activities at LHAAP. The FFA became effective December 30, 1991. LHAAP operated until 1997 when it was placed on inactive status and classified by the U.S. Army Armament, Munitions, and Chemical Command as excess property. The majority of LHAAP has been transferred by the U.S. Army to the U.S. Fish and Wildlife Service (USFWS) for management as the Caddo Lake National Wildlife Refuge.

LHAAP-16, a capped landfill, is located in the south-central portion of LHAAP and covers an area of approximately 20 acres (**Figure 2-2**). Harrison Bayou runs along the northeastern edge of LHAAP-16. The landfill was established in the 1940s and was used for the disposal of solid and industrial wastes until the 1980s when disposal activities were terminated.

2.2 Site History and Enforcement Activities

2.2.1 History of Site Activities

LHAAP was established in December 1941 with the primary mission of manufacturing TNT. Production of TNT began at Plant 1 in October 1942 and continued through World War II until August 1945, when the facility was placed on standby status until February 1952. LHAAP facility was reactivated with the opening of Plant 2, where pyrotechnic ammunition, such as photoflash bombs, simulators, hand signals, and tracers for 40 millimeter ammunition, were produced until 1956.

In December 1954, a third facility, Plant 3, began production of solid-fuel rocket motors for tactical missiles. Rocket motor production at Plant 3 continued to be the primary operation at LHAAP until 1965 when Plant 2 was reactivated for the production of pyrotechnic and illuminating ammunition. In the years following the Vietnam conflict, LHAAP continued to produce flares and other basic pyrotechnic or illuminating items for the U.S. Department of Defense inventory. From September 1988 to May 1991, LHAAP was also used for the static firing and elimination of Pershing I and II rocket motors in compliance with the Intermediate-Range Nuclear Force Treaty in effect between the United States and the former Union of Soviet Socialist Republics. LHAAP operated until 1997 when it was placed on inactive status and classified by the U.S. Army Armament, Munitions, and Chemical Command as excess property.

LHAAP-16 Landfill was established in the 1940s and was used for disposal of solid and industrial wastes until the 1980s when disposal activities were terminated. The U.S. Army and the USEPA signed a ROD in 1995 approving an interim remedial action for LHAAP-16 to mitigate potential risks posed by buried source material at the site. The interim remedial action included the construction of a landfill cap, considered a component of the final remedy for the site. Construction of the 13-acre multilayer cap was completed in 1998. The ROD also specified that the U.S. Army would be required to “perform long-term maintenance of the cap.” The landfill cap would be inspected at regular intervals to check for erosion, settlement, and deep-rooted vegetation. Repairs would be implemented as needed. LUCs, such as future use restrictions, would also be required.

In addition, at the request of the regulatory authorities, but not pursuant to a decision document (e.g., a record of decision or consent order), a groundwater extraction system was voluntarily installed by the U.S. Army in 1996 and 1997 as a treatability study to prevent the groundwater plume from migrating to Harrison Bayou. The extraction system has now been operating for over 10 years (Shaw, 2010).

2.2.2 History of Investigative Activities

As part of the Installation Restoration Program, the U.S. Army began an environmental investigation in 1976 at LHAAP followed by installation wide assessments/investigations that included the following:

- In 1980, U.S. Army Toxic and Hazardous Materials Agency (USATHAMA) conducted a record search to assess the impact of the LHAAP installation activities including usage, storage, treatment, and disposal of toxic and hazardous materials on the environment, and defined conditions that may have adversely affected human health and the environment. Groundwater monitoring wells were installed and water samples were collected from the wells at the LHAAP-16 site (USATHAMA, 1980).
- Contamination Survey – In 1982 as part of the LHAAP contamination survey, Environmental Protection Systems collected six groundwater samples for laboratory analyses. Subsequently in 1987, as part of the Resource Conservation and Recovery Act (RCRA) permit application process, and as a continuation of the contamination survey, U.S. Army Environmental Hygiene Agency (USAEHA) identified, described, and evaluated all solid waste management units at LHAAP. Soil, groundwater, surface water and sediment samples were collected from the LHAAP-16 site (USAEHA, 1987). Units requiring further sampling, investigation and corrective action were delineated.
- RCRA Facility Assessment (RFA) – In 1988, a preliminary RFA was conducted by the U.S. Army (Maley, 1988). Waste at the various sites was characterized, but no samples were collected.

Several investigations to determine the nature and extent of contamination in the soil, groundwater, surface water, and sediments at LHAAP-16 were conducted and are listed below. Samples were analyzed for VOCs, semivolatile organic compounds (SVOCs), metals, explosive compounds, perchlorate, pesticides, polychlorinated biphenyls (PCBs), and/or dioxins/furans, depending on the focus of the investigation. For some of the earlier investigations, LHAAP sites were organized into groups, and LHAAP-16 was included in Group 2. LHAAP-16 was pulled out of Group 2 to allow for expedited decision making, and early actions to control the release of site-related contaminants. The following summarizes the investigations at LHAAP-16.

- **Multi-phase investigation of LHAAP-16**: Between 1993 and 1999 numerous investigations were conducted in a phased approach by Sverdrup, U.S. Army Corps of Engineers (USACE), and Jacobs. Activities included installation of monitoring wells and analysis of groundwater, surface water, soil, and sediment samples. Various landfill investigative tools were also used, including collecting soil gas samples. The results are documented in the RI report (Jacobs, 2000).
- **Plant-wide perchlorate investigation**: The soil and groundwater investigation was conducted by Solutions to Environmental Problems, Inc. (STEP) in 2000 through 2003 (STEP, 2005).

- **Baseline Human Health Risk Assessment**: The BHHRA (Jacobs, 2001a) used data from the investigations conducted through 1999. Dioxin and furan results had been omitted from the BHHRA, therefore an addendum to the BHHRA addressing potential human health risks associated with exposure to dioxins and furan was issued (Jacobs, 2001b). **Environmental Site Assessment: Media** evaluated in 2003 included soil and groundwater (Plexus, 2005), although no sampling was conducted at LHAAP-16 for this assessment.

- **Groundwater Monitoring**: Additional groundwater monitoring was conducted between 2003 and 2004 after the BHHRA was finalized to provide additional information regarding LHAAP-16 groundwater contamination identified during previous sampling events. Groundwater monitoring results from sampling conducted during Spring 2003, Spring 2004, and Winter 2004 were presented in the Groundwater Monitoring Report (USACE and ALL Consulting, 2007).

- **Surface Water Monitoring**: Since 1999 to present, surface water monitoring has been conducted on a quarterly basis at LHAAP-16. Surface water samples are collected from three locations in Harrison Bayou; upgradient, downgradient and immediately adjacent to LHAAP-16. Surface water analytical results indicated that in the past there has been some discharge by seepage into Harrison Bayou (Jacobs, 2002 and Shaw, 2007c).

- **Baseline Ecological Risk Assessment**: The BERA (Shaw, 2007a) iden**tified COPECs for the Waste S**ub-Area, which includes LHAAP-16. COPECs for the sub-area are addressed in the remedial actions for LHAAP-17, another site within the sub-area. The evaluation was based on environmental investigations from 1993 to 2006.

- **Feasibility Study**: The FS (Jacobs, 2002) was based on available results from investigation conducted up to 1999. The FS presented an interim analysis of remedial alternatives for LHAAP-16. Final Ecological risks and extent of groundwater remediation were not addressed in that document. Shaw issued the FS Addendum (Shaw, 2010) providing a basis for the final evaluation of alternatives and selection of a final remedy for LHAAP-16 consistent with the intended future use of LHAAP-16 as part of the national wildlife refuge. A new alternative, Alternative 7 was added to the existing FS. The FS Addendum also included natural attenuation and geochemical evaluation conducted in 2007, installation and sampling of wells near Harrison Bayou conducted in 2007, installation and sampling of wells to address data gaps conducted in 2008, and groundwater sampling for metals, perchlorate, and volatile organic compounds performed in 2009. The findings of the BERA were also included in the FS Addendum.

Figures 2-3 and **2-4** show the sampling locations for soil and groundwater, and surface water and sediment, respectively.

2.2.3 History of CERCLA Enforcement Activities

Due to the releases of chemicals from facility operations, the USEPA placed LHAAP on the Superfund NPL on August 9, 1990. Activities to remediate contamination associated with the listing of LHAAP as a Superfund site began in 1990. After the listing on the NPL, the U.S. Army, the USEPA, and the Texas Water Commission (currently known as the TCEQ) entered into a CERCLA §120 FFA for remedial activities at LHAAP. The FFA became effective December 30, 1991.

In 1995 as part of the public participation requirements under CERCLA, the U.S. Army issued a Proposed Plan for LHAAP-16 (U.S. Army, 1995) followed by a ROD (U.S. Army and USEPA, 1995) for the site addressing an early IRA. The early IRA was necessary to mitigate potential risks posed by buried source materials. Specifically, the objectives of the IRA were to minimize long-term vertical infiltration of water through the landfill and minimize contaminant transport.

From 1996 to 1998 a landfill cover system (also referred to as a cap) was placed over the site (**Figure 2-5**) and was completed as part of an early IRA in accordance with the USEPA presumptive remedy guidance under CERCLA for municipal landfills (USEPA, 1993) and for military landfills (USEPA, 1996).

The FS (Jacobs, 2002), presenting an interim analysis of remedial alternatives for LHAAP-16, was issued in March 2002. In order to evaluate a final remedy for LHAAP-16, a FS Addendum (Shaw, 2010) was issued in March 2010, and the Proposed Plan (U.S. Army, 2010) was issued in September 2010. This ROD follows that Proposed Plan and precedes the more detailed RD.

2.3 Community Participation

The U.S. Army, USEPA, TCEQ and the LHAAP Restoration Advisory Board (RAB) have provided public outreach to the surrounding community concerning LHAAP-16 and other environmental sites at LHAAP. The outreach program has included fact sheets, media interviews, site visits, invitations to attend quarterly RAB meetings, and public meetings consistent with its public participation responsibilities under Sections 113(k)(2)(B), 117(a), and 121(f)(1)(G) of CERCLA.

The Final Proposed Plan (U.S. Army, 2010) for the selection of the remedy for LHAAP-16 was released to the Administrative Record and made available to the public for review and comment on September 23, 2010. A media release was sent to radio stations KETK, KMSS, KSLA, and KTBS on September 23, 2010. The notice of availability of the Proposed Plan and other related documents in the Administrative Record file was published in *The Shreveport Times* and the *Marshall News Messenger* on September 26, 2010. The newspaper and media notices for the meeting are provided in **Appendix A**. The public comment period for the Proposed Plan began on October 10, 2010, and ended November 9, 2010. A public meeting was held on October 19, 2010, in a formal format and with a court reporter. The transcript for the meeting is part of the Administrative Record. The significant comments (oral or written) are addressed in the Responsiveness Summary, which is included in this ROD as **Section 3.0**.

The Administrative Record may be found locally at the information repository maintained at the following location:

Location: Marshall Public Library
300 S. Alamo
Marshall, Texas, 75670

Business Hours: Monday – Thursday 10:00 a.m. – 8:00 p.m.
Friday – Saturday 10:00 a.m. – 5:00 p.m.

2.4 Scope and Role of Response Action

The scope and role of the action discussed in this ROD includes all remedial actions planned for this site. The final selected remedy at LHAAP-16 will prevent potential risks associated with exposure of the hypothetical future maintenance worker to landfill waste material and exposure to contaminated groundwater. The remedial action will include maintenance of the existing cap, groundwater use restrictions, installation of a biobarrier in the shallow groundwater zone adjacent to the landfill, in situ enhanced bioremediation in the shallow and intermediate groundwater zones, installation of a biobarrier in the shallow groundwater zone between LHAAP-16 and Harrison Bayou, and MNA of the shallow and intermediate groundwater zones.

The selected action at LHAAP-16 will prevent potential risks associated with exposure to contaminated groundwater. Although groundwater at Longhorn is not currently being used as drinking water, nor may it be used in the future based on its reasonably anticipated use as a national wildlife refuge, when establishing the remedial action objectives for this response action, the U. S. Army has considered the NCP's expectation to return usable groundwaters to their potential beneficial uses wherever practicable and has also considered the State of Texas designation of all groundwater as potential drinking water, unless otherwise classified, and consistent with 30 TAC 335.563(h)(1) [background total dissolved solids (TDS) content less than or equal to 10,000 mg/L and that occurs within a geologic zone that is sufficiently permeable to transmit water to a pumping well in usable quantities]. The U.S. Army intends to return the contaminated groundwater at LHAAP-16 to its potential beneficial uses, which for the purposes of this ROD is considered to be attainment of the Safe Drinking Water Act (SDWA) MCLs to the extent practicable, and consistent with 40 CFR § 300.430(e)(2)(i)(B&C). If an MCL is not available for a chemical, the promulgated TCEQ groundwater medium-specific concentration (MSC) for industrial use (GW-Ind) will be used in place of the MCL, in accordance with 30 TAC 335.559(d)(2). If a return to potential beneficial uses is not practicable, the NCP expectation is to prevent further migration of the plume, prevent exposure to the contaminated groundwater, and evaluate further risk reduction.

The selected remedial action will treat the contaminated groundwater plume to prevent the migration of groundwater COCs and COC by-products into Harrison Bayou that would result in an exceedance of surface water criteria In addition, the selected remedial action will include groundwater monitoring to demonstrate that the contaminants and by-product contaminants are not migrating into Harrison Bayou at or above the SDWA MCLs, or if MCLs are not available, the Texas MSCs for GW-Res as authorized under 30 TAC 335.559(b) and surface water monitoring to confirm that surface water standards for the contaminants and by-product contaminants are not exceeded. For purposes of this ROD, surface water standards include the Texas Surface Water Quality Standards found at 30 TAC 307, or if those standards are not available, the SDWA MCLs, or if MCLs are not available, the Texas MSCs for GW-Res as authorized under 30 TAC 335.559(b).

The final selected remedy will protect human health and the environment. The human receptor evaluated was the hypothetical future maintenance worker. The maintenance and repair will preserve the integrity of the existing landfill cover system. In situ bioremediation will treat/remediate and reduce contaminant mass and lower contaminant concentrations in groundwater. Installation of biobarriers will treat/remediate and thereby control potential migration of contaminants and by-product contaminants from the landfill and will reduce groundwater contaminant mass thus providing additional protection of Harrison Bayou. Natural attenuation will further reduce groundwater contaminants and by-product contaminants respective concentrations. The LUC performance objectives to be implemented include groundwater use restrictions and land use restrictions to protect and maintain the integrity of the existing landfill cover system. The LUCs to protect and maintain the integrity of the landfill cap will remain in place as long as the landfill waste remains at the site~~ orand until the levels of COCs in soil and groundwater allow for unlimited use and unrestricted exposure~~. The LUCs restricting the potable use of groundwater above cleanup levels~~to environmental monitoring and testing only~~ and the LUC restricting land use to nonresidential will remain in place until the levels of COCs in soil and groundwater allow ~~the contaminated groundwater attains groundwater cleanup levels~~ for unlimited use and unrestricted exposure~~ in order to prevent human exposure to the contaminated groundwater~~. ~~The LUC restricting land use to nonresidential will remain in place until it is demonstrated that surface soil and subsurface soil are at levels that allow for unlimited use and unrestricted exposure.~~ ~~The LUC to maintain the integrity of any current or future remedial or monitoring systems to prevent the use of groundwater contaminated above cleanup levels as a potable water source shall remain in effect until those cleanup levels are met.~~ Without the selected remedial action, the potential for the contaminated groundwater to seep into Harrison Bayou, at levels that equal or exceed surface water standards constitutes an unacceptable risk to human health and the environment.

2.5 Site Characteristics

This section of the ROD presents a brief comprehensive overview of LHAAP-16 site characteristics with respect to the conceptual site model (CSM), physical site features, known or suspected sources of contamination, types of contamination, and affected media. Known or potential routes of contaminant migration are also discussed. Detailed information about the site characteristics can be found in the RI (Jacobs, 2000).

2.5.1 Conceptual Site Model

Figure 2-6 illustrates the conceptual model for the source area at LHAAP-16. The model presents the role of the landfill cap constructed in the IRA of 1998 (**Section 1.4**) and specifies the potential exposure pathways that were cut off by the landfill cap. The construction of the cap as part of the IRA is consistent with USEPA (1993) guidance. **Figure 2-7** illustrates the conceptual model for the non-source area, which lies outside the landfill cap, and which may contain residues of waste materials that may have been transported from the landfill prior to the IRA of 1998. The model presents pathways associated with the non-source area media that are complete and are being considered for remediation, and pathways that are likely incomplete or have negligible impact and are not being considered for remediation.

The landfill contents are not thoroughly known, but disposal history indicates that TNT wastewater ash was deposited in the early 1940s. During the 1950s, a large bermed depression in the central section of the currently capped area was reportedly used for disposal of a variety of materials such as substandard TNT, barrels of chemicals, oil, paint, , scrap iron, containers, scrap metal, wood, and other items. Burn pits and waste storage were reported to be common at the site, although there is little documentation of these activities (Jacobs, 2002). Consistent with the USEPA guidance on presumptive remedies for landfills (1993), it was anticipated that the landfill would pose an unacceptable human health risk, and the landfill was capped as part of the 1998 IRA.

Before the landfill was capped, soil outside the landfill, the non-source area, could have become contaminated from spills, leaks, and runoff of contaminants from the landfill. The baseline human health risk assessment indicated that the cancer risk for the hypothetical maintenance worker was at the lower end of or below the target risk range for surface soil, surface/subsurface soil and sediment. The BERA concluded that no action is needed for LHAAP-16 for the protection of ecological receptors (Shaw, 2007a).

The groundwater is affected by contaminants from the landfill. This was probably caused by the migration of contaminants, via rainwater infiltration, from the landfill waste to groundwater prior to capping the landfill. Analytical results from groundwater samples indicate that the groundwater contamination poses a risk well above the target risk range. The primary COCs in groundwater include TCE, cis-1,2- DCE, vinyl chloride, and perchlorate. Since the groundwater at LHAAP-16 may pose a risk for the hypothetical future maintenance worker, the pathways considered for remediation include future industrial groundwater use.

The contaminants in the shallow groundwater migrate toward and discharge by seepage into Harrison Bayou. The seepage of contaminated groundwater into Harrison Bayou represents a groundwater to surface water pathway of exposure that is identified and addressed by the selected remedial action.

2.5.2 Overview of the Site

LHAAP-16 encompasses an area of approximately 20 acres, of which 13 acres are covered by a landfill cap, in the south-central portion of LHAAP. Harrison Bayou runs along the northeastern edge of LHAAP-16. Most of LHAAP-16 is relatively flat. The outer edges of the site are forested, and the land becomes steeper near Harrison Bayou. The capped landfill is vegetated. Surface drainage from LHAAP-16 flows mostly through small gullies and ditches to Harrison Bayou. Harrison Bayou flows into Caddo Lake, to the northeast of the site. The lake is a source of drinking water for several neighboring communities in Louisiana including Vivian, Oil City, Mooringsport, South Shore, Blanchard, Shreveport, and Bossier City.

The eastern and southeastern edges of LHAAP-16 are located within the 100-year floodplain of Harrison Bayou. LHAAP-16 has no known areas of archeological or historical importance.

2.5.3 Geology and Hydrogeology

The surface soil at LHAAP-16 consists of fine sandy loam. The subsurface is composed of medium plastic sandy silt, fine sands, and clay. The clay layers tend to separate the groundwater into shallow, intermediate, upper deep and deep zones.

The shallow groundwater zone varies in thickness from 9 to 18 feet and extends 33 feet below ground surface (bgs). Groundwater elevations were measured by Shaw in June 2007. The shallow zone groundwater elevation contours based on these data are shown on **Figure 2-8**. Depth to groundwater in the shallow zone is approximately 4 to 25 feet bgs. An intermediate groundwater zone containing fewer fines than the shallow zone extends from 35 to 62 feet bgs. **Figure 2-9** shows measured groundwater elevations and groundwater contours for the data collected in June 2007. The upper deep groundwater zone extends from approximately 80 to 151 feet bgs. The deep groundwater zone extends below 220 feet bgs. While flow is primarily horizontal in these zones, vertical interaction between the shallow and intermediate zones is evidenced by pumping test results as well as the presence of contamination in both zones. Such interconnection is consistent with soil layers formed in fluvial depositional environments. The groundwater flow direction is northeast toward Harrison Bayou in the shallow, intermediate and deep zones, while flow direction is southeast toward Harrison Bayou in the upper deep groundwater zone. Overall, the groundwater flow is toward Caddo Lake. The mean hydraulic conductivity value varies from 1.5×10^{-3} centimeters per second (cm/sec) in the shallow zone to 4.2×10^{-4} cm/sec in the deep zone (Jacobs, 2002).

Groundwater flow between the landfill and Harrison Bayou is also influenced by the presence of an extraction well system consisting of four wells in the shallow groundwater zone and four wells in the intermediate groundwater zone. The wells were installed in 1996 and 1997 as part of a treatability study.

2.5.4 Sampling Strategy

Several sampling events were conducted at LHAAP-16 from 1980 to 2009, as outlined in **Section 2.2.2** on site investigations. In the early investigations, groundwater monitoring wells were installed and samples were collected from throughout the site to determine the areas of contamination. Subsequent investigations focused on the areas where contamination was found, performing additional soil, groundwater, surface water and sediment sampling and installing additional monitoring wells to delineate the contamination. Samples were analyzed for various analytes including VOCs, SVOCs, metals, explosives, perchlorate, pesticides/PCBs, and dioxins/furans. In the area of the contaminant plume, groundwater samples were also analyzed for indicators of conditions that promote natural attenuation (biodegradation), such as dissolved oxygen, conductance, pH, oxidation-reduction potential, sulfide, methane, and chloride.

2.5.5 Nature and Extent of Contamination

The contaminated media at LHAAP-16 include buried source material (landfill waste under the cap) and the shallow and intermediate groundwater beneath and down-gradient of the landfill. A presumptive remedy (IRA) was implemented in 1996 through 1998 by placement of a multilayer cap at LHAAP-16 mitigating potential risks posed by buried landfill waste. The cap prevents rainfall from infiltrating and leaching contaminants from principal threat wastes within the landfill. However, contaminated groundwater still appears to be migrating from beneath the landfill presenting an unacceptable risk. A groundwater extraction system was installed as a treatability study to prevent the groundwater plume from migrating to Harrison Bayou.

The major groundwater COCs for LHAAP-16 identified in the FS (Shaw, 2010) are VOCs, including TCE, cis-1,2-DCE, and vinyl chloride and perchlorate in the shallow and intermediate groundwater. The approximate extent of VOC and perchlorate contamination in the shallow and intermediate zones is shown on **Figure 2-3**. The highest concentration of TCE detected was 173,000 micrograms per liter (µg/L) on October 1, 2003 at the extraction well 16EW02. The TCE plume's edge is defined by the MCL of 5 µg/L. The daughter products cis-1,2-DCE had a maximum detection of 520,000 µg/L on March 21, 1995 at 16PB08 and vinyl chloride had a maximum detection of 11,000 µg/L on June 15, 1998 at 16WW16. The maximum concentration for perchlorate was detected at 5990 µg/L at 16WW12 in October 2007. Five metals (arsenic, chromium, manganese, nickel and thallium) had sporadic elevated detections and were also retained as COCs. The detected metals do not appear to be associated with widespread contamination from the landfill.

Data collected from the upper deep groundwater zone indicate that no groundwater contamination has been detected since 1997. Data also confirmed that contaminants have not migrated down to the deep zone.

2.6 Current and Potential Future Land and Resource Uses

2.6.1 Current and Future Land Uses

LHAAP is located near the unincorporated community of Karnack, Texas. Karnack is a rural community with a population of 775 people. The incorporated community of Uncertain, Texas, population 205, is located to the northeast of LHAAP on the edge of Caddo Lake and is a resort area and an access point to Caddo Lake. The industries in the surrounding area consist of agriculture, timber, oil and natural gas production, and recreation.

LHAAP has been an industrial facility since 1942. Production activities and associated waste management activities continued until the facility was determined to be in excess of the U.S. Army's needs in 1997. The plant area has been relatively dormant since that time. LHAAP is surrounded by a fence (except on the border with Caddo Lake), and current security measures at the LHAAP preclude unlimited public access to areas within the fence. The fence now represents the National Wildlife Refuge boundary. Approved access for hunters is very limited.

The reasonably anticipated future use of LHAAP-16 is as part of a national wildlife refuge. This anticipated future use is based on a Memorandum of Agreement (MOA) (U.S. Army, 2004) between the USFWS and the U.S. Army. That MOA documents the transfer process of the LHAAP acreage to USFWS to become the Caddo Lake National Wildlife Refuge and will be used to facilitate a future transfer of LHAAP-16. Presently the Caddo Lake National Wildlife Refuge occupies approximately 7,000 acres of the 8,416-acre former installation. In accordance with the National Wildlife Refuge System Administration Act of 1966 and its amendments (16 USC 668dd), the land will remain as a national wildlife refuge unless there is a change brought about by an act of Congress, or the land is part of an exchange authorized by the Secretary of the Interior.

2.6.2 Current and Future Surface Water Uses

Harrison Bayou, which is located on and adjacent to LHAAP, currently supports wildlife and aquatic life. Humans may have limited access to parts of Harrison Bayou during animal hunts, but there is no routine use of Harrison Bayou located at LHAAP. Harrison Bayou does not carry adequate numbers and size of fish to support either sport or subsistence fishing. During the summer months, Harrison Bayou ceases flowing and/or dries up. The eastern portion of the LHAAP-16 is located within Harrison Bayou's 100-year flood-plain. When flowing, Harrison Bayou discharges into Caddo Lake, a large recreational lake covering 51 square miles with a mean depth of 6 feet. The watershed of the lake encompasses approximately 2,700 square miles.

Caddo Lake is used extensively for fishing and boating. The anticipated future uses of surface water are the same as the current uses.

2.6.3 Current and Future Groundwater Uses

Groundwater in the drinking water aquifer (250-430 feet bgs) under and near LHAAP is currently used as a drinking water source. The drinking water aquifer should not be confused with the deep zone groundwater, which extends only to a depth of approximately 151 feet bgs. The deep zone groundwater and the drinking water aquifers are distinct from each other and there is no connectivity between the contaminated zone and the drinking water aquifer. There are five active water supply wells near LHAAP that are completed in the drinking water aquifer. One well is located in and owned by Caddo Lake State Park. The well is completed to a depth of 315 feet bgs and has been in use since 1935. A second well owned by the Karnack Water Supply Corporation services the town of Karnack and is located approximately 2 miles southeast of town. This well is completed to approximately 430 feet bgs and has been in use since 1942. The Caddo Lake Water Supply Corporation has three wells located both north and northwest of LHAAP. These wells are identified as Caddo Lake Water Supply Corporation Wells 1, 2, and 3, and all are hydraulically upgradient of LHAAP (Jacobs, 2002). These wells are completed deeper than the deepest zone of contamination at LHAAP. Because of this and the large distance between these wells and LHAAP, water removal from these wells is not expected to affect groundwater flow at the site. In addition, there are several livestock and domestic wells located in the vicinity of LHAAP with depths averaging approximately 250 feet bgs.

Three water supply wells are located within the boundary of LHAAP itself. One well is located at the Fire Station; the second well is located approximately 0.35 miles southwest of the Fire Station. The third well is located north of the USFWS administration building for Caddo lake National Wildlife Refuge, near the main entrance to LHAAP. The distances from these water supply wells to the middle of LHAAP-16 are approximately 2.2 miles, 1.75 miles, and 1.77 miles, respectively. The three water supply wells were completed at a depth much greater than the zone of contamination described at LHAAP-16. Two additional wells previously supplied water to the installation, but these have been plugged and abandoned. None of these three wells are currently used for drinking water at LHAAP, although they may supply water for non-potable uses.

Although the anticipated future use of the facility as a national wildlife refuge does not include the use of the groundwater at LHAAP-16 as a drinking water source, the State of Texas designates all groundwater as potential drinking water, unless otherwise classified, and consistent with 30 TAC 335.563(h)(1). To be conservative, a hypothetical industrial use scenario was evaluated for risk. The future industrial scenario for LHAAP assumes limited use of groundwater as a drinking water source.

2.7 Summary of Site Risks

Quantitative risk assessment for the non-source areas anticipated to have received contaminants migrating from the source area are consistent with USEPA (1993) guidance for presumptive remedies as conducted in the 1998 IRA. This section summarizes the results of the baseline human health and ecological risk assessments conducted for LHAAP-16 (Jacobs, 2001a; 2001b; Shaw 2007a). The risk assessment consists of a BHHRA (Jacobs, 2001a), an Addendum to the BHHRA (Jacobs, 2001b) and an installation-wide BERA performed by Shaw (Shaw, 2007a) and summarized in the Addendum to the Final FS (Shaw, 2010). The assessments provide the basis for taking action and identify the contaminants and exposure pathways that need to be addressed by the remedial action.

2.7.1 Summary of Human Health Risk Assessment

This section is based on the conclusions presented in the *Final Baseline Risk Assessment: Human Health Evaluation, Site 16* (Jacobs, 2001a), in the *Addendum to Final Baseline Risk Assessment: Human Health Evaluation, Site 16* (Jacobs, 2001b), in the *Final Feasibility Study LHAAP-16* (Jacobs, 2002), and in the *Final Addendum to Final Feasibility Study, LHAAP-16* (Shaw, 2010). The risk assessment used data from the investigations conducted through 1999. Results from the later investigations through 2009 did not change the overall outcome of the risk assessment. During the risk assessment, soil and groundwater, and Harrison Bayou surface water and sediment data were used to calculate the aggregate risk, which was then compared to the USEPA target risk range of 1×10^{-4} to 1×10^{-6} for the excess lifetime carcinogenic risk and to a hazard index (HI) of 1 for non-carcinogenic hazards. If there is no unacceptable risk associated with a medium, and a cleanup level is not exceeded, then the medium is not identified in this ROD for remediation. The human health risk did not include contaminant concentrations in the waste material within the landfill because the exposure to the waste material has been eliminated. The CSM that is associated with the risk assessment was introduced in **Section 2.5.1**, and is presented as **Figure 2-7**.

2.7.1.1 Identification of Chemicals of Potential Concern

The BHHRA identified chemicals of potential concern (COPCs) for LHAAP-16 and evaluated the carcinogenic risk and non-carcinogenic hazard for each. **Table 2-1** summarizes the risk assessment data for the COPCs, including minimum and maximum detected concentrations, number of samples with detectable concentrations, and exposure point concentrations (EPCs).

2.7.1.2 Exposure Assessment

The Jacobs risk assessment (Jacobs, 2001a; 2001b) presented the human health risks and hazards to an on-site trespasser under current site conditions for surface soil, surface water, sediment, and fish ingestion and a hypothetical future maintenance worker under an industrial scenario for soil and/or groundwater.

For the trespasser, reasonable exposure pathways evaluated are: incidental ingestion of the surface soil (0 to 0.5 feet bgs), dermal contact with the surface soil, inhalation of particulates, and inhalation of VOCs from the soil (0 to 0.5 feet bgs). The trespasser scenario was also evaluated for potential contact with Harrison Bayou media including ingestion of sediment, dermal contact with sediment and surface water, and ingestion of fish.

The BHRRA found that for the current trespasser, none of the exposure pathways contributed to carcinogenic risk or non-carcinogenic hazard, thus the current trespasser data was not included in **Table 2-1**.

For the hypothetical future maintenance worker, reasonable soil exposure routes evaluated are: incidental ingestion of the surface soil (0 to 5 feet bgs), dermal contact with the surface soil, inhalation of particulates, and inhalation of VOCs from the soil (0 to 5 feet bgs).

For groundwater, reasonable exposure pathways for the hypothetical future maintenance worker are ingestion of groundwater, dermal contact while showering with contaminated groundwater, and inhalation of VOCs while showering with contaminated groundwater.

2.7.1.3 Toxicity Assessment

The carcinogenic and non-carcinogenic toxicity assessments from the BHHRA are summarized in **Tables 2-2** and **2-3**, respectively. The toxicity data assumes that exposure would be chronic to be conservative. Sources for the data include the Integrated Risk Information System (IRIS) and Health Effects Assessment Summary Tables (HEAST).

2.7.1.4 Risk Characterization

Characterization of the carcinogenic risk and non-carcinogenic hazard are summarized in **Tables 2-4** and **2-5**, respectively. For carcinogens, risks are generally expressed as the incremental probability of an individual's developing cancer over a lifetime as a result of exposure to the carcinogen. Excess lifetime carcinogenic risk is calculated from the following equation:

$$\text{Risk} = \text{CDI} \times \text{SF}$$

where: risk = unitless probability of an individual developing cancer

CDI = chronic daily intake averaged over 70 years, expressed as milligrams per kilogram per day (mg/kg-day)

SF = slope factor, expressed as $(\text{mg/kg-day})^{-1}$

These risks are probabilities that usually are expressed in scientific notation. An excess lifetime carcinogenic risk of 1×10^{-6} indicates that an individual experiencing the reasonable maximum exposure estimate has a 1 in 1,000,000 chance of developing cancer as a result of site-related exposure. This is referred to as an "excess lifetime carcinogenic risk" because it would be in addition to the risks of cancer that individuals face from other causes such as smoking or exposure to too much sunlight. The chance of an individual developing cancer from all other causes has been estimated to be as high as one in three. USEPA's generally acceptable risk range for site-related exposures is 1×10^{-4} to 1×10^{-6}.

The potential for non-carcinogenic effects is evaluated by comparing an exposure level over a specified time period (e.g., lifetime) with a reference dose (RfD) derived for a similar exposure period. An RfD represents a level that an individual may be exposed to that is not expected to cause any deleterious effect. The ratio of exposure to toxicity is called a hazard quotient (HQ). An HQ < 1 indicates that a receptor's dose of a single contaminant is less than the RfD, and that toxic non-carcinogenic effects from that chemical are unlikely. The HI is generated by adding the HQs for all COCs that affect the same target organ (e.g. liver) or that act through the same mechanism of action within a medium or across all media to which a given individual may reasonably be exposed. An HI < 1 indicates that, based on the sum of all HQ's from different contaminants and exposure routes, toxic non-carcinogenic effects from all contaminants are unlikely. An HI > 1 indicates that site-related exposures may present a risk to human health.

The HQ is calculated as follows:

Non-carcinogenic HQ = CDI/RfD

Where: CDI = chronic daily intake
RfD = reference dose

CDI and RfD are expressed in the same units and represent the same exposure period (e.g. chronic, subchronic, or short-term).

The carcinogenic risk for soil and groundwater are 8.1×10^{-6} and 1.4×10^{-1}, respectively, based on the initial human health risk evaluation (Jacobs, 2001a). The dioxins and furans results had been omitted from the initial risk assessment evaluation. When the assessment was revised to address the potential human health risks associated with exposure to dioxins and furans congeners detected in surface and subsurface soil and groundwater (Jacobs, 2001b), the risks for soil and groundwater became 1.0×10^{-5} and 1.4×10^{-1}, respectively. Risks from potential exposure to dioxin and furan congeners detected in surface soil and groundwater are within USEPA target risk range. The HI for soil and groundwater are 0.13 and 1,230, respectively. The carcinogenic risk and non-carcinogenic hazard for soil are within the acceptable range. The carcinogenic risk and non-carcinogenic hazard for groundwater are unacceptable; therefore, the remedial action focuses on the groundwater. The major contributors to the non-carcinogenic hazard in groundwater were cis-1,2-DCE, TCE and 1,2-DCE accounting for approximately 97% of the total non-carcinogenic hazard. The carcinogenic risk in groundwater was driven by maximum detection of TCE, and vinyl chloride.

The BHHRA included an uncertainty analysis which identified factors that would cause values used in the risk assessment to be over or underestimated. The analysis concluded that the risks and HIs are overestimated, making the BHHRA a conservative evaluation. The analysis listed seven factors that would lead to overestimations, three that would lead to underestimations, and five that could lead to either over or underestimations.

2.7.2 Post Risk Assessment Data Evaluation

The risk assessment (Jacobs, 2001a; 2001b) was completed using data from the samples reported in the Final Remedial Investigation Report (Jacobs, 2000). Since that time, additional samples have been collected at LHAAP-16. A plant-wide perchlorate investigation was conducted in 2002, and the results were presented in the Plant-wide Perchlorate Investigation Report (STEP, 2005). Three groundwater monitoring events were conducted at the site during winter 2003, spring 2004, and winter 2004, and the results were reported in the Groundwater Monitoring Report (USACE and ALL CONSULTING, 2007). In 2007, 2008, and 2009, Shaw collected groundwater samples and analyzed them for various analytes, including analysis of MNA parameters in 2007. In 2007 and 2008, Shaw installed additional wells to better define the groundwater contamination.

2.7.2.1 Soil

No significant concentrations of perchlorate were detected in the soil samples collected at LHAAP-16. The results obtained from these post-risk assessment soil samples do not alter the conclusions of the risk assessment for soil. The cancer risks and non-cancer hazards posed by soil are 8.1×10^{-6} and 0.13, respectively. These fall within the acceptable ranges.

2.7.2.2 Groundwater

TCE was found in well 16EW02 at an estimated concentration of 173,000 µg/L in October 2003. This is higher than the groundwater exposure point concentration of 160,000 µg/L. However, both the risk and hazard were already noted as above 1×10^{-6} and 0.1, respectively, so TCE is already addressed as a potential COC and this does not change the outcome of the risk assessment. Methylene chloride was found in well 16WW16 at an estimated concentration of 9,500 µg/L in October 2000. This is higher than the groundwater exposure point concentration of 3,500 µg/L. However, both the risk and hazard were already noted as above 1×10^{-6} and 0.1, respectively, so methylene chloride is already addressed as a potential COC and this does not change the outcome of the risk assessment.

1,2-dichloroethane (DCA) was found in well 16EW01 at a concentration of 161 µg/L in April 2004. This is comparable to the groundwater exposure point concentration of 160 µg/L.

However, the risk was already noted as above 1×10^{-6}, so 1,2-DCA is already addressed as a potential COC and this does not change the outcome of the risk assessment.

1,1,2-trichloroethane was found in well 16EW02 at a concentration of 23.6 µg/L in April 2005. This is higher than the groundwater exposure point concentration of 12 µg/L. However, the risk was already noted as above 1×10^{-6}, so 1,1,2-trichloroethane is already addressed as a potential COC and this does not change the outcome of the risk assessment.

Acetone was detected in 16WW16 at an estimated concentration of 14,000 µg/L in October 2000. This is higher than the groundwater exposure point concentration of 3,920 µg/L. Both the previous maximum concentration of acetone in groundwater from 16EW01 in 1996 (3,920 µg/L), used as the EPC, and the most recent acetone result at 16WW16 from October 2000, did not exceed the Texas groundwater MSC for industrial use (GW-Ind comparison value of 92,000 µg/L. Acetone is not considered a COC for the hypothetical future maintenance worker at LHAAP-16.

Arsenic was found in well 16WW35 at an estimated concentration of 123 µg/L in March 2009. This is higher than the groundwater exposure point concentration of 34 µg/L. However, both the risk and hazard were already noted as above 1×10^{-6} and 0.1, respectively, so arsenic is already addressed as a potential COC and this does not change the outcome of the risk assessment.

Chromium was found in well 16WW34 at a concentration of 32,400 µg/L in February 2004. This is higher than the groundwater exposure point concentration of 5,220 µg/L. However, the hazard was already noted as above 0.1, so chromium is already addressed as a potential COC and this does not change the outcome of the risk assessment.

Nickel was found in well 16WW34 at a concentration of 1,780 µg/L in March 2009. This is higher than the groundwater exposure point concentration of 1,630 µg/L. However, the hazard was already noted as above 0.1, so nickel is already addressed as a potential COC and this does not change the outcome of the risk assessment.

Strontium was detected in 16WW25 at a concentration of 12,300 µg/L in December 2004. This is higher than the groundwater exposure point concentration of 10,400 µg/L. Both the previous maximum concentration of strontium in groundwater (10,400 µg/L), used as the EPC, that was from 16WW13 in October 1997 and the most recent strontium result at 16WW25 from December 2004 did not exceed the GW-Ind comparison value of 61,000 µg/L. Strontium is not considered a COC for the hypothetical future maintenance worker at LHAAP-16.

The maximum concentration of perchlorate (5,990 µg/L) in the groundwater was from 16WW12 in October 2007. Perchlorate was not analyzed in the samples collected prior to the risk assessment and therefore perchlorate was not included in the risk assessment evaluation. The maximum concentration of perchlorate at 5,990 µg/L was higher than the GW-Ind comparison value of 72 µg/L, therefore, perchlorate is added as a potential COC at LHAAP-16.

The other chemical concentrations found in groundwater samples collected after the risk assessment was completed, were all less than the values used for the exposure point concentrations.

The results obtained from these post-risk assessment groundwater samples do not alter the conclusions of the risk assessment for groundwater. The cancer risks and non-cancer hazards posed by groundwater are 1.4 x 10-1 and 1,230, respectively. These fall outside the acceptable ranges, and action is needed to manage and reduce those risks and hazards.

While these additional investigations did not change the overall outcome of the earlier BHHRA, they determined what COCs needed to be targeted by the remedial action. **Table 2-6** lists chemicals in the groundwater that have a carcinogenic risk greater than $1{\times}10^{-5}$ and those with an HQ greater than 0.1 for the hypothetical maintenance worker. The table also summarizes the justifications for which of the COPCs should be classified as COCs. COPCs in groundwater were identified as COCs when they posed a carcinogenic risk above the acceptable range (risk greater than $1{\times}10^{-4}$), when their HQ was greater than 1.0, or when the EPC was above the MCL or the GW-Ind. Perchlorate and chlorinated solvents were retained as COCs. Five inorganics (arsenic, chromium, manganese, thallium and nickel) had sporadic elevated detections and were also retained as COCs. While the occurrence of these metals does not appear to be associated with widespread contamination from the landfill, further monitoring is warranted. Recent data obtained after the BHRRA investigation was used when possible. **Table 2-7** presents the final list of COCs, along with cleanup levels.

2.7.3 Summary of Ecological Risk Assessment

The ecological risk for LHAAP-16 was addressed in the installation-wide BERA (Shaw, 2007a). The only medium of potential concern for ecological risk at LHAAP-16 is soil. LHAAP-16 is part of the Harrison Bayou watershed, and no COPECs were identified in Harrison Bayou surface water or sediment (Shaw, 2007a). The BERA provides a process that evaluates the likelihood that adverse ecological effects may occur, or are occurring, as a result of exposure to one or more stressors. A stressor is any physical, chemical, or biological entity that can induce an adverse ecological response. The BERA for LHAAP focuses only on chemical stressors.

Ecological risk does not exist unless:

- The stressor has the inherent ability to cause adverse effects

- It co-occurs with or contacts an ecological component (i.e., organism, population, community, or ecosystem) long enough and at sufficient intensity to elicit an adverse effect

For the BERA, the entire installation was divided into three large sub-areas (i.e., the Industrial Sub-Area, Waste Sub-Area, and Low Impact Sub-Area) for the terrestrial evaluation. Each of the individual sites at LHAAP was grouped into one of these sub-areas based on commonalities of historic use, habitat type, and spatial proximity to each other. Conclusions for individual sites and the potential for detected chemicals to adversely affect the environment are made in the context of the overall conclusions of the sub-area in which the site falls. LHAAP-16 lies within the Waste Sub-Area.

The BERA concluded that the final COPECs in soil that require remedial action in the waste sub-area are barium, 2,4-DNT, 2,6-DNT, 2,4,6-TNT, and dioxin (2,3,7,8-tetrachlorodibenzo-p-dioxin [TCDD] toxic equivalent) because of their potential to cause adverse impacts to one or more ecological receptors. These COPECs pose a potential risk to ecological receptors due to the direct contact with soil and indirect (i.e., dietary) exposure routes. The BERA evaluated eleven soil samples collected during the RI from outside the landfill. Results indicated that the ecological preliminary remediation goal was exceeded by barium in only one sample in surface soil but not in total soil. Removal or treatment of barium-impacted soil at LHAAP-16 would not appreciably lower the 95 percentile upper confidence limit (UCL) for the barium exposure point concentration in the Waste Sub-Area (Shaw, 2010). Therefore, it was concluded that barium within the Waste Sub-Area will be addressed at LHAAP-17, another site within the Waste Sub-Area. TNT and DNT were below detection limits; therefore, these explosive compounds do not contribute to ecological risk at LHAAP-16. Based on detected congeners, dioxins and furans in the soil at LHAAP-16 do not exceed ecological criteria (Shaw, 2007b). In summary, no action is needed at LHAAP-16 for the protection of ecological receptors.

2.7.4 Basis of Action

The remedial action selected in this ROD is necessary to protect the public health or welfare or the environment from actual or threatened releases of hazardous substances, pollutants, or contaminants into the environment. Actions for the groundwater are necessary to address the potential for human health risks in the unlikely event there is an attempt to use groundwater as a potable water source. **Table 2-7** presents the COCs and their cleanup levels for groundwater and surface water. There are no COCs for soil.

As it concerns the contaminated groundwater at LHAAP-16, a SDWA MCL has been identified for each of the COCs with the exception of perchlorate, manganese and nickel. For those COCs and by-product (i.e., daughter) contaminants that have an MCL, the MCL constitutes the groundwater cleanup level to be attained. If no MCL exists for a COC and by-product contaminants found in the contaminated groundwater, the MSC for GW-Ind as authorized under 30 TAC 335.559(d), constitutes the groundwater cleanup standard to be attained. With respect to the surface waters that could be impacted by contaminated groundwater discharging into Harrison Bayou, which flows into Caddo Lake (a drinking water source), the Texas Surface Water Quality Standards found at 30 TAC 307, or if those standards are not available, the SDWA MCLs, or if MCLs are not available the Texas MSCs for GW-Res, as authorized under 30 TAC 335.559(b), constitute the surface water standards to be met at the site for the COCs and by-product (i.e., daughter) contaminants to confirm that the RAO for groundwater to surface water migration is achieved.

2.8 Remedial Action Objectives

The RAOs for LHAAP-16, which address contamination associated with the media at the site and take into account the future uses of LHAAP surface waters, land, and groundwater, are:

- Protection of human health and the environment by preventing exposure to landfill contents;
- Protection of human health and the environment by reducing leaching and migration of landfill hazardous substances into the groundwater;
- Protection of human health by preventing human exposure to the contaminated groundwater;
- Protection of human health and the environment by preventing COCs and COC by-products from migrating into Harrison Bayou at levels that cause surface water in Harrison Bayou to exceed surface water criteria; and
- Return of groundwater to its potential beneficial uses as drinking water, wherever practicable.

The above RAO recognizes USEPA's policy to return all groundwater to beneficial uses, based on the non-binding programmatic expectation in the NCP and is consistent with the NCP regulations requiring the lead agency, the U.S. Army in this case, to establish RAOs specifying contaminants and media of concern, potential exposure pathways, and remediation goals.

2.9 Description of Alternatives

Seven alternatives (including No Further Action) have been evaluated. This section introduces the remedy components, identifies the common elements and distinguishing features of each alternative, and describes the expected outcomes of each.

2.9.1 Description of Remedy Components

Alternative 1 – No Further Action

As required by the NCP, the no action alternative provides a comparative baseline against which the action alternatives can be evaluated. At LHAAP-16, an interim remedy (landfill cap) has already been implemented and maintenance of that remedy is a legal requirement per the 1995 ROD. Therefore, the comparative baseline is considered to be "No Further Action." Under this alternative the existing landfill cap would be left in place and the landfill waste material, surface water, and groundwater would be left "as is," without implementing additional containment, removal, treatment, or other mitigating actions. The existing landfill cap would be maintained to isolate wastes from direct contact and to minimize the driving force of infiltration through the landfill thereby reducing the leaching of contaminants to groundwater. Land use controls would be implemented to protect the existing remedy (landfill cap). Closure and post-closure ARARs were identified for LHAAP-16 in the IRA ROD and these included 30 TAC 335.112, 335.118, 335.119 and 335.174 and 40 CFR Sections 264.228 and 264.310 addressing landfills and surface impoundments storing hazardous waste. Although closure requirements were met during implementation of the (landfill cap) presumptive remedy of the IRA, post-closure requirements remain appropriate and relevant. The existing groundwater extraction process and media monitoring would be discontinued. No other actions, including monitoring, would be implemented to reduce existing or potential future exposure to human and ecological receptors, although natural attenuation would be ongoing.

Estimated Capital Present Worth Cost: $0
Estimated O&M Present Worth Cost: $630,000
Cost Estimate Duration: 30 years
Estimated Present Worth Cost: $630,000

Alternative 2 – Maintenance of Existing Landfill Cap, Enhanced Groundwater Extraction and Land Use Controls

The major components of this alternative include the following.

- Maintenance of the landfill cap to preserve landfill cap integrity. The cap isolates wastes from direct contact and minimizes the driving force of infiltration through the landfill thereby reducing the leaching of contaminants to groundwater
- Enhanced groundwater extraction to increase reliability of the extraction wells and related equipment to treat contaminated groundwater from the shallow and intermediate groundwater plumes. Shallow groundwater will be treated before it seeps into Harrison Bayou
    - Monitoring wells and Harrison Bayou surface water sampling; quarterly for the first year followed by annual sampling

- Groundwater monitoring system maintenance. A groundwater monitoring system will be implemented to demonstrate the active groundwater treatment and MNA remedies are protective of human health and the environment. The groundwater monitoring system will remain in place until the groundwater cleanup levels specified in Table 2-7 are achieved. If any of the elements of the groundwater monitoring system are damaged, destroyed, or become ineffective, they will be repaired or replaced.

- The LUCs' performance objectives are to protect the existing remedy (landfill cap) and prevent human exposure to landfill waste for as long as the landfill waste remains at the site ~~orand until the levels of COCs allow for unlimited use and unrestricted exposure~~, to prohibit the potable use of ~~access to~~ contaminated groundwater above cleanup levels, ~~(except for monitoring and testing) until cleanup levels are reached,~~ and to restrict land use to nonresidential use until it is demonstrated that surface ~~soil~~ and subsurface soil and groundwater are at levels that allow for unlimited use and unrestricted exposure ~~and to maintain the integrity of any current or future remedial or monitoring systems to prevent the use of groundwater contaminated above cleanup levels as a potable water source until those cleanup levels are met~~.

Estimated Capital Present Worth Cost: $760,000
Estimated O&M Present Worth Cost: $9,050,000
Cost Estimate Duration: 30 years
Estimated Present Worth Cost: $9,820,000

Alternative 3a – Maintenance of Existing Landfill Cap, Monitored Natural Attenuation and Land Use Controls

Alternative 3b – Maintenance of Existing Landfill Cap, Hot ~~spot~~ Spot Extraction, Monitored Natural Attenuation and Land Use Controls

The major components of this Alternative 3a include the following:

- Maintenance of the landfill cap to preserve landfill cap integrity. The cap isolates wastes from direct contact and minimizes the driving force of infiltration through the landfill thereby reducing the leaching of contaminants to groundwater

- Discontinued use of the existing groundwater extraction system

- MNA documenting that the contaminated shallow and intermediate groundwater zones remain localized with minimal migration and that contaminant concentrations are being reduced to groundwater cleanup levels before seeping into Harrison Bayou
  - Reactivation of the existing groundwater extraction system and installation of additional extraction wells if MNA is found to be ineffective

  - Monitoring wells and Harrison Bayou surface water sampling; quarterly for the first year followed by annual sampling

- Groundwater monitoring system maintenance. A groundwater monitoring system will be implemented to demonstrate the active groundwater treatment and MNA remedies are protective of human health and the environment. The groundwater monitoring system will remain in place until the groundwater cleanup levels specified in Table 2-7 are achieved. If any of the elements of the groundwater monitoring system are damaged, destroyed, or become ineffective, they will be repaired or replaced.

- The LUCs' performance objectives are to protect the existing remedy (landfill cap) and prevent human exposure to landfill waste for as long as the landfill waste remains at the site~~ orand until the levels of COCs allow for unlimited use and unrestricted exposure~~, to prohibit the potable use of~~ access to~~ contaminated groundwater above cleanup levels ~~(except for monitoring and testing) until~~ ~~cleanup levels are reached,~~ and to restrict land use to nonresidential use until it is demonstrated that surface ~~soil~~ and subsurface soil and groundwater are at levels that allow for unlimited use and unrestricted exposure~~ and to maintain the integrity of any current or future remedial or monitoring systems to prevent the use of groundwater contaminated above cleanup levels as a potable water source until those cleanup levels are met~~.

- Alternative 3b is identical to Alternative 3a except an extraction well network would be operated in the groundwater hot spot for approximately 5 years to reduce contaminant mass followed by MNA throughout the rest of the O & M period.

Estimated Capital Present Worth Cost:	*(a) $620,000*
	(b) $1,290,000
Estimated O&M Present Worth Cost:	*(a) $2, 100,000*
	(b) $2,140,000
Cost Estimate Duration: 30 years	
Estimated Present Worth Cost:	*(a) $2,710,000*
	(b) 3,430,000

Alternative 4 – Maintenance of Existing Landfill Cap, In Situ Permeable Reactive Barrier (Passive Groundwater Treatment) and Land Use Controls

The major components of this alternative include the following:

- Maintenance of the landfill cap to preserve landfill cap integrity. The cap isolates wastes from direct contact and minimizes the driving force of infiltration through the landfill thereby reducing the leaching of contaminants to groundwater

- Discontinued use of the existing groundwater extraction system

- Installation of an in situ permeable reactive barrier across the heart of the shallow groundwater plume that is seeping into Harrison Bayou. The contaminants to be treated by this reactive media are TCE and perchlorate. The treatment process would be anaerobic biological degradation that uses a combination of gravel and various organic media.

  - Long-term monitoring (LTM) – Monitoring wells and Harrison Bayou surface water sampling; quarterly for the first year followed by annual sampling.

  - Semiannual sampling of the trench monitoring wells and the discharge of the reactive media treatment vessel.

- Groundwater monitoring system maintenance. A groundwater monitoring system will be implemented to demonstrate the active groundwater treatment and MNA remedies are protective of human health and the environment. The groundwater monitoring system will remain in place until the groundwater cleanup levels specified in Table 2-7 are achieved. If any of the elements of the groundwater monitoring system are damaged, destroyed, or become ineffective, they will be repaired or replaced.

- The LUCs' performance objectives are to protect the existing remedy (landfill cap) and prevent human exposure to landfill waste for as long as the landfill waste remains at the site ~~orand until the levels of COCs allow for unlimited use and unrestricted exposure~~, to prohibit the potable use of ~~access to~~ contaminated groundwater above cleanup levels~~(except for monitoring and testing)~~ ~~until~~ ~~cleanup levels are reached,~~ and to restrict land use to nonresidential use until it is demonstrated that surface ~~soil~~ and subsurface soil and groundwater are at levels that allow for unlimited use and unrestricted exposure~~ and to maintain the integrity of any current or future remedial or monitoring systems to prevent the use of groundwater contaminated above cleanup levels as a potable water source until those cleanup levels are met~~.

Estimated Capital Present Worth Cost: $2,540,000

Estimated O&M Present Worth Cost: $2,020,000

Estimated Duration: 30 years

Estimated Total Present Worth Cost: $4,560,000

Alternative 5a – Landfill Hot Spot Removal, In Situ Permeable Reactive Barrier (Passive Groundwater Treatment), Off-Site Disposal and Land Use Controls

Alternative 5b – Complete Landfill Removal, In Situ Permeable Reactive Barrier (Passive Groundwater Treatment), Off-Site Disposal and Land Use Controls

The major components of Alternative 5a include the following:

- Removal of landfill hotspot areas based on the results of previous soil gas survey. The excavated waste would be field screened: the results would be used to define the location and nature of hot spot material to focus the excavation efforts and detail the waste handling and treatment process

- Repair of the landfill cap

- Discontinued use of the existing groundwater extraction system

- Installation of an in situ permeable reactive barrier across the portion of the shallow groundwater plume with the highest contaminant concentrations, reducing the contaminant mass seeping into Harrison Bayou

  - LTM - Monitoring wells and Harrison Bayou surface water sampling; quarterly for the first year followed by annual sampling.

  - Semiannual sampling of the trench monitoring wells and the discharge of the reactive media treatment vessel.

- Maintenance of the landfill cap to preserve landfill cap integrity. The cap isolates wastes from direct contact and minimizes the driving force of infiltration through the landfill thereby reducing the leaching of contaminants to groundwater

- Groundwater monitoring system maintenance. A groundwater monitoring system will be implemented to demonstrate the active groundwater treatment and MNA remedies are protective of human health and the environment. The groundwater monitoring system will remain in place until the groundwater cleanup levels specified in Table 2-7 are achieved. If any of the elements of the groundwater monitoring system are damaged, destroyed, or become ineffective, they will be repaired or replaced.

- The LUCs' performance objectives are to protect the existing remedy (landfill cap) and prevent human exposure to landfill waste for as long as the landfill waste remains at the site ~~orand until the levels of COCs allow for unlimited use and unrestricted exposure~~, to prohibit the potable use of ~~access to~~ contaminated groundwater above cleanup levels,~~(except for monitoring and testing)~~ until ~~cleanup levels are reached,~~ and to restrict land use to nonresidential use until it is demonstrated that surface ~~soil~~ and subsurface soil and groundwater are at levels that allow for unlimited use and unrestricted exposure ~~and to maintain the integrity of any current or future remedial or monitoring systems to prevent the use of groundwater contaminated above cleanup levels as a potable water source until those cleanup levels are met~~.

- **Alternative 5b** is identical to alternative 5a in all respects except that all of the landfill wastes would be removed. Because this alternative does not leave any landfill waste in place, there are no long-term cap maintenance and landfill LUCs requirements. ~~However, groundwater LUCs would remain in effect until groundwater cleanup levels are met.~~

Estimated Capital Present Worth Cost: *(a)$3,080,000*
(b) $106,110,000

Estimated O&M Present Worth Cost: *(a)$9,990,000*
(b) $9,490,000
Estimated Duration: 30 years
Estimated Total Present Worth Cost: *(a)$13,070,000*
(b) $115,610,000

Alternative 6 – Landfill Source In Situ Treatment, Monitored Natural Attenuation and Land Use Controls

The major components of this alternative include the following:

- In situ treatment of the landfill hot spots by soil vapor extraction (SVE) to reduce contaminant concentrations in targeted areas that have the highest concentrations
    - Maintenance and monitoring of the SVE system for 5 years.
- Maintenance of the landfill cap to preserve landfill cap integrity. The cap isolates wastes from direct contact and minimizes the driving force of infiltration through the landfill thereby reducing the leaching of contaminants to groundwater
- Repair of the landfill cap following completion of vapor extraction operations
- Discontinued use of the existing groundwater extraction system
- MNA documenting that the contaminated shallow and intermediate groundwater zones remain localized with minimal migration and that contaminant concentrations are being reduced to groundwater cleanup levels before seeping into Harrison Bayou
    - Reactivation of the existing groundwater extraction system and installation of additional extraction wells if MNA is found to be ineffective
    - LTM - Monitoring wells and Harrison Bayou surface water sampling; quarterly for the first year followed by annual sampling
- Groundwater monitoring system maintenance. A groundwater monitoring system will be implemented to demonstrate the active groundwater treatment and MNA remedies are protective of human health and the environment. The groundwater monitoring system will remain in place until the groundwater cleanup levels specified in Table 2-7 are achieved. If any of the elements of the groundwater monitoring system are damaged, destroyed, or become ineffective, they will be repaired or replaced.
- The LUCs' performance objectives are to protect the existing remedy (landfill cap) and prevent human exposure to landfill waste for as long as the landfill waste remains at the site ~~orand until the levels of COCs allow for unlimited use and unrestricted exposure~~, to prohibit the potable use of ~~access to~~ contaminated groundwater above cleanup levels,~~(except for monitoring and testing) until~~ ~~cleanup levels are reached,~~ and to restrict land use to nonresidential use until it is demonstrated that surface ~~soil~~ and subsurface soil

and groundwater are at levels that allow for unlimited use and unrestricted exposure~~ and to maintain the integrity of any current or future remedial or monitoring systems to prevent the use of groundwater contaminated above cleanup levels as a potable water source until those cleanup levels are met~~.

Estimated Capital Present Worth Cost: $2,750,000

Estimated O&M Present Worth Cost: $3,650,000

Estimated Duration: 30 years

Estimated Total Present Worth Cost: $6,400,000

Alternative 7 – Cap, Land Use Controls, In Situ Enhanced Bioremediation, Biobarriers, and Monitored Natural Attenuation

The major components of this alternative include the following:

- Maintenance of the landfill cap to preserve landfill cap integrity. The cap isolates wastes from direct contact and minimizes the driving force of infiltration through the landfill thereby reducing the leaching of contaminants to groundwater
- Discontinue use of current extraction system
- Installation of a biobarrier in the shallow groundwater zone adjacent to the landfill near the fence line to degrade contaminants in groundwater
- In situ enhanced bioremediation in the most contaminated portion of the shallow and intermediate groundwater zones in conjunction with phased shut down of the existing groundwater extraction system.
- Installation of a second biobarrier in the shallow groundwater zone near Harrison Bayou to further degrade contaminants
- MNA of the shallow and intermediate groundwater zones to further reduce the concentrations of contaminants and by-product contaminants in the groundwater so that the contaminated groundwater attains groundwater cleanup levels/standards, and that surface water in Harrison Bayou is not adversely impacted by groundwater such that it fails to meet surface water standards for the COCs and by-product (daughter) contaminants.
  - Performance objectives to evaluate the MNA remedy performance after 2 years
  - A reapplication of bio-amendments if MNA is found to be ineffective

  - LTM semiannually for 3 years, annually until the next five-year review, then annually thereafter until recommended otherwise by the five-year review. Monitoring will continue until five-year review demonstrate that there is no further threat of release of contaminated groundwater into the surface water and the groundwater has met cleanup levels~~can be used without restriction~~. LTM will be initiated only after MNA performance monitoring and MNA is determined to be effective.

- Groundwater monitoring system maintenance. A groundwater monitoring system will be implemented to demonstrate the active groundwater treatment and MNA remedies are protective of human health and the environment. The groundwater monitoring system will remain in place until the groundwater cleanup levels specified in Table 2-7 are achieved. If any of the elements of the groundwater monitoring system are damaged, destroyed, or become ineffective, they will be repaired or replaced.

- The LUCs' performance objectives are to protect the existing remedy (landfill cap) and prevent human exposure to landfill waste for as long as the landfill waste remains at the site~~ orand until the levels of COCs allow for unlimited use and unrestricted exposure~~, to prohibit the potable use of~~access to~~ contaminated groundwater above cleanup levels~~(except for monitoring and testing)~~ ~~until~~ ~~cleanup levels are reached,~~ and to restrict land use to nonresidential use until it is demonstrated that surface ~~soil~~ and subsurface soil and groundwater are at levels that allow for unlimited use and unrestricted exposure~~ and to maintain the integrity of any current or future remedial or monitoring systems to prevent the use of groundwater contaminated above cleanup levels as a potable water source until those cleanup levels are met~~.

Estimated Capital Present Cost: $390,000

Estimated O&M Present Worth Cost: $1,590,000

Estimated Duration: 30 years

Estimated Total Present Worth Cost: $1,980,000

2.9.2 Common Elements and Distinguishing Features of Each Alternative

Common Elements of Alternatives 1 through 7

LUCs are common to all alternatives, MNA is common to Alternatives 3, 6, and 7, and inspection/LTM is common to Alternatives 2 through 7. These elements are described below.

LUCs – The LUCs would be implemented to support the RAOs. ~~The U.S. Army would be responsible for long-term implementation, maintenance, inspection, reporting, and enforcement of the LUCs. The U.S. Army will provide details of the LUCs long-term implementation and long-term maintenance actions in the RD for the site.~~ The LUCs would prevent human exposure to landfill contents and residual groundwater contamination that may present an unacceptable risk to human health, ~~and would preclude the withdrawal or use of groundwater beneath the site for anything other than environmental monitoring and testing~~ and would restrict the land use to nonresidential. The ~~groundwater use prohibition~~ landfill LUCs ~~(except for monitoring and testing)~~ would be maintained as long as landfill waste remained at the site~~ or until the COCs allowed for unlimited use and unrestricted exposure~~. The groundwater and nonresidential use LUCs would remain in place until the COCs in ~~the~~ groundwater and soil allow ~~can be used without restrictions. The nonresidential land use LUC restriction would remain in place until it is demonstrated that surface soil and subsurface soil are at levels that allow~~ for unlimited use and unrestricted exposure.~~ The LUC to maintain the integrity of any current or future remedial or monitoring systems to prevent the use of groundwater contaminated above cleanup levels as a potable water source shall remain in effect until those cleanup levels are met.~~

In addition, within 90 days of signature of this ROD, the U.S. Army shall request the Texas Department of Licensing and Regulation to notify well drillers of groundwater use prohibitions based on a preliminary LUC boundary. Within 21 days of the issuance of the Record of Decision, the Army will propose target dates for completion of the draft secondary comments and deadlines for completion of the R~~emedial~~D~~esign~~ Work Plan, R~~emedial~~D~~esign~~, and Remedial Action Work Plan. The documents will be prepared and submitted to EPA and TCEQ pursuant to the FFA. The LUC RD will contain implementation and maintenance actions, including periodic inspections. Consistent with the dates presented for these documents, the U.S. Army shall: 1) request the Texas Department of Licensing and Regulation to notify well drillers of the final boundary of groundwater use prohibitions; and 2) notify the Harrison County Courthouse of the LUCs to include a map showing the areas of groundwater and nonresidential use restrictions,~~ the monitoring system~~ and the landfill cap at the site, in accordance with 30 TAC 335.565.

The Army will implement, maintain, monitor, report on and enforce land use controls at Army-owned property. The Army shall perform those actions related to land use control activities described in this ROD and in the Remedial Design for the ROD. For portions of the Site subject to land use controls that are not owned by the Army, the Army will monitor and report on the implementation, maintenance, and enforcement of land use controls, and coordinate with federal, state, and local governments and owners and occupants of properties subject to land use controls. The Army will provide notice of the groundwater and soil contamination and any land use restrictions referenced in the ROD. The Army will send these notices to the federal, state and local governments involved at this site and the owners and occupants of the properties subject to those use restrictions and land use controls. The Army shall provide the initial notice within 90 days of ROD signature. The frequency of subsequent notifications will be described in the Remedial Design for the ROD. The Army remains responsible for ensuring that the remedy remains protective of human health and the environment. The Army will fulfill its responsibility and obligations under CERCLA and the NCP as it implements, maintains, and reviews the selected remedy.

Upon transfer of Army-owned property, the Army will provide written notice of the land use controls to the transferee of the groundwater and soil contamination and any land use restrictions referenced in the ROD. Within 15 days of transfer, the Army shall provide EPA and TCEQ with written notice of the division of implementation, maintenance, and enforcement responsibilities unless such information has already been provided in the LUC RD. The LUC RD will address the procedures to be used by the Army and the transferee to document compliance with the LUCs described in this ROD. In the event property is transferred out of Federal control, the land use controls relating to property and groundwater restrictions shall be recorded in the deed and shall be enforceable by the United States and the state of Texas.

To transfer LHAAP-16, an Environmental Condition of Property (ECP) document would be prepared and the Environmental Protection Provision from the ECP would be attached to the letter of transfer. The ECP will include cap protection and maintenance, land use, ~~and~~ and groundwater use ~~and monitoring system maintenance~~ restrictions as part of the Environmental Protection Provisions. The property would be transferred subject to the LUCs identified in the ECP. These restrictions would prohibit or restrict property uses that may result in damage to the existing remedy (landfill cap) ~~or monitoring system~~ or unacceptable exposure to the contaminated groundwater (e.g., ~~drilling restrictions~~potable use of groundwater) or soil (e.g. residential land use prohibition).

The U.S. Army and regulators will consult to determine appropriate enforcement actions should there be a failure of a LUCs objective at the site after it has been transferred. ~~The U.S Army shall consult with TCEQ and obtain USEPA concurrence prior to the termination or significant modification of LUCs or in the highly unlikely event of a land use change inconsistent with the industrial/recreational use assumptions of the remedy. In the event that TCEQ and/or USEPA and the U.S. Army agree with respect to any significant modification of the selected remedy, including the LUCs component of the selected remedy, the remedy will be changed consistent with the FFA and 40 CFR §300.435(c)(2).~~

MNA – MNA is a passive remedial action that relies on natural biological, chemical, and physical processes to reduce the mass and concentrations of groundwater COCs under favorable conditions. A preliminary natural attenuation evaluation indicates that MNA is a feasible remedy for certain portions of LHAAP-16, but not as a sole remedy for the entire site due to migration concerns for the shallow groundwater zone (Shaw, 2010). Monitoring activities associated with MNA would confirm the protection of human health and the environment by documenting the return of groundwater to its potential beneficial use as a drinking water supply, by documenting reduction of the contaminant mass and protection of surface water through containment of the plume. In Alternative 3, contaminant reduction would occur by MNA alone in both the shallow and intermediate zones. In Alternative 6, SVE would reduce contaminant concentrations in targeted landfill source areas after which the treatment in both the shallow and intermediate zones would be MNA. In Alternative 7, contaminant reduction would occur by a biobarrier in the shallow zone adjacent to the landfill, in situ enhanced bioremediation in the most contaminated portion of the shallow and intermediate zones, and a second biobarriers in the shallow groundwater zone near Harrison Bayou. Contaminant reduction would occur by MNA alone in the areas outside the influence of the active remedies in both the shallow and intermediate zones.

MNA performance monitoring will be conducted quarterly for the first 2 years in the areas outside the influence of the active remedies. For the active remedies areas, MNA performance monitoring will be conducted quarterly for 2 years following implementation of the remedies. After eight quarterly sampling events, MNA effectiveness will be evaluated. The analytical program will consist of VOCs, including chlorinated compounds and degradation products, methane, ethene, and ethane. Initially, the following geochemical parameters will also be included in the analytical program: dissolved oxygen (field), redox potential (field), sulfate, nitrate, nitrites, alkalinity, total organic carbon, and ferrous iron (field).

Groundwater Monitoring System Maintenance - A groundwater monitoring system will be implemented to demonstrate the active groundwater treatment and MNA remedies are protective of human health and the environment. The groundwater monitoring system will remain in place until the groundwater cleanup levels specified in Table 2-7 are achieved. If any of the elements of the groundwater monitoring system are damaged, destroyed, or become ineffective, they will be repaired or replaced.

Inspection/Long-Term Groundwater Monitoring – Alternatives 2 through 7 include inspection and long-term groundwater and surface water monitoring activities. The long-term reliability of the LHAAP-16 landfill cap to control infiltration, contaminant runoff, and contaminant exposure depends on adequate long-term inspection and maintenance. Further groundwater and surface water monitoring would be used to evaluate contaminant and by-product contaminant migration, confirm that the COCs and by-product contaminants in the groundwater plumes degrade in a manner to achieve attainment of groundwater cleanup standards/levels, and to verify that COCs and by-product COC contaminant levels in Harrison Bayou are less than the surface water standards. The eventual groundwater concentration goal is to reduce COC concentrations to groundwater cleanup levels. The LUCs, cap maintenance, and long-term monitoring would be continued as required to demonstrate effectiveness of the remedy, compliance with applicable or relevant and appropriate requirements (ARARs), and RAOs, and to support five-year reviews.

Distinguishing Features of the Alternatives

Alternative 2, Alternative 3a and Alternative 3b

The distinguishing feature of **Alternative 2** is the inclusion of enhanced groundwater extraction. **Alternative 3a** when compared to Alternative 2 is distinguished by the discontinued use of the extraction system relying on MNA to reduce the groundwater contamination and impacts to Harrison Bayou over long-term. **Alternative 3b** is identical to 3a except that an extraction well network will be operated in the groundwater hot spot for approximately 5 years to reduce contaminant mass, followed by MNA. These actions are described below.

Enhanced Groundwater Extraction – The current groundwater extraction system would be upgraded to increase reliability of the extraction wells and related equipment and increase its hydraulic influence on the shallow and intermediate groundwater plume. There are eight existing groundwater extraction wells that were installed at the site in 1996 as part of a groundwater treatability study and design. The extraction wells were installed as four pairs (nests) each consisting of a shallow well (wells 16EW01 through 16EW04) installed in the shallow saturated zone, and an intermediate well (wells 16EW05 through 16EW08) installed to a depth of approximately 55 feet screened in the intermediate saturated zone. Historically, the extraction wells have produced below the optimum combined flow of 8 gallons per minute (gpm). Several upgrades to the existing system would be implemented to improve performance and minimize system downtime. The existing pumps have been a maintenance problem, often clogging with soil fines. Polyvinyl chloride (pvc) check valves and filter socks would be installed to remove soil fines. A remote level control system offered by the pump manufacturer would be installed at each well to allow water level adjustments to keep the pumps submerged, reducing the iron fouling problems. To reduce the amount of time the compressor runs, the 2-hp air compressor unit would be replaced by a 7-hp compressor.

Additional Extraction Wells – Based on an evaluation of the shallow and intermediate plume locations, the hydrogeologic conditions, and the location and estimated hydraulic influence of the existing extraction well network, there is considerable uncertainty as to the effectiveness of the current system's ability to adequately capture the northernmost portions of the plume. To capture that part of the plume, a pair of nested, 4-inch ID extraction wells, one each in the shallow and intermediate zones, would be installed approximately 75 to 100 feet north of extraction wells 16EW01and 16EW05. These new extraction wells would capture the northern components of the shallow and intermediate groundwater plumes. They would be tied into the groundwater extraction system piping. It is estimated that these new wells would produce approximately 2 gpm. The extracted groundwater would be treated at the LHAAP-18/24 treatment plant.

Water Treatment – The extracted groundwater would be treated at the groundwater treatment plant at LHAAP-18/24. The plant was originally built to treat contaminated water from other LHAAP sites. Since 1996 the plant has also treated groundwater from LHAAP-16 extraction wells, which contribute less than 10 percent of the total amount of water treated at the plant. The treatment plant uses air stripping, metals precipitation, carbon adsorption, and catalytic oxidation and would not require modification for this alternative. A fluidized bed reactor was added for perchlorate treatment and has been operating since April 2001. The plant is capable of treating chlorinated solvents, perchlorate, and metals. Plant influent from all sources is blended in a 300,000-gallon equalization tank before treatment. Treated effluent is discharged into Harrison Bayou or injected at LHAAP-18/24.

Performance Monitoring – Groundwater and surface water monitoring would be required throughout the O&M period, estimated to be beyond the 30-year present worth period. O&M would include continuous pumping of the extraction wells, monitoring of environmental media, extraction well and monitoring well maintenance, and water treatment. Harrison Bayou would be sampled at three locations quarterly for one year followed by annual sampling and the samples submitted for VOC and perchlorate analyses. It is also assumed that 2 new monitoring wells would be installed on the other side of Harrison Bayou and a total of 10 wells also monitored for VOCs and perchlorate. The wells would be sampled quarterly for the first year followed by annual sampling.

Upgrading the existing extraction system and installation of the new extraction wells is estimated to take approximately 3 months. The groundwater extraction system would need to operate until contaminated groundwater at LHAAP-16 has attained the SDWA MCLs and Texas MSCs for GW-Ind. For those COCs and by-product (i.e., daughter) contaminants that have an MCL, the MCL constitutes the groundwater cleanup level to be attained. If no MCL exists for any COC found in the contaminated groundwater, the Texas MSCs for GW-Ind, as authorized under 30 TAC 335.559(d) constitutes the groundwater cleanup standard/level to be attained. With respect to the surface waters that could be impacted by contaminated groundwater seeping into Harrison Bayou, the Texas Surface Water Quality Standards found at 30 TAC 307, or if those standards are not available, the SDWA MCLs, or if MCLs are not available the Texas MSCs for GW-Res, as authorized under 30 TAC 335.559(b), constitute the surface water standards for the COCs and by-product (i.e., daughter) contaminants to confirm that the RAO for groundwater to surface water migration is achieved.

Groundwater Hot Spot Extraction – The groundwater contaminant mass would be significantly reduced through an aggressive pump and treat operation in the heart of the shallow and intermediate contaminant plumes. The system would use four new shallow zone extraction wells, 2 existing shallow zone extraction wells, and two existing intermediate zone extraction wells. Existing shallow zone wells 16EW01 and 16EW02 would complete the shallow zone extraction network in the heart of the shallow plume. The four new shallow zone extraction wells would be installed to 30 feet. Existing intermediate zone wells 16EW05 and 16EW06 are located in the heart of the intermediate zone plume. All new wells would be constructed the same as existing extraction wells (4-inch-diameter pvc with pneumatic pumps), and both new and existing wells would employ the upgrades identified in Alternative 2. With the exception of 16EW01, 16EW02, 16EW05, and 16EW06, the existing extraction wells would not be operated under this alternative.

The extraction wells would be tied into the existing extraction well network, and the extracted groundwater would be treated at the groundwater treatment plant at LHAAP-18/24. The well network would be operated for an estimated 5 years. It is roughly estimated that the contaminant mass in this section of the shallow and intermediate zone plumes would be reduced by up to 50 percent. Extraction well maintenance would be required for the whole duration of groundwater extraction.

Performance monitoring would be conducted as described for Alternative 2. One of the Harrison Bayou sampling locations would be adjacent to the seep.

Alternative 4, Alternative 5a and Alternative 5b

The distinguishing feature of **Alternatives 4, 5a**, and **5b** is the inclusion of groundwater treatment. Compared to Alternative 4, the distinguishing features of **Alternatives 5a** and **5b**, are the inclusion of landfill hot spot excavation and complete landfill excavation, respectively. These actions are described below.

In Situ Permeable Reactive Barrier (Passive Groundwater Treatment) – To protect Harrison Bayou from shallow contaminated groundwater infiltration from the seep at the northeastern end of the site, an in situ treatment system would be installed across the heart of the shallow groundwater contaminant plume. This barrier would consist of a gravel filled groundwater collection trench with a reactive media bed located at the downslope discharge point of the collection trench. The highly permeable gravel in the trench would channel the shallow groundwater to the reactive media contained in a buried treatment vessel. The collection trench is sized to intercept only that part of the shallow groundwater plume with highest contaminant concentrations, likely having the greatest impact on VOC levels in Harrison Bayou. Installation of the trench would create a preferential flow path. The actual size and location of the trench would need to be determined during the design.

The reactive media vessel would be located approximately 250 feet downslope from the end of the collection trench to provide adequate head to move the collected groundwater through the treatment vessel. A perforated pipe would be buried at the bottom of the collection trench to convey the collected groundwater through a non-perforated pipe connected to the reactive media treatment vessel. The treatment vessel would be filled with the reactive media and sized to provide the requisite residence time for the contaminants to be treated. The treatment vessel discharges to a buried drain field, allowing the treated groundwater to drain into the soil downslope of the treatment vessel. The placement of the reactive media in a treatment vessel instead of the entire collection trench would reduce the overall media cost and facilitate the replacement of the media when expended.

The contaminants to be treated by this reactive media are TCE and perchlorate. The treatment process would be an anaerobic biological degradation process that would use a combination of gravel and various organic media. The treatment vessel would be buried to enhance anaerobic conditions. The organic media would function as carbon sources for the anaerobic microbes. Possible sources of media are, among others, compost, vegetables, molasses, cotton seed, and citrate which can be used in combination to achieve the necessary treatment levels. The organic media mix and the size of the treatment vessel must be determined through treatability testing and design. It is assumed that the media would require replacement every 5 years. Three shallow monitoring wells (one every 100 feet) would be installed immediately downgradient of the collection trench to monitor the performance of the trench.

The excavated soil material removed from the trenching operations would be placed in a prepared staging area. The excavated soil would be sampled and analyzed for perchlorate, VOCs, SVOCs, toxicity characteristic leaching procedure (TCLP), metals, dioxins/furans, and PCBs and could likely be used as clean fill at the site. Dewatering of the trench may be required during excavation. Any groundwater removed would be assumed to be contaminated and would be treated at the groundwater treatment plant at LHAAP-18/24.

It would take at least 6 months to conduct the reactive barrier treatability study. It would take approximately 6 months to clear and grub the area, install the soil staging area, and install the permeable reactive barrier. The permeable reactive barrier would have to be operated until the upgradient groundwater contamination degraded to the point that no future impacts to Harrison Bayou are likely. Groundwater and surface water monitoring would be required throughout the O&M period, estimated to be required beyond the 30-year present worth period.

Landfill Hot Spot Excavation – The landfill hot spots would be removed with conventional excavation equipment. To verify the hot spot locations, 10 test trenches would be excavated at various locations across the landfill, biased by the results of the previous soil gas survey. These test trenches, dug to the bottom of the landfill, would provide insight into the physical makeup of the waste likely to be excavated, in addition to analytical data from samples taken from these trenches. The excavated waste would be segregated, roughly catalogued, and placed in 55-gallon drums for disposal. Debris would be taken from each of the trenches and screened in the field for VOCs and analyzed for perchlorate, VOCs, SVOCs, TCLP, metals, dioxins/furans, and PCBs. The results of this sampling effort would be used to define the location and nature of hot spot material to focus the excavation efforts and detail the waste handling and treatment processes.

Once the location of the hot spot material was confirmed, an excavation path would be cut into the landfill through the center of the assumed hot spot areas. This approach would expose the greatest volume of hot spot material while minimizing disturbances to the areas of the landfill that would not be excavated. The cap covering the hot spots would be carefully removed before excavation, facilitating the replacement of the liner and other cap material after excavation is complete.

The excavated material would be placed in piles on a staging area adjacent to the landfill. Every 200 cubic yards of waste placed in the waste staging area would be sampled and analyzed for VOCs, SVOCs, TCLP, metals, dioxins/furans, and PCBs to determine whether it meets the waste acceptance criteria of the off-site disposal facility. Approximately 60 samples would be collected and shipped to an offsite laboratory. The waste would remain in the staging area until the analytical results are received from the laboratory. The probable condition is that all of the waste is not RCRA-hazardous and could be disposed of in an industrial landfill. Once the waste was sampled and determined to meet the waste acceptance criteria of the disposal facility, it would be loaded into dump trucks and transported for disposal.

***Landfill Cap Repair* –** The cap would be repaired following landfill hot spot excavation under Alternative 5a. The open excavations would be backfilled with clean fill, and a geocomposite clay liner and a 20-mil geomembrane would be installed and joined with their counterparts in the existing cap. Approximately 425 cubic yards of soil would then be graded into the existing soil cover.

***Complete Landfill Excavation* –** There is a degree of uncertainty as to the total volume and locations of the hot spot material. Although the results of the soil gas survey indicate the possible location of hot spot material based on elevated soil gas readings, it is possible that the volume and locations of the hot spot material are much greater and more widespread. The results of the test trenching would add significantly to the confidence level for hot spot locations, volume, and constituents, but uncertainty remains because of the inherent variability in landfill wastes and the scarcity of disposal information. Alternative 5b addresses the distinct possibility that once full-scale excavation begins, hot spots may be found throughout the landfill. To place an upper bound on the volume of waste to be excavated under this alternative, this option assumes all of the landfill wastes would need to be excavated (approximately 327,000 cubic yards of material).

The excavation, sampling, and waste transportation methods for Alternative 5b would be identical to that described for Alternative 5a. Approximately 327,000 cubic yards of backfill would be required, and waste samples collected and analyzed for every 200 cubic yards of waste removed. The entire landfill would be excavated in sections. The cap from each section would be removed as that section is excavated. Excavation operations would take approximately 30 months. Groundwater and surface water monitoring would be required throughout the O&M period.

In Situ Permeable Reactive Barrier (Permeable Reactive Barrier) – To meet surface water standards in Harrison Bayou, an in situ treatment system would be installed across the majority of the shallow groundwater contaminant plume to intercept and treat all contaminated shallow groundwater that may seep into Harrison Bayou. This permeable reactive barrier would be installed in both Alternatives 5a and 5b and operate identically to the permeable reactive barrier used in Alternative 4. This barrier would be approximately 700 feet long in order to intercept the entire shallow groundwater plume.

The possibility of the intermediate groundwater plume impacting Harrison Bayou is remote, but because of the aggressive approach to meeting surface water standards under this alternative, the intermediate zone groundwater would also be intercepted. The proposed design of the collection trench and treatment vessel relies on hydraulic head to move the collected groundwater through the trench into the treatment vessel. The intermediate zone groundwater level is below the level of the treatment vessel and even if the collection trench were constructed to intercept the intermediate zone there would be no hydraulic head to induce the collected groundwater to flow up to the treatment vessel. Because some type of active extraction would be necessary for the intermediate zone, the existing wells were selected over a deeper trench and pumping due to ease of implementation and lower cost. This alternative would use the existing intermediate zone extraction wells (16EW05, 16EW06, 16EW07, and 16EW08) to capture the intermediate zone plume. The existing shallow zone extraction wells would not be used. An additional intermediate zone extraction well would be installed north of 16EW05. It would be placed in the same location and constructed identically to the additional intermediate zone well described in Alternative 2. The extracted water would be piped through the existing transport system to the existing groundwater treatment plant. Seven shallow zone monitoring wells (one every 100 feet) would be installed immediately downgradient of the collection trench to monitor trench performance.

The soil excavated from the trench would be staged in the staging area used for the landfill waste. The soil would be sampled and analyzed for perchlorate, VOCs, SVOCs, TCLP, metals, dioxins/furans, and PCBs. It is assumed that this soil could be used as clean fill. Dewatering may be required during the excavation of the trench. Note however, these soils would be subject to the waste analysis and land disposal restriction requirements found in 40 C.F.R. §§ 262.11 and 268.7. The groundwater removed would likely be contaminated and transported to the treatment plant at LHAAP-18/24.

It would take at least 6 months to conduct a reactive barrier treatability study. The clearing and grubbing of the waste staging area and its construction would take approximately 1 month. The partial removal of the cap and the excavation of the 10,000 cubic yards of hot spot material would take approximately 6 months. The off-site transportation and disposal of the excavated waste material would lag behind the waste removal by 1 month. The backfilling of the excavation area, the repair of the cap, and the closure of the landfill would take 1 month. The reactive barrier would be installed concurrently with the hot spot excavation. It would take approximately 6 months to clear and grub the reactive barrier area and install the barrier. The overall duration of this alternative is approximately 12 months. Groundwater and surface water monitoring would be required throughout the O&M period, estimated to be required beyond the 30-year present worth period.

Samples for both Alternatives 5a and 5b would be collected semi-annually from the trench monitoring wells and the discharge of the media treatment vessel. These samples would be analyzed for VOCs, perchlorate, and general chemistry parameters. It is assumed that the media in the permeable reactive barrier would be replaced and disposed of every 5 years.

The contingent action for Alternatives 5a and 5b addresses the possibility that a percentage of the excavated landfill waste is RCRA-characteristic hazardous waste; it is assumed that 5 percent would be RCRA characteristic hazardous waste and require treatment to meet land disposal restrictions (LDRs) before disposal.

Alternative 6

The distinguishing feature of **Alternative 6** is the inclusion of a SVE system that would be installed in the hot spots to remove the bulk of the volatile organics (e.g., TCE, cis-l,2-dichloroethene, vinyl chloride, etc.) that likely permeate the hot spot waste. The vapor extraction operations would consist of a temporary extraction system for a short-term pilot test and a more permanent, skid- or trailer-mounted system for long-term operations. These actions are described below.

Pilot Test **–** The pilot test would be conducted to collect the necessary information to design and install the long-term skid- or trailer-mounted system. The pilot test would consist of a soil gas survey in 10 locations to verify the location and relative concentrations of VOCs in the landfill waste. Based on this information a pilot-scale vapor extraction system would be installed and operated as a proof of principle. Four soil-vapor extraction wells would be installed to 15 feet bgs and would feed an estimated 250 cubic feet per minute (cfm) of vapor and water to a vacuum extraction truck and an internal combustion engine. The collected VOCs would be destroyed in the internal combustion engine. Water collected from the extraction effort would be discharged to the contaminated groundwater collection tank currently used for the LHAAP-16 groundwater extraction system. This extracted water would ultimately be treated at the LHAAP treatment plant. The components of the pilot test would include the following:

- Engineering phase – develop work plans; procure subcontractors
- Field phase – install extraction wells; conduct extraction for 2 months
- Reporting – evaluate data and report results.

Soil Vapor Extraction – Based on the results of the pilot test, a full-scale extraction system would be designed and installed. Approximately eight additional wells would be installed in the areas with elevated soil gas readings found during the pilot test soil gas survey. Each extraction well is assumed to have a radius of influence of 50-75 feet. A header would be run above ground to each well, and each well would be equipped with a valve to allow adjustment of air flow. The vapor extraction system would consist of a blower, knockout tank, and a catalytic oxidation unit. The catalytic oxidation unit would be propane-fueled and have a throughput of approximately 500 cfm (assumes 300 cfm/acre × 1.5 acres). VOC concentrations in the extracted air would be automatically monitored. The components of the long-term vapor extraction would include:

- Reporting – prepare an annual report on system performance
- Engineering phase – design and procure system and subcontractors
- Installation – install additional extraction wells and install piping, treatment unit, and utilities
- Operation – start up, operate, and maintain unit
- Reporting – prepare an annual report on system performance

Water discharged from the extraction system would be sent to the existing groundwater storage tank at LHAAP 16 before being pumped to the groundwater treatment plant at LHAAP-18/24. It is assumed that the vapor extraction system would operate for 5 years.

The installation, operation, documentation, and reporting of the pilot-scale vapor extraction test results would take approximately 4 months. The installation of the full-scale extraction system would take 6 months, and the unit would operate for approximately 5 years. It is estimated that all of the VOCs that can be practicably removed by this system would have been removed in this time period. Following completion of vapor extraction operations, the extraction wells would be plugged and abandoned and the cap repaired in those areas.

The vapor extraction system would require maintenance and monitoring over the 5 years that it would be in operation. It is likely that all of the equipment would operate for the full 5 years without the need for replacement if maintenance is routinely performed. Water and water vapor would be collected, transported, and treated at the treatment plant at LHAAP-18/24 for the entire 5 years.

Alternative 7

The distinguishing features of **Alternative 7** are the inclusion of an in situ enhanced bioremediation and biobarriers. These actions of Alternative 7 are described below.

In Situ Bioremediation – To treat the highest levels of chlorinated ethenes, located in the vicinity of the shallow extraction wells and upgradient of those wells, in situ bioremediation would be performed. This technology uses a carbon source and a bioaugmentation culture to create conditions favorable for reductive dechlorination. Preliminary MNA evaluation results indicates that reductive dechlorination is taking place in the shallow groundwater zone at LHAAP-16, but carbon levels appear to decrease with distance from the landfill itself. Therefore, the addition of a carbon source would further encourage the growth of microorganisms in the subsurface. As the microorganisms multiply, they would consume available respiratory substrates including iron and sulfate. As those respiratory substrates are consumed, conditions would be created which are favorable to destruction of chlorinated ethenes via reductive pathways. A bioaugmentation culture (e.g., SDC-9) would also be added to provide a microbial species specifically able to completely degrade TCE to harmless ethene.

It is proposed to inject the carbon source and bioaugmentation culture into the shallow zone using direct push technology (DPT), and into the intermediate zone by injection through existing wells. It has been assumed that approximately 40 injection points would be required within the treatment area. The details of implementation would be established during remedial design. The number of DPT injection points and the injection volumes would be finalized at that time. The design effort would consider optional injection patterns. Once the carbon source and the bioaugmentation culture were injected into the subsurface, reducing conditions would be created, followed by a significant reduction in chlorinated ethene concentrations.

Biobarriers – A biobarrier would be installed in the downgradient portion of the groundwater plume to prevent contaminated groundwater from seeping into Harrison Bayou at concentrations that cause the surface water in Harrison Bayou to exceed the surface water standards for the COCs and by-product COCs. A second biobarrier would be installed at the edge of the landfill between 16WW38 and 16WW13 to control potential migration of VOCs from the landfill. Specifically, a row of injection points perpendicular to groundwater flow direction would be installed down-gradient of the shallow monitoring well close to Harrison Bayou (16WW12). The biobarrier would consist of emulsified oil that will enable ambient microorganisms to create favorable conditions and a bioaugmentation culture (e.g., SDC-9) to provide a microbial species that is able to completely degrade TCE to ethene. The emulsified oil is a slow-release carbon source with an enhanced subsurface longevity; it would be injected to provide a long-lasting source of fermentable carbon to stimulate the biological reduction of perchlorate and TCE and its daughter products.

Once reducing conditions were achieved in the biobarrier, bioaugmentation culture (e.g., SDC-9) would be added to provide microorganisms to completely degrade chlorinated ethenes. The emulsified oil would be injected across the path of shallow groundwater to form two biobarriers – one close to Harrison Bayou and another at the eastern edge of the landfill. Sufficient emulsified oil would be added to each injection point to provide a sustained carbon source for an estimated 3 to 5 years. Follow-up injections would be conducted if deemed necessary from the performance groundwater monitoring results. Concentrations of COCs downgradient of the biobarriers will be monitored to evaluate the continuing effectiveness of the biobarriers.

2.9.3 Expected Outcomes of Each Alternative

Alternative 1 would allow the site to remain a hazard to human receptors due to the potential ingestion of contaminated groundwater; and to the environment, because no remedial activities would be conducted and there would be no LUCs except for cap maintenance. Note however, the landfill cap maintenance would comply with RCRA landfill closure and post-closure care regulations. Alternatives 2 through 7 all provide engineering controls, treatment, containment, or removal and disposal of the waste material to levels protective of human receptors and the environment, including the groundwater at the site, and Harrison Bayou. The six action alternatives have very similar outcomes of preventing exposure to landfill wastes and contaminated groundwater utilizing the landfill cap and LUCs. Alternatives 2, 3, 4, 6, and 7 would maintain the surface water standards of Harrison Bayou through a variety of treatment processes. Alternative 2 takes advantage of the existing groundwater treatment plant. Alternative 3b, 4, 5a, 6 and 7 would achieve groundwater cleanup standards/levels in less time through utilization of active treatment. The similar outcomes include restoration of the contaminated groundwater by attainment of the SDWA MCLs for those COCs and by-product (i.e., daughter) contaminants that have an MCL, to the extent practicable, and consistent with 40 CFR §300.430(e)(2)(i)(B&C). Because no SDWA MCL exist for some COCs including perchlorate, manganese, and nickel, the MSCs (GW-Ind) as authorized under 30 TAC 335.559(d) constitutes the groundwater cleanup standard to be attained. Similar outcomes also include the protection of surface water standards in surface waters that may be impacted by the contaminated groundwater discharges at LHAAP. As such, the Texas Surface Water Quality Standards found at 30 TAC 307, or if those standards are not available, the SDWA MCLs, or if MCLs are not available the Texas MSCs (GW-Res) as authorized under 30 TAC 335.559(b), constitute the surface water standards that will be monitored to confirm protection of Harrison Bayou surface waters. In addition, the groundwater and surface water monitoring activities associated with Alternatives 2 through 7 would confirm the protection of human health and the environment by documenting the return of groundwater to its potential beneficial use as a drinking water supply, by documenting reduction of the contaminant mass, and protection of surface water through containment of the plume. ~~A LUC requiring maintenance of the integrity of any current or future remedial or monitoring systems to prevent the use of groundwater contaminated above cleanup levels as a potable water source would remain in place until those cleanup levels are met.~~ ~~The groundwater~~ LUCs prohibiting the potable use of the site's groundwater above cleanup levels ~~except for environmental monitoring and sampling~~ and restricting land use to nonresidential will remain in place until it is demonstrated that COCs in groundwater, surface soil and subsurface soil are at levels that allow~~the contaminated groundwater attains groundwater cleanup levels~~ for unlimited use and unrestricted exposure.~~,~~ LUCs to prevent human exposure to landfill waste will remain in place as long as the landfill waste remains at the site~~ orand until the levels of COCs allow for unlimited use and unrestricted exposure~~. ~~and the LUC restricting land use to nonresidential will remain in place until it is demonstrated that surface soil and subsurface soil are at levels that allow for unlimited use and unrestricted exposure.~~

2.10 Summary of Comparative Analysis of Alternatives

Nine criteria identified in the NCP §300.430(e)(9)(iii) are used to evaluate the different remediation alternatives individually and against each other in order to select a remedy. This section profiles the relative performance of each alternative against the nine criteria, noting how it compares to the other options under consideration. The nine evaluation criteria are discussed below. **Table 2-8** summarizes the comparative analysis of the alternatives.

2.10.1 Overall Protection of Human Health and the Environment

Overall protection of human health and the environment addresses whether each alternative provides adequate protection of human health and the environment and describes how risks posed through each exposure pathway are eliminated, reduced, or controlled, through treatment, engineering controls, and/or institutional controls.

Alternative 1, the no further action alternative, does not protect human health or the environment because no remedial activities would be conducted and no LUCs (except for cap maintenance) would be maintained. Therefore, LHAAP-16 contamination would present unacceptable risks to human health and the environment through ingestion of groundwater. The other six alternatives, collectively referred to as the action alternatives, would provide engineering controls, treatment, containment, or removal and disposal of the waste material to levels protective of human health and the environment.

The six action alternatives would provide access and use restrictions, capping of buried wastes (except for the entire landfill excavation option of Alternative 5), and long-term media monitoring. The landfill cap and LUCs would prevent exposure to landfill wastes and contaminated groundwater.

Alternatives 2, 3, 4, 6, and 7 would maintain Harrison Bayou water quality through a variety of means. Alternative 2 maintains the current actions of capping and groundwater extraction to contain the contaminated groundwater plume and prevent it from further impacting Harrison Bayou. Alternatives 3, 4, and 7 are similar to Alternative 2 in that they all maintain the cap, but they all discontinue the groundwater extraction system (Alternative 3b after an estimated 5 years). Alternative 4 uses an in situ permeable reactive barrier installed parallel to Harrison

Bayou, and Alternatives 3, 6, and 7 use MNA to assure protection of Harrison Bayou. Alternative 6 couples vapor extraction of the landfill hot spots with groundwater natural attenuation. Alternative 7 utilizes in situ bioremediation of target areas and biobarriers in conjunction with groundwater natural attenuation.

Alternative 5a is the second most aggressive of all the alternatives in that it removes the landfill hot spots (conventional excavation, off-site disposal) and installs a permeable reactive barrier to treat groundwater before it seeps into Harrison Bayou. Alternative 5b, the most aggressive alternative, removes all of the landfill waste and uses the same reactive barrier as in Alternative 5a. All alternatives are protective, though Alternative 5b is most reliable in the long term because it has less reliance on long-term LUCs.

All action alternatives satisfy the RAOs for LHAAP-16. Action alternatives provide confirmation that human health and the environment will be protected because the monitoring will be conducted to confirm that active remedies and/or MNA is returning the contaminated shallow and intermediate groundwater zones at LHAAP-16 to their potential beneficial uses as a drinking water, wherever practicable, and to document that the plumes are contained and prevented from impacting surface water at levels that could present a risk to human health and the environment. Furthermore, the LUCs would protect human health by preventing exposure to landfill waste, protecting the landfill cover system and restricting access to the contaminated groundwater until the levels of COCs ~~and COC by-products (daughter contaminants)~~ in groundwater and soil allow for unlimited use and unrestricted exposure. ~~contaminants in the groundwater attain the cleanup levels (SDWA MCLs or GW-Ind if no MCL is available) for all contaminants above the cleanup levels.~~

2.10.2 Compliance with ARARs

Section 121(d) of CERCLA and 40 CFR §300.430(f)(1)(ii)(B) require that remedial actions at CERCLA sites attain legally applicable or relevant and appropriate Federal and State requirements, standards, criteria, and limitations, which are collectively referred to as “ARARs” unless such ARARs are waived under CERCLA Section 121(d)(4). The ARARs that pertain to this ROD are discussed in **Section 2.13.2**.

Because contaminated groundwater has seeped into Harrison Bayou, chemical-specific ARARs for surface water consumption are applicable, relevant and appropriate. Specifically, Texas surface water quality standards are set forth in 30 TAC 307.6(d)(1) for TCE (5 µg/L), 1,2-DCA (5 µg/L), 1,1-DCE (7 µg/L), 1,1,2-TCA (5 µg/L), vinyl chloride (2 µg/L), arsenic (10 µg/L), and thallium (2 µg/L) will be met for surface water at LHAAP-16. The SDWA MCL constitute the cleanup standards/levels to be met per 30 TAC 335.559(b). The MCL for cis-1,2-DCE (70 µg/L), methylene chloride (5 µg/L), chromium (100 µg/L), will be met at the site. The MSC

(GW-Res) for nickel (730 µg/L), and perchlorate (26 µg/L), and the 95%UTL for manganese (7,820 µg/L) will be met at the site.

Alternative 1 does not comply with chemical-specific ARARs because no additional remedial action would be implemented. All of the action alternatives comply with chemical-specific ARARs for groundwater because they will return the contaminated shallow and intermediate groundwater zones at LHAAP-16 to their potential beneficial use as a drinking water, wherever practicable, which for the purposes of this ROD is considered to be attainment of the relevant and appropriate cleanup levels (SDWA MCLs or GW-Ind if no MCL is available) to the extent practicable, and consistent with 40 CFR 300.430(e)(2)(i)(B&C) and 30 TAC 335.559(d)(2). If a return to potential beneficial uses is not practicable, these alternatives would still meet the NCP expectation to prevent further migration of the plume, prevent exposure to the contaminated groundwater, and evaluate further risk reduction. All of the action alternatives comply with surface water chemical specific ARARs because active remedial processes will reduce the contaminant concentrations in groundwater to the cleanup levels prior to seeping into surface water.

Location-specific and action-specific MCLs would not apply to Alternative 1 since no remedial activities would be conducted. All of the action alternatives comply with all location-specific and action-specific ARARs.

2.10.3 Long-Term Effectiveness and Permanence

Long-term effectiveness and permanence refers to expected residual risk and the ability of a remedy to maintain reliable protection of human health and the environment over time, once clean-up levels have been met. This criterion includes the consideration of residual risk that will remain onsite following remediation and the adequacy and reliability of controls.

The no further action alternative would not be effective in the long term, because the baseline risk assessment indicates that the current groundwater conditions are not protective of human health and the environment, and no remedial activities would be conducted to address groundwater under this alternative.

All alternatives except Alternative 5b rely on LUCs and source isolation (i.e., capping) to isolate the residual waste from potential receptors. With the exception of the complete landfill excavation option for Alternative 5b, all action alternatives would leave waste on site. Because Alternative 5b removes the entire landfill source term, it is the most reliable in long-term protection of future human receptors. Alternatives 5a and 6 are the next most reliable in the long term because of their removal and in situ treatment, respectively, of the hot spot wastes. The long-term cap maintenance and LUCs offered by Alternatives 2, 3, 4, 5a, 6, and 7 restricting access to the contaminated media would adequately maintain residual risks below acceptable levels. If cap maintenance and monitoring programs are maintained and the owner of LHAAP-

16 maintains the LUCs, the cap and LUCs programs can reliably maintain residual risks at acceptable levels.

The permeable reactive barriers used in Alternatives 5a and 5b to avoid the potential risk that the contaminated groundwater seeping into surface water could cause Harrison Bayou to exceed surface water standards, may be effective and relatively reliable with long-term maintenance and monitoring. To control seepage into Harrison Bayou, Alternatives 2 and 3b extract and treat contaminants in groundwater. Alternative 2 requires long-term groundwater extraction, which has proven to be moderately effective. The extraction system has had reliability problems as with any mechanical system that must operate over the long term. Alternative 3b extracts groundwater for a shorter amount of time.

The other action alternatives rely on treatment options (i.e., in situ permeable reactive barrier, in situ bioremediation, biobarriers) along with MNA to protect Harrison Bayou. The in situ permeable reactive barriers used in Alternatives 4, 5a, and 5b and in situ bioremediation and biobarriers used in Alternative 7, would require regular monitoring and replacement of the reactive media to maintain long-term effectiveness. Long-term maintenance of these barriers could prove to be problematic because of potential fouling of the treatment media and changing geochemistry that could reduce their effectiveness. Collection trenches at LHAAP-16 would be difficult to design to effectively intercept the contaminated groundwater and drain by use of gravity. Permeable barriers and biobarriers were selected to be the representative process option because of their flexibility in being used to address VOC and perchlorate removal.

If operating effectively, the in situ groundwater treatment process of Alternatives 4 and 5 and in situ enhanced bioremediation and biobarriers of Alternative 7, more reliably meet the surface water objective of preventing seepage of contaminants into Harrison Bayou than the natural attenuation option in Alternatives 3 and 6. Results of the MNA evaluation for LHAAP-16 indicated that natural attenuation is a feasible remedy for certain portions of the site but not as a sole remedy due to migration concerns for the shallow groundwater zone. Alternatives 3 and 6 have a planned contingent action of using the enhanced extraction and treatment system of Alternative 2 if natural attenuation is not occurring at a sufficient level to control future seepage into Harrison Bayou.

Alternative 7 utilizes in situ bioremediation and biobarriers to further degrade the contaminants in groundwater in conjunction with MNA. Based on the results of the ESTCP semi-passive biobarrier technology demonstration (ESTCP, 2005; ESTCP, 2007) and the preliminary MNA evaluation, the groundwater contaminants at LHAAP-16 have been shown to be amenable to degradation by biological processes prior to seepage into Harrison Bayou. In summary, all of the action alternatives, including their contingent actions, would effectively meet the RAOs. The reliability of the permeable treatment barrier of Alternatives 4 and 5 is less certain than that of the extraction system of Alternative 2 and 3b, but it may be more effective than the natural attenuation component of Alternatives 3a, 6, and 7. The biological processes utilized in Alternative 7 have been shown to be effective and reliable at LHAAP-16. The current source action, a cap, is limiting releases from the landfill material to the groundwater. However, the removal of the hot spots in Alternative 5a (to the extent these can be found without completely removing the composite synthetic/ bentonite clay liner), or treatment of those same hot spots as in Alternative 6, could enhance the reliability of the cap. LUCs to prevent access to the landfill material are considered effective. There is no information to suggest that the hot spots identified as the probable source of migration of contaminants to groundwater would also have the greatest risk if accessed, so these alternatives are not considered more reliable. However, full removal of the waste, Alternative 5b, would be the most reliable.

Monitoring activities associated with all action alternatives would confirm the protection of human health and the environment by documenting the return of the groundwater to its potential beneficial use as a drinking water supply, by documenting reduction of the contaminant mass and protection of surface water through containment of the plume. Maintenance of the integrity of the monitoring system associated with the groundwater remedy until cleanup levels specified in Table 2-7 have been achieved also provides for the long-term effectiveness of Alternatives 2 through 7.

2.10.4 Reduction of Toxicity, Mobility, or Volume through Treatment

Reduction of toxicity, mobility, or volume through treatment refers to the anticipated performance of the treatment technologies that may be included as part of a remedy.

The no further action alternative does not include treatment and would not result in a reduction of toxicity, mobility, or volume of contaminants.

Alternatives 2, 3, 4, and 7 would not address the landfill source other than providing containment through capping. Alternative 3a, through its complete reliance on groundwater natural attenuation, provides the least reduction in contaminant volume and toxicity. The natural biological and chemical processes, over time, would gradually reduce the toxicity of VOCs in groundwater and the overall volume of contaminated groundwater. Alternative 4, with its permeable reactive barrier, would reduce the toxicity and volume of the shallow groundwater that passes through it. Although the groundwater upgradient of the reactive barrier is unaffected by the reactive media (until it passes through it), the reactive barrier provides a greater reduction in toxicity and volume than Alternative 3a. Alternatives 2 and 3b actively remove contaminated groundwater from the heart of the plume and treat it ex situ in the LHAAP treatment plant. The processes in the treatment plant would reduce the toxicity and volume of the extracted groundwater. Much of the contamination in the groundwater plume would be reduced over time, offering greater reductions in toxicity and volume than that in Alternative 3a.

Alternative 7 includes in situ bioremediation in the vicinity of shallow wells and upgradient of the wells with the highest levels of chlorinated ethenes. The process would reduce the toxicity and volume. The biobarriers provide further reduction of toxicity, mobility, and volume of the groundwater that passes through them. MNA in conjunction with in situ bioremediation would enhance reduction of toxicity and volume. Alternative 7 includes treatment of groundwater within the plume itself. Alternatives 3a, 3b, 6, and 7 include a natural attenuation component together with dilution, dispersion, and other natural processes that have the capability of ultimately reducing the contaminants to satisfy the chemical-specific ARARs.

Alternative 6 includes the in situ treatment of the landfill. The extracted VOCs, the majority of the source at LHAAP-16, would be destroyed in a thermal oxidation unit. Although the contaminants in groundwater would be treated only through natural degradation processes, the overall reduction in toxicity and volume is greater than other alternatives.

Alternative 5 removes source material from the site, but the base action does not include treatment of that material. The permeable barrier does provide some reduction of toxicity of contaminants through treatment. If the excavated material is RCRA-characteristic, treatment of such materials to meet LDRs would satisfy the CERCLA Section 121(b) statutory preference for treatment.

2.10.5 Short-Term Effectiveness

Short-term effectiveness addresses the period of time needed to implement the remedy and any adverse impacts that may be posed to workers, the community, and the environment during construction and operation of the remedy until cleanup levels are achieved.

The no further action alternative would not involve any action; therefore, there would be no increase in short-term risks and no short-term environmental effects.

Through LUCs and engineered controls (e.g., physical barriers, administrative controls, and dust suppression), the six action alternatives would be protective of the community during implementation. Alternative 3a would be the most protective in the short term because there is no construction or off-site transportation. Alternative 5b and, to a lesser extent, Alternative 5a would pose the greatest potential exposure and transportation risks to the public due to the extensive waste excavation and transportation activities. Local and site traffic would be similar for all other alternatives.

The cap maintenance activities at the landfill would require the same health and safety measures for all alternatives except for Alternative 5b. Alternative 5b and to a lesser extent Alternative 5a require extensive handling of the landfill waste and thus pose the greatest risk to remediation workers. Alternative 5a would also be inherently dangerous for workers and machinery because a landfill is an unstable area for trench excavation. Alternative 6 presents lower risks to remediation workers than Alternative 5a because of the less intrusive waste operations of the vapor extraction operations. Appropriate mitigative measures would be applied during construction and transportation to attain appropriate worker and public health exposure requirements in all action alternatives. By planning the construction, excavation, and transportation activities in accordance with industry and OSHA codes and requirements, risks from contaminant exposure and construction operations would be controlled to acceptable levels. All of the remaining alternatives pose similar risks to the remediation worker with Alternative 3a being the safest alternative to implement.

The short-term disturbance of on-property vegetation and wildlife habitat would be greatest under Alternatives 5a and 5b, primarily because of the waste excavation activities and the installation of the long groundwater collection trench. There would be short-term impacts on the vegetation and wildlife habitats in the vicinity of the permeable reactive barrier under alternative 4 and in situ bioremediation injection points and biobarriers under alternative 7, though less than that for the longer barriers in Alternatives 5a and 5b. The vapor extraction operations in Alternative 6 would lightly impact vegetation on the landfill. The remaining alternatives would have little to no short-term impacts above those related to minor maintenance activities. For earthwork and construction activities, sediment deposition into Harrison Bayou would be controlled. Erosion control measures would include surface grading; placement of rip rap and silt fences; covering surfaces with straw, mulch, riprap, or geotextile fabrics; and/or using riprap in areas with high water velocity. Following completion of all construction and excavation, disturbed areas would be regraded with clean backfill and revegetated with native grasses.

The approximate construction time for the action alternatives ranges from 6 months in Alternative 2 to 36 months in Alternative 7. Because the source term is effectively controlled in all of the alternatives (with appropriate cap maintenance), the length of time required before groundwater containment systems are no longer needed are comparable, outside the 30-year present worth period. Additional source actions (Alternatives 5 and 6) are likely to lessen the time required to control the groundwater.

The MNA evaluation for LHAAP-16 demonstrated that natural attenuation is occurring in some areas at the site. The attenuation of contaminants was observed at the source and side-downgradient of the plume. However, the shallow groundwater zone plume is still migrating along the groundwater flow direction toward Harrison Bayou. The intermediate groundwater zone plume is more stable with less migration along the flow direction toward Harrison Bayou. Thus, natural attenuation is a feasible remedy for certain portions of the site but not as a sole remedy due to migration concerns for the shallow zone. MNA is proposed for Alternative 7 in conjunction with in situ bioremediation to enhance reductive dechlorination within the plume and a biobarrier to prevent the seepage of contaminants into surface water. Natural attenuation would be evaluated after 2 years of quarterly monitoring and a re-application of bio-amendments (i.e., additional in situ bioremediation) would be implemented if deemed necessary.

Detailed evaluation of natural attenuation processes would be required to determine whether the Harrison Bayou remediation levels can be met in the near future or whether a contingent action is needed under Alternatives 3 and 6.

2.10.6 Implementability

Implementability addresses the technical and administrative feasibility of a remedy from design through construction and operation. Factors such as availability of services and materials, administrative feasibility, and coordination with other governmental entities are also considered.

Under the no further action alternative, no new remedial action would be taken. Therefore, there would be no difficulties or uncertainties with implementation.

Overall, all of the action alternatives are technically feasible to implement. Although Alternatives 5a, 5b, and 6 would require more time, equipment, and activity than the other alternatives, the components of most alternatives use technologies that have been straightforward to implement at other sites with contaminants and conditions similar to those found at LHAAP-16. These technologies would be implemented using conventional equipment and construction methods. The excavation of the landfill wastes under Alternatives 5a and 5b would be moderately difficult because of the inherent difficulties associated with excavating debris from a landfill with an uncertain disposal history. Given the uncertain nature of the wastes in the landfill, the potential for delays in excavation exist should anomalous items or debris be encountered. Likewise, coordination issues between excavation, waste characterization sampling, and disposal could slow the process. Alternative 5a has additional implementation difficulties due to the need to penetrate and rebuild the capping system and the impracticability of verifying that all potential sources of groundwater contamination are removed. Although the media in the reactive barrier in Alternatives 4, 5a, and 5b is expected to treat VOCs and perchlorate, the specific conditions at LHAAP-16 (low gradient, high VOCs, low perchlorate levels) have not been tested. There are negative interactions with other site contaminants that could reduce the media's performance. Based on the ESTCP semi-passive biobarriers technology demonstrations, groundwater contaminants at LHAAP-16 are amenable to degradation by biological processes under Alternative 7. All components of Alternative 7 are readily implementable. Alternative 5b, and to a lesser extent Alternative 5a, would be the most technically difficult to implement.

Alternative 6 would be more technically implementable than Alternatives 5a and 5b, though there may be some challenges associated with the installation of the vapor extraction system in the landfill wastes. Also, the uncertainties associated with the flow of soil gas through the variable and heterogeneous buried waste would also contribute to difficulties in implementability and performance. However, the process is robust and would remove adequate volumes of soil vapor. Alternative 6 also has uncertainty associated with the implementation and operation of a permeable barrier.

There are few technical challenges to the implementation of Alternative 4 other than those associated with the installation of the permeable reactive barrier. Although Alternative 3a does not require the installation of any engineered components, the uncertainty in the long-term effectiveness of natural attenuation with the source term still in place may cause future delays should a contingent action need to be implemented. The groundwater extraction system and water treatment plant used in Alternatives 2 and 3b are currently operating and proven in their operation and effectiveness and make these alternatives the most technically implementable.

Administratively, all alternatives are implementable. Virtually all services and materials required for the implementation of the action alternatives would be standard for the construction industry and would be readily available. However, considerable testing and development may be needed to produce an effective design for in situ treatment of VOCs and perchlorate in groundwater. Alternative 5 is the least administratively implementable because of the off-site waste transportation and disposal activities. Various Department of Transportation regulations (e.g., 49 CFR 172, 173, and 177) apply to the transportation of wastes such as those expected from the landfill, and the waste acceptance criteria of the off-site disposal facility must be complied with. In the event that a portion of the wastes must be treated before disposal (Alternative 5 contingent action), the waste acceptance criteria of the treatment facility must also be met. Alternatives 4 and 5 would also require personnel with specialized experience in reactive barrier treatability testing, installation, and operation. The vapor extraction activities in Alternative 6 would require personnel with specialized experience in vapor extraction installation and operation. Alternative 7 would require expertise in engineering design and implementation of the in situ bioremediation and the biobarrier component of the alternative. Alternative 2 and Alternative 3 are the most administratively implementable.

2.10.7 Cost

Cost estimates are used in the CERCLA process to eliminate those remedial alternatives that are significantly more expensive than competing alternatives without offering commensurate increases in performance or overall protection of human health or the environment. The cost estimates developed are preliminary estimates with an intended accuracy range of –30 to +50 percent. Final costs will depend on actual labor and material costs, actual site conditions, productivity, competitive market conditions, final scope, final schedule, final engineering design, and other variables.

The cost estimates include capital costs (including fixed-price remedial construction) and long-term O&M costs (post-remediation). Present worth costs were developed for each alternative assuming a discount rate of 2.7 percent. The estimates for all alternatives utilize a 30-year project life for costing purposes, although the timeframe to achieve RAOs is expected to be longer. The costs of Alternatives 1 through 6 have been updated from the costs presented in the Final FS (Jacobs, 2002) to January 2008 using the Engineering News Record construction cost index, and the costs of five-year reviews have been added to all alternatives. Also, the cost of Alternative 1 has been updated to reflect the ongoing cap maintenance/inspection activities and the implementation of LUCs under the Interim ROD for LHAAP-16.

The progression of present worth costs from the least expensive alternative to the most expensive alternative is as follows: Alternative 1, Alternative 7, Alternative 3a, Alternative 3b, Alternative 4, Alternative 6, Alternative 2, Alternative 5a, and Alternative 5b. Lowest costs are associated with Alternative 1 because no further remedial activities would be conducted. Alternative 7 has the lowest present worth and capital costs of the action alternatives. Alternatives 3a, 3b, and 4 are next in costs (all $5,000,000 or below). While Alternatives 3a and 3b rely heavily on a passive remedial action component (MNA), Alternative 7 utilizes active technologies (in situ bioremediation and biobarriers) prior to MNA; those active technologies lead to much lower monitoring costs in the future, thus giving Alternative 7 a lower total present value cost. The large O&M cost for groundwater treatment (Alternative 2) and the higher capital and O&M cost of in situ vapor extraction (Alternative 6) make these alternatives roughly twice as expensive as Alternatives 3a, 3b, and 4. However, if other sites require use of the LHAAP groundwater treatment plant, the cost of Alternative 2 will be comparable to Alternative 3.

Alternatives 5a (present worth of $13 million) and 5b (present worth of $116 million) are considerably more expensive because of the combination of high capital costs and high O&M costs. The contingent action costs do not change the order of costs.

2.10.8 State/Support Agency Acceptance

The USEPA and TCEQ have reviewed the Proposed Plan, which presented Alternative 7 as the preferred alternative. Comments received from the USEPA and TCEQ during the Proposed Plan development have been incorporated. Both agencies concur with the selected remedial action.

2.10.9 Community Acceptance

Community acceptance is an important consideration in the final evaluation of the selected remedy. Three sets of written public comments were received during the 30-day public comment period; there were no verbal comments from the October 19, 2010 public meeting. The topics of the comments included: time the landfill will continue to be a source of contamination, time required to achieve cleanup levels, effectiveness of MNA, defining the extent of groundwater contamination, adequacy of the monitoring wells and Harrison Bayou sampling locations, perchlorate cleanup levels, and additional contaminants (antimony, thallium, dioxins and furans) to be added to the list of COCs. Comment responses were provided and incorporated into the ROD, including reiteration of the evaluation criteria for the selected remedy, explanation that the landfill cover system implemented in 1998 as part of the IRA was intended to be consistent with the final remedy and is considered a component of the final selected remedy, explanation that the existing monitoring wells and surface water sampling locations are adequate to monitor contamination at the site and within Harrison Bayou. In addition, explanation as to why thallium will be added to the COC list while antimony and dioxins/furans were not selected as COCs is given. The written comments received and their responses are presented in the Responsiveness Summary (**Section 3.0**).

2.11 Principal Threat Wastes

LHAAP-16 was used primarily as a solid and industrial waste landfill. Placement of the landfill cap prevents rainfall from further infiltrating and leaching contaminants from principal threat wastes in the landfill. However, contaminated groundwater beneath the landfill area continues to migrate. A groundwater extraction and treatment system was voluntarily installed in 1996 to prevent the groundwater plume from migrating to Harrison Bayou.

Capping the landfill as opposed to waste treatment or removal is a presumptive remedy at landfills as it has been shown to be more effective in comparison to other remedies. Landfill removal and landfill source treatment alternatives were included in the comparative analysis of alternatives performed during the feasibility study (Jacobs, 2002) for LHAAP-16. These remedial alternatives did not demonstrate increases in effectiveness that was balanced by their increased costs and short-term impacts.

2.12 The Selected Remedy

2.12.1 Summary of Rationale for the Selected Remedy

Alternative 7, capping, LUCs, in situ enhanced bioremediation in a target area, biobarriers, and MNA, is the selected alternative for LHAAP-16 and is consistent with the intended future use of the site as a national wildlife refuge. This alternative would satisfy the RAOs for the site through the following:

- Maintenance and repair of the existing landfill cap will preserve the integrity of the cap, thus preventing exposure to landfill contents and protecting human health and the environment by reducing leaching and migration of landfill hazardous substances into groundwater. Closure and post-closure ARARs were identified for LHAAP-16 in the IRA ROD and these included 30 TAC 335.112, 335.118, 335.119 and 335.174 and 40 CFR Sections 264.228 and 264.310 addressing landfills and surface impoundments storing hazardous waste. Although closure requirements were met during implementation of the (cap) presumptive remedy of the IRA, post-closure requirements remain appropriate and relevant.

- Treatment of groundwater by in situ enhanced bioremediation in the more contaminated areas and installation of biobarriers will reduce contaminant mass and control contaminated groundwater from migrating into Harrison Bayou. The above selected remedial actions employing treatment along with MNA, will ultimately restore the groundwater to attain groundwater cleanup standards/levels.

- MNA was selected as one component of the remedy based on available groundwater evidence as presented in the Addendum to the FS (Shaw, 2010). A tiered approach using three lines of evidence was used to examine the occurrence of natural attenuation. The first line of evidence evaluated reductions in COC concentrations over time and with distance, the second line of evidence evaluated geochemical indicators, while the third line of evidence entailed estimation of natural attenuation rates. Historical decreases in concentrations of chlorinated solvents and perchlorate in individual wells were observed in both shallow and intermediate groundwater, including the detection of daughter by-products that suggest the occurrence of complete reductive dechlorination. These results indicated the shallow and intermediate contaminant plumes are stable in certain areas (at the source area and side-downgradient in the plumes); however, there were increases in other well locations in the shallow groundwater that suggest a portion of the plume is migrating toward Harrison Bayou. The intermediate groundwater zone plume was relatively more stable than the shallow groundwater with less migration. Geochemical conditions were adequate for perchlorate degradation (as evidenced by non-detect nitrate/nitrite levels), but methanogenic conditions (needed for chlorinated ethene degradation) were not detected consistently throughout the site. Thus, natural attenuation was considered feasible for much of the site, but not as a sole remedy for the entire site. Additional evaluation, including the installation of additional monitoring wells, will be implemented as part of the MNA component. MNA, together with the in situ bioremediation and biobarriers, will ultimately restore the groundwater to attain groundwater cleanup standards/levels; this is anticipated to be completed in approximately 280 years. This approximate timeframe to achieve cleanup levels is considered reasonable based on the anticipated future land use of the site as a national wildlife refuge and the fact that there is no current or anticipated future use of groundwater as a drinking water supply. Thus, MNA is an appropriate component of the remedy for those regions outside the influence of the active remedies because it will protect human health and the environment and will document that further reductive dechlorination is occurring within the groundwater plume and that contaminant concentrations are being reduced to attain groundwater standards/levels.

- Landfill LUCs will remain in place as long as the landfill waste remains at the site~~ orand until the levels of COCs and COC by-products allow for unlimited use and unrestricted exposure~~. ~~In addition, the~~ The LUC restricting the potable use of groundwater above cleanup levels~~to environmental monitoring and testing only~~ and the LUC restricting land use to nonresidential~~,~~ will remain in place until the levels of COCs in surface and subsurface soil and groundwater allow ~~the contaminated groundwater attains groundwater cleanup standards/levels~~ for unlimited use and unrestricted exposure~~ in order to prevent human exposure to the contaminated groundwater~~. ~~The LUC restricting land use to nonresidential will remain in place until it is demonstrated that surface soil and subsurface soil meet unrestricted use criteria.~~ ~~The LUC to maintain the integrity of~~

> ~~any current or future remedial or monitoring systems to prevent the use of groundwater contaminated above cleanup levels as a potable water source will be in place until groundwater cleanup levels are met.~~

Groundwater monitoring will be conducted to confirm that COC and by-product contaminant concentrations in the groundwater plume are declining through treatment and natural processes and that Harrison Bayou is protected from groundwater seeps that fail to attain groundwater cleanup standards/levels. In situ bioremediation and biobarriers constitute treatment measures designed to reduce the COCs and by-products contaminant mass, and protect Harrison Bayou from contaminant and by-product contaminant seeps that would cause Harrison Bayou surface water to exceed Texas Surface Water Quality Standards. Monitoring will continue until it is demonstrated that groundwater has achieved the cleanup standards.

The selected remedies employing treatment will significantly reduce contaminant concentrations. The remedies employing treatment along with MNA will ultimately restore the groundwater to attain groundwater cleanup standards/levels. The performance of natural attenuation will be evaluated by 2 years of monitoring using data acquired from quarterly results. If MNA is not successful, the active remedies will be re-implemented, in part or in whole, based on evaluation of site data available at that time.

Five-year reviews will be performed to document that the remedy remains protective of human health and the environment.

Alternative 7 is readily implementable and no significant short-term risks to worker health and safety or to the community would be expected. The present worth cost of Alternative 7 is lower than the other remedial alternatives except for Alternative 1, the no further action alternative.

Based on the information currently available, the U.S. Army believes that the selected alternative meets the threshold criteria and provides the best balance of tradeoffs among the other alternatives with respect to the CERCLA §121(b) criteria used to evaluate remedial alternatives. The selected alternative will 1) be protective of human health and the environment; 2) comply with ARARs; 3) be cost-effective; 4) utilize permanent solution; and 5) utilizes treatment as a principal element.

The U.S Army will present details of the in situ bioremediation and biobarrier implementation, groundwater and surface water monitoring plan, LUCs implementation plan, and the MNA remedy implementation in a remedial design for LHAAP-16.

2.12.2 Description of the Selected Remedy

The selected remedy, Alternative 7, was outlined in **Section 2.9**; that description is expanded in the following discussion. The remedy may undergo modifications as a result of the RD and construction processes. Modifications of the remedy described in the ROD will be documented using a technical memorandum in the Administrative Record, an Explanation of Significant Differences (ESD), or a ROD amendment.

The major components of the remedy and the contingency remedies include:

- *Cap Maintenance*. The existing cap was designed as a standard RCRA-style multilayer cap. The current cap meets USEPA performance standards established for hazardous waste landfill closure and post-closure care. Therefore, the current cap will not be modified as part of this alternative. Further, consistent with the requirements described in the 1995 ROD for LHAAP-16 establishing an interim remedial action for the site to mitigate potential risks posed by buried landfill waste, the existing cap will continue to be monitored, maintained, and repaired, as necessary, to preserve its long-term effectiveness. This includes inspections of the landfill to check for erosion, settlement, and deep-rooted vegetation and implementation of necessary repairs. Routine maintenance and repair of the cap will include actions needed to preserve the integrity of the cap (e.g., mowing, seeding, and settlement/erosion repair). Post-closure requirements identified as ARARs in the IRA ROD are considered appropriate and relevant and include 40 CFR 264.228 (b)(1), (3), and (4), 264.310 (b)(1), (4) and (5)and 30 TAC 335.174. Although there is no permanent benchmark inside the Site 16 area, one is located adjacent to the site. Therefore 40 CFR 264.310(b)(6) is considered appropriate and relevant for a benchmark located near the landfill. In addition, those substantive requirements of 40 CFR 264.117 though 120 related to post-closure for the remedy-in-place are considered appropriate and relevant.

~~*Land Use Control*. The land use controls objectives include maintaining the integrity of any current or future remedial or monitoring systems to prevent the use of groundwater contaminated above cleanup levels as a potable water source. The groundwater treatment and MNA remedial components include a groundwater monitoring system that will be used to characterize the condition of the groundwater during the period the groundwater remedy is in place until the groundwater remediation goals are achieved, and to demonstrate achievement of the groundwater remediation goals when the groundwater remedy is complete. As a part of this groundwater remedy, the Army will maintain the remedial and monitoring systems associated with the groundwater remedies until these components of the remedy are no longer needed to achieve cleanup levels, and cleanup levels have been achieved. During the period of operation of the groundwater remedy, if any of the elements of the remedial and groundwater monitoring systems are damaged, destroyed, or become ineffective, they will be repaired or replaced with suitable components to assure that the remedial and groundwater monitoring systems are able to provide data of the quality necessary to determine the progress of and eventual completion of this component of the remedy. The actions to be taken to implement these LUC objectives and requirements will be provided through modifying the "Comprehensive Land Use Control (LUC) Management Plan, Former Longhorn Army Ammunition Plant, Karnack, Texas" and detailed in the LUC RD.~~

- *Groundwater Monitoring System Maintenance.* A groundwater monitoring system will be implemented to demonstrate the active groundwater treatment and MNA remedies are protective of human health and the environment. The groundwater monitoring system will remain in place until the groundwater cleanup levels specified in Table 2-7 are achieved. If any of the elements of the groundwater monitoring system are damaged, destroyed, or become ineffective, they will be repaired or replaced.

- The LUCs' performance objectives are to prohibit access to ~~the~~ contaminated groundwater above the cleanup levels specified in Table 2-7,~~except for environmental monitoring and testing only~~, to ~~preserve~~protect the integrity of the landfill cap and ~~to~~ restrict intrusive activities (e.g., digging) that would degrade or alter the cap, ~~and~~ and to restrict land use to nonresidential~~ and to maintain the integrity of any current or future remedial or monitoring systems to prevent the use of groundwater contaminated above cleanup levels as a potable water source~~. The landfill LUCs will remain in place as long as the landfill waste remains at the site~~ or until the levels of COCs allow for unlimited use and unrestricted exposure~~. The LUCs restricting the potable use of groundwater above cleanup levels~~to environmental monitoring and testing only~~ and the LUC restricting land use to nonresidential will remain in place until the levels of COCs in surface and subsurface soil and groundwater allow~~ the contaminated groundwater attains groundwater cleanup levels~~ for unlimited use and unrestricted exposure~~ in order to prevent human exposure to the contaminated groundwater~~. ~~The LUC restricting land use to nonresidential will remain in place until it is demonstrated that the contaminated surface soil and subsurface soil meet unrestricted use criteria.~~ ~~The LUC to maintain the integrity of any current or future remedial or monitoring systems to prevent the use of groundwater contaminated above cleanup levels as a potable water source will be in place until groundwater cleanup levels are met.~~ A LUC RD~~Remedial Design~~ will be finalized as the land use component of the Remedial Design. Within 21 days of the issuance of the ROD~~Record of Decision~~, the Army will propose deadlines for completion of the RD~~Remedial Design~~ Work Plan, RD~~emedial Design~~, and Remedial Action Work Plan. The documents will be prepared and submitted to EPA and TCEQ ~~for Consultation~~ pursuant to the FFA. ~~and~~ T~~t~~he LUC RD~~remedial design that~~ will contain implementation and maintenance actions, including periodic inspections. The recordation notification for the site which will be filed with Harrison County will include a description of the LUCs. The boundary of the LUCs would enclose the site boundaries and the plume boundaries shown on **Figure 2-3**.

  The Army will implement, maintain, monitor, report on and enforce land use controls at Army-owned property. The Army shall perform those actions related to land use control activities described in this ROD and in the Remedial Design for the ROD. For portions of the Site subject to land use controls that are not owned by the Army, the Army will monitor and report on the implementation, maintenance, and enforcement of land use controls, and coordinate with federal, state, and local governments and owners and occupants of properties subject to land use controls. The Army will provide notice of the groundwater and soil contamination and any land use restrictions referenced in the ROD. The Army will send these notices to the federal, state and local governments involved at this site and the owners and occupants of the properties subject to those use restrictions and land use controls. The Army shall provide the initial notice within 90 days of ROD signature. The frequency of subsequent notifications will be described in the Remedial Design for the ROD. The Army remains responsible for ensuring that the remedy remains protective of human health and the environment. The Army will fulfill its responsibility and obligations under CERCLA and the NCP as it implements, maintains, and reviews the selected remedy.

Upon transfer of Army-owned property, the Army will provide written notice of the land use controls to the transferee of the groundwater and soil contamination and any land use restrictions referenced in the ROD. Within 15 days of transfer, the Army shall provide EPA and TCEQ with written notice of the division of implementation, maintenance, and enforcement responsibilities unless such information has already been provided in the LUC RD. The LUC RD will address the procedures to be used by the Army and the transferee to document compliance with the LUCs described in this ROD. In the event property is transferred out of Federal control, the land use controls relating to property and groundwater restrictions shall be recorded in the deed and shall be enforceable by the United States and the state of Texas.~~The U.S. Army would be responsible for implementation, maintenance, inspection, reporting on, and enforcement of the LUCs. Although the U.S. Army may later pass these procedural responsibilities to the transferee by property transfer agreement, the U.S. Army shall retain ultimate responsibility for: (1) CERCLA 121(c) Five Year Reviews; (2) notification of the appropriate regulators of any known LUCs deficiencies or violations; (3) access to the property to conduct any necessary response; (4) reservation of the authority to change, modify or terminate LUCs and any related transfer or lease provisions; and (5) ensuring the protectiveness of the selected remedy. In the event that TCEQ and/or EPA and the Army agree with respect to any significant modification of the selected remedy, including the LUCs component of the selected remedy, the remedy will be changed consistent with the FFA and 40 C.F.R. §300.435(c)(2) . The U.S. Army shall retain the ultimate responsibility for remedy integrity as provided in the 1991 FFA.~~

LUCs implementation and maintenance actions would be described in the RD for LHAAP-16. The LUCs would be included in the property transfer documents and ~~a~~ recorded~~ation~~ ~~of them would be filed~~ in the Harrison County Courthouse. The LUCs will prevent unacceptable human exposure to groundwater contaminated with chlorinated solvents, metals, and perchlorate through the prohibition of potable groundwater use above cleanup levels and restricting land use to nonresidential,~~(except for environmental monitoring and testing)~~, ~~and~~ and require cap protection and maintenance.~~, restrict land use to nonresidential, and require maintenance of the integrity of any current or future remedial or monitoring systems to prevent the use of groundwater contaminated above cleanup levels as a potable water source~~. ~~The groundwater LUCs shall be maintained until there is no further threat of releases of contaminated groundwater into the surface water and the concentrations of contaminants and by-product (daughter) contaminants have been reduced to below their respective MCLs under the SDWA to allow unrestricted use and unlimited exposure at LHAAP-16.~~ In addition, within 90 days of signature of this ROD, the U.S. Army shall request the Texas Department of Licensing and Regulation to notify well drillers of groundwater use prohibitions based on a preliminary LUC boundary. Within 21 days of the issuance of the Record of Decision, the Army will propose ~~target dates for completion of the draft secondary comments and~~

deadlines for completion of the R~~emedial ~~D~~esign~~ Work Plan, R~~emedial ~~D~~esign~~, and Remedial Action Work Plan. The documents will be prepared and submitted to EPA and TCEQ pursuant to the FFA. The LUC RD will contain implementation and maintenance actions, including periodic inspections. Consistent with the dates presented for these documents, the U.S. Army shall: 1) request the Texas Department of Licensing and Regulation to notify well drillers of the final boundary of groundwater use prohibitions; and 2) notify the Harrison County Courthouse of the LUCs to include a map showing the area of groundwater use prohibition at the site, in accordance with 30 TAC 335.565. ~~The landfill LUCs will remain in place as long as the landfill waste remains at the site. The LUCs restricting the use of groundwater to environmental monitoring and testing only will remain in place until the contaminated groundwater attains groundwater cleanup levels in order to prevent human exposure to the contaminated groundwater. The LUC restricting land use to nonresidential will remain in place until it is demonstrated that the contaminated surface soil and subsurface soil are at levels that allow for unlimited use and unrestricted exposure.~~

Monitoring activities associated with the LUCs would be undertaken to confirm that groundwater is not being improperly used and the cap is protected and maintained. Long-term operational requirements under this alternative would include maintenance of the LUCs. Groundwater monitoring will demonstrate no migration of the plume and the eventual reduction of contaminates to levels below cleanup levels. The need for continued groundwater and surface water monitoring will be evaluated every 5 years during the reviews. Monitoring for metals will be evaluated at the first five year review to determine if any further monitoring for metals is warranted. Sampling frequency and analytical requirements will be presented as an appendix to the RD for LHAAP-16.

- *In Situ Bioremediation*. The desired outcome will be to reduce contaminant mass and lower the contaminant concentrations that reach the biobarrier in the future. Elevated levels of chlorinated ethenes (TCE 1,2-DCE, and VC) have been observed in the shallow groundwater zone downgradient of the landfill cap at LHAAP-16, and will be treated by an addition of a carbon source. Evidence indicates that reductive dechlorination is taking place in the shallow groundwater zone at LHAAP-16, but carbon levels appear to decrease with distance from the landfill itself. Therefore, the addition of a carbon source will further encourage the growth of microorganisms in the subsurface. As the microorganisms multiply, they will consume available respiratory substrates including iron and sulfate. As those respiratory substrates are consumed, conditions are created which are favorable to destruction of chlorinated ethenes via reductive pathways. A bioaugmentation culture (e.g., SDC-9) will also be added to provide a microbial species specifically able to completely degrade TCE to harmless ethene. Injection of the carbon source and bioaugmentation culture into the shallow zone will be accomplished utilizing DPT, and into the intermediate zone by injection through the existing wells. The number of DPT injection points and the injection volumes will be finalized at that time. The design effort will consider optional injection patterns. Once the carbon source and the bioaugmentation culture have been injected into the subsurface, reducing conditions will be created, followed by a significant reduction in chlorinated ethene concentrations.

The natural attenuation rates measured for TCE showed half-lives ranging from less than 2 years to more than 25 years. Half-lives measured for TCE daughter by-products (cis-1,2-DCE and VC) and perchlorate were much faster, so the attenuation rate of TCE determines the time to reach cleanup goals. The application of in situ bioremediation is expected to reduce the half-life for TCE to between 2 and 5 years, thus accelerating remediation in the treatment area.

- *Biobarriers.* The purpose of the biobarriers (in conjunction with natural attenuation) is to reduce groundwater concentrations to levels that will not cause surface water to exceed surface water standards, to control potential migration of contaminants from the landfill, and to reduce groundwater contaminant mass. A biobarrier will be installed in the downgradient portion of the contaminant plume to prevent contaminated groundwater from seeping into Harrison Bayou at concentrations that would cause surface water to exceed Texas Surface Water Quality Standards, SDWA MCL standards and Texas MSC for GW-Res standards. A second biobarrier will be installed at the edge of the landfill between 16WW38 and 16WW13 to control potential migration of VOCs from the landfill. Specifically, a row of injection points perpendicular to groundwater flow direction will be installed down-gradient of the shallow monitoring well close to Harrison Bayou (16WW12). The biobarrier will consist of emulsified oil that will enable ambient microorganisms to create favorable conditions and a bioaugmentation culture (e.g., SDC-9) to provide microbial species able to completely degrade TCE to ethene. The emulsified oil is a slow-release carbon source with an enhanced subsurface longevity; it will be injected to provide a long-lasting source of fermentable carbon to stimulate the biological reduction of perchlorate and TCE and its daughter products. Sufficient emulsified oil will be added to each injection point to provide a sustained carbon source for an estimated 3 to 5 years. Follow-up injections will be conducted if deemed necessary from the performance groundwater monitoring results. COC and by-product concentrations will be reduced as contaminated groundwater flows through the biobarrier. Concentrations of COCs and by-product downgradient of the biobarriers will be monitored to evaluate the continuing effectiveness of the biobarriers.

- *MNA to return groundwater to its potential beneficial use, wherever practicable.* A preliminary MNA evaluation demonstrated that natural attenuation is occurring in some areas at LHAAP-16. The attenuation of perchlorate, TCE, 1,2-DCE, VC, and 1,1-DCE have been observed at the source and side-downgradient of the plume. However, the shallow groundwater zone plume is still migrating along the groundwater flow direction toward Harrison Bayou. The intermediate groundwater zone plume is more stable with less migration along the flow direction. Thus, natural attenuation is a feasible remedy for certain portions of the site but not as a sole remedy for the entire plume due to migration concerns for the shallow zone. Therefore, MNA is proposed for LHAAP-16 in conjunction with in situ bioremediation to enhance reductive dechlorination within the groundwater plume. Biobarriers will prevent the seepage of contaminants and by-product contaminants into surface water (i.e. Harrison Bayou). Monitoring wells will be sampled for eight consecutive quarters to evaluate and confirm the occurrence of natural attenuation in conjunction with historical data. Data from the eight quarterly events will be combined with historic data to evaluate the effectiveness of various natural physical, chemical, and biological processes in reducing contaminant concentrations.

  - *Performance objectives to evaluate the MNA remedy performance after 2 years.* Each of the general performance objectives must be met as indicated below. If the criteria are not met to illustrate that MNA is an effective remedy, the contingency action would be initiated. If MNA is effective, a baseline will be established from the data to this point in time. Specific evaluation criteria will be developed in the RD. The MNA evaluation will be based on consideration of plume stability, the USEPA lines of evidence (USEPA, 1999) and the anaerobic screening (USEPA, 1998) as follows:

    - Plume stability (i.e., the plume concentrations are decreasing in the majority of performance wells, and the plume is not expanding in area as demonstrated with compliance wells).

    - MNA potential based on evaluation biodegradation screening scores using USEPA guidance

    - MNA Process Evaluation demonstrated based on an attenuation rate calculated with empirical performance monitoring data, and MNA Process Demonstration based on the presence of daughter products and bacterial culture counts.

  - *A contingency remedy involving in situ bioremediation to reach the RAOs if MNA is found to be ineffective.* The contingency remedy will use reapplication of bio-amendments (i.e. additional in situ bioremediation) to address the ineffective aspects of MNA. The area and the elements of the contingency remedy would be selected based on the entire data set available. If the contingency remedy is implemented, it will be documented in an ESD.

  - *Initiate LTM.* If MNA is determined to be effective, monitoring will be conducted to evaluate the remedy performance and determine if the plume conditions remain constant, improve or worsen after the baseline is established. LTM will be implemented at a frequency of semiannual for 3 years, then annually until the next five-year review. The performance monitoring plan will be developed in the RD and will be based on USEPA guidance (USEPA, 2004).

  - *Continue LTM to evaluate remedy performance and determine if plume conditions remain constant, improve, or worsen.* The results from monitoring will be reviewed during the five-year review. Unless otherwise indicated by the data, the wells will then be sampled annually.

- *Groundwater and Surface Water Monitoring.* Groundwater monitoring will continue at LHAAP-16 to evaluate the effectiveness of the cap, confirm the decrease in COC concentrations within the groundwater plume, and to protect surface water in Harrison Bayou from the seepage of contaminated groundwater that would prevent Harrison Bayou from attaining the surface water standards for those contaminants. Following completion of the MNA evaluation, groundwater and surface water monitoring will continue at a number of locations. The monitoring program will be established during remedial design. Following the MNA evaluation, sampling will be conducted semi-annually for 3 years. Surface water and wells will then be sampled annually until the next five-year review and annually thereafter until recommended otherwise by the five-year review.

- *Long-Term Operations.* Long-term operations will include maintenance of the landfill cap, maintenance of the groundwater monitoring system, maintenance of LUCs, and groundwater and surface water monitoring. Additional injections (approximately every 5 years) of vegetable oil may be required at the biobarriers to provide continued treatment effectiveness.~~ LUCs include activities to protect the integrity of the landfill cap and to, restrict groundwater and land use at the site and maintain the integrity of any monitoring system. Groundwater and land use restrictions will remain in place until the levels of COCs in soil and groundwater allow for unlimited use and unrestricted exposure. COC and by-product contaminant concentrations drop to levels below the SWDA MCLs and Texas MSCs for GW-Ind, and support unrestricted use of the groundwater~~. Groundwater and surface water monitoring will be implemented at least every 5 years. Monitoring will continue until the sampling data demonstrate that there are no releases or threat of releases of contaminated groundwater into Harrison Bayou at levels that would cause surface water to exceed the Texas Surface Water Quality Standards, the SDWA MCLs, and Texas MSCs for GW-Res for the COCs and by-product COCs that are present.

2.12.3 *Cost Estimate for the Selected Remedy*

Table 2-9 presents the present worth analysis of the cost for the selected remedy, Alternative 7. The information in the table is based on the best available information regarding the anticipated scope of the remedial alternative. The quantities used in the estimate are for estimating purposes only. Changes in the cost elements are likely to occur as a result of new information and data collected during the engineering design of the remedial alternative. Modifications may be documented in the form of a memorandum in the Administrative Record, an ESD, or a ROD amendment. This is an order-of-magnitude engineering cost estimate that is expected to be within -30 to +50 percent of the actual project cost.

The total project present worth cost of this alternative is approximately $1,980,000, using a discount rate of 2.7%. The capital cost is estimated at $390,000. The total O&M present value cost is estimated at approximately $1,590,000. The O&M cost includes evaluation of MNA, maintenance of the cap, maintenance of LUCs, two additional emulsified vegetable oil injections subsequent to the initial implementation of the barrier, and LTM through Year 30. The LTM will support the required CERCLA five-year reviews.

2.12.4 *Expected Outcomes of Selected Remedy*

The purpose of this response action is to attain the RAOs stated in Section 2.8 of this ROD. The groundwater will be restored to attain groundwater cleanup standards/levels, to the extent practicable. With respect to the COCs and by-product contaminants found in the groundwater at the site, the groundwater cleanup standards/levels include attainment of the SDWA MCL for those COCs and by-product (i.e., daughter) contaminants that have a MCL, to the extent practicable, consistent with 40 C.F.R. § 300.430(e)(2)(i)(B & C). Because no SDWA MCL exists for some COCs and by-product contaminants including perchlorate, manganese and nickel, the MSCs (GW-Ind) as authorized under 30 TAC 335.559(d) constitutes the groundwater cleanup standard to be attained (Table 2-7). Surface water standards in surface waters impacted by the contaminated groundwater seeps at LHAAP will be protected as well. The Texas Surface Water Quality Standards found at 30 TAC 307, or if those standards are not available, the SDWA MCLs, or if MCLs are not available the Texas MSCs (GW-Res) as authorized under 30 TAC 335.559(b), constitute the surface water standards in Harrison Bayou.

The expected outcome of the selected remedy is that the contaminants and by-product contaminants in the groundwater will be reduced to attain the SDWA MCLs and Texas MSCs for GW-Ind, and that any groundwater seeping into Harrison Bayou will be at concentrations that do not result in exceedances of the Texas Surface Water Quality Standards for the COCs and by-product COCs. Achievement of the groundwater cleanup standards/levels is anticipated to be completed in approximately 280 years. The actual time frame depends on the success of the active remediation, but, for cost estimating purposes, it is assumed that five-year reviews will continue until Year 30. ~~When the groundwater cleanup levels are achieved, the LUC for the maintenance of the monitoring system will be removed.~~ When the ~~groundwater cleanup~~ levels of COCs in soil and groundwater allow for unlimited use and unrestricted exposure~~have been attained~~, the groundwater and soil LUC restrictions will be removed. ~~However, t~~The LUCs to protect the landfill remedy will remain in place as long as the landfill waste remains at the site ~~orand until the levels of COCs allow unlimited use and unrestricted exposure~~. ~~The nonresidential use LUC will remain in place until the contaminated surface soil and subsurface soil attain cleanup standards/levels that support unlimited use and unrestricted exposure.~~ In the short-term (prior to the groundwater achieving cleanup levels~~MCLs~~), the site will be made part of a national wildlife refuge operated by USFWS, and will continue as such in the long-term (after the groundwater achieves cleanup levels~~MCLs~~).

In addition, the monitoring activities associated with MNA will confirm the protection of human health and the environment by documenting the return of the groundwater to its potential beneficial use as a drinking water supply, by documenting reduction of the contaminant mass and protection of surface water through containment of the plume. ~~The groundwater LUCs will remain in place until groundwater COC and by-product contaminant concentrations drop to levels below the SDWA MCLs and Texas MSCs. The groundwater LUC will prohibit the use of the site's groundwater except for environmental monitoring and testing~~.

As part of the evaluation of MNA, attenuation rates are computed and evaluated in accordance with the USEPA guidance material (USEPA, 1998). Time-dependent attenuation rate constants and estimated in-well cleanup times are determined based on COC concentration data over time from individual wells assuming first order degradation kinetics. Attenuation rates are calculated for the monitoring wells with the highest concentrations for which the available data allow such a calculation. Attenuation rates are based on the following formula from the USEPA guidance (USEPA, 1998):

$$C = C_o e^{-kt}$$

where: C = concentration at time t
C_o = initial concentration
k = attenuation rate constant (first order reaction).

2.13 Statutory Determinations

Under CERCLA §121 and the NCP, the U.S. Army must select remedies that are protective of human health and the environment, comply with ARARs (unless a statutory waiver is justified), are cost effective, and utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. In addition, CERCLA includes a preference for remedies that employ treatment that permanently and significantly reduces the volume, toxicity, or mobility of hazardous wastes as a principal element and a bias against off-site disposal of untreated wastes. The following sections discuss how the selected remedy meets the statutory requirements.

2.13.1 Protection of Human Health and the Environment

The selected remedy, Alternative 7 will achieve the RAOs for LHAAP-16 by protecting human health from exposure to landfill waste and contaminated groundwater, reducing the COC and by-product contaminant concentrations within the groundwater plume to attain groundwater cleanup standards/levels, and reducing surface water quality impacts to Harrison Bayou such that surface water standards/levels for COCs and by-products are not exceeded. LUCs and continued maintenance of the existing cap would ascertain that receptors are not exposed to landfill contents or unacceptable levels of contaminated groundwater. ~~Notification of LUCs would be recorded with Harrison County. Upon transfer of the land to another federal agency (e.g., the USFWS), the LUCs would be incorporated into the transferee's land management program. If LHAAP-16 is transferred out of federal control, restrictions would be required to address prohibitions and/or restrictions concerning property uses (e.g., drinking water well installation) in order to prevent exposure to landfill material or contaminated groundwater.~~ The LUCs associated with the contaminated groundwater would be required until~~while~~ the COC and by-product contaminants attained levels in soil and groundwater that allow for unlimited use and unrestricted exposure~~the SDWA MCLs and Texas MSCs for GW-Ind~~.

The cap is considered an effective means of source control to reduce contamination entering the groundwater via prevention of surface water infiltration. In situ bioremediation would reduce the mass of contamination in the heart of the shallow groundwater plume and in specific target areas within the intermediate groundwater zone. The biobarriers would prevent the eastward migration of COCs in the shallow groundwater. Natural attenuation would also reduce the COC concentrations in both the shallow and intermediate groundwater plumes over time, thereby reducing the potential risk of human exposure. A MNA program would be implemented to verify the effectiveness of monitored natural attenuation following shutdown of the extraction wells and completion of the in situ bioremediation. Further monitoring would be used to evaluate contaminant and by-product contaminant migration, confirm that the COCs and by-product (daughter) contaminants in the groundwater plumes continue to degrade, and verify that contaminant and by-product contaminant concentration levels in Harrison Bayou do not exceed the in-stream standards/levels of the Texas Surface Water Quality Standards, SDWA MCLs and Texas MSCs for GW-Res standards. The eventual groundwater concentration remedial action objective is the return of groundwater to its potential beneficial uses as drinking water, wherever practicable. Achievement of this RAO will be measured by attainment of the SDWA MCLs and Texas MSCs for GW-Ind for all COCs.

A site-wide ecological baseline risk assessment has been performed for LHAAP. As noted in **Section 2.7.3**, no action is required to address soil concentrations outside the landfill to protect ecological receptors at LHAAP-16. Therefore, ecological risks can be controlled by preventing contact with contents of the landfill. Maintenance of the existing cap ~~and enforcement of LUCs~~ will achieve that objective.

There are no short-term threats associated with the selected remedy that cannot be readily controlled. In addition, no adverse cross-media impacts are expected from the selected remedy.

2.13.2 Compliance with ARARs

The selected remedy complies with all ARARs. The ARARs are presented below and in **Table 2-10**.

Chemical-Specific ARARs

The chemical-specific ARAR is the attainment of the SDWA MCL for all groundwater COCs and by-product contaminants. For those COCs and by-product contaminants that do not have an MCL, the Texas MSCs for GW-Ind as authorized under 30 TAC 335.559(d) constitutes the groundwater chemical-specific ARAR to be attained. The selected remedial action employs treatment including in situ bioremediation and biobarriers, and passive remedial action (i.e., MNA) to return the contaminated shallow and intermediate groundwater zone at LHAAP-16 to its potential beneficial use as drinking water, wherever practicable. For the purposes of this ROD attainment of the SDWA MCLs or the Texas MSC for GW-Ind if no MCL is available, constitutes a return of the contaminated groundwater to it potential beneficial use as a drinking water. If a return to potential beneficial uses is not practicable based upon 40 C.F.R.§ 300.430(f)(1)(ii)(C), this alternative would still meet the NCP remedy selection requirements by reducing or controlling exposure to the contaminated groundwater consistent with 40 C.F.R.§ 300.430(e)(9). With respect to the surface waters impacted by the contaminated groundwater seeping into Harrison Bayou, the Texas Surface Water Quality Standards (in-stream) found at 30 TAC 307, or if those standards are not available, the SDWA MCLs, or if MCLs are not available the Texas MSCs for GW-Res as authorized under 30 TAC 335.559(b), constitute the surface water standards confirming protectiveness of the remedy.

Location-Specific ARARs

The activities that will be conducted under this alternative will comply with location-specific ARARs.

Action-Specific ARARs

The selected remedy has potential action-specific ARARs related to the following activities: site preparation, construction, and excavation activities; waste management activities, well construction and post closure care.

- **Site preparation, construction, and excavation activities**: Certain on-site preparation, construction, and/or excavation activities will be necessary under all remediation actions to prepare the site for remediation, including the soil-moving or site-grading activities. Storm water discharges from construction activities that disturb equal to or greater than one acre of land must comply with the substantive requirements of a USEPA National Pollutant Discharge Elimination System (NPDES) general permit (40 CFR 122.26; 30 TAC 205, Subchapter A; and 30 TAC 308.121), depending on the amount of acreage disturbed. Substantive requirements include implementation of good construction management techniques; phasing of large construction projects; minimal clearing; and sediment, erosion, structural, and vegetative controls to mitigate runoff and satisfy discharge requirements.

- **Waste Management**: The processes of monitoring, intercepting, or treating contaminated groundwater may generate a variety of primary and secondary waste streams (e.g., soil, personal protective equipment, and dewatering and decontamination fluids). These waste streams are expected to be non-hazardous waste. All wastes must be managed in accordance with the ARARs for waste management listed in **Table 2-10** for the particular type of waste stream or contaminants in the waste.

- **Well construction**: The remedial action may involve the placement, use, or eventual plugging and abandonment of some type of groundwater monitoring, injection, and/or extraction wells, either for in situ treatment or extraction of the contaminated groundwater or for LTM of the groundwater. Available standards for well construction and plugging/abandonment would provide ARARs for such actions and include 30 TAC 331, Subchapters A, C, and H. Texas has promulgated technical requirements in Chapter 76 of Title 16 of the TAC applicable to construction, operation, and plugging/abandonment of water wells. In particular, 16 TAC 76.1000 (*Locations and Standards of Completion for Wells*), 16 TAC 76.1002 (*Standards for Wells Producing Undesirable Water or Constituents*) (LHAAP-16 contaminated groundwater could be considered "undesirable water" defined pursuant to Section 76.10[36] as "water that is injurious to human health and the environment or water that can cause pollution to land or other waters"), 16 TAC 76.1004 (*Standards for Capping and Plugging of Wells and Plugging Wells that Penetrate Undesirable Water or Constituent Zones*), and 16 TAC 76.1008 (*Pump Installation*) may provide ARARs for the placement, construction, and eventual plugging/abandonment of groundwater injection or extraction wells or the placement and long-term operation of groundwater monitoring wells for proposed groundwater remedial strategies.

- **Post-closure Care**: Closure and post- closure ARARs were identified for LHAAP-16 in the IRA ROD and included 30 TAC 335.112, 335.118, 335.119 and 335.174 and 40 CFR Sections 264.228 and 264.310 addressing landfills and surface impoundments storing hazardous waste. Closure requirements were met during implementation of the (cap) presumptive remedy of the IRA. Post-closure requirements are appropriate and relevant and include 40 CFR 264.228 (b)(1), (3), and (4), 264.310 (b)(1), (4) and (5) and 30 TAC 335.174. Although there is no permanent benchmark inside the Site 16 area, one is located adjacent to the site. Therefore 40 CFR 264.310(b)(6) is considered appropriate and relevant for a benchmark located near the landfill. In addition those substantive requirements of 40 CFR 264.117 though 120 related to post-closure for the remedy-in-place are considered appropriate and relevant.

2.13.3 Cost-Effectiveness

Alternative 7 has the lowest present worth and capital costs of the action alternatives that were evaluated in the FS (Jacobs, 2002) and FS Addendum (Shaw, 2010). Alternative 7 utilizes active technologies (in situ bioremediation and biobarriers) prior to MNA; those active technologies lead to much lower monitoring costs in the future, thus giving Alternative 7 a relatively low total present value cost. **Table 2-9** is the cost estimate summary table for the selected remedy.

2.13.4 Utilization of Permanent Solutions and Alternative Treatment (or Resource Recovery) Technologies to the Maximum Extent Practicable

The U.S. Army has determined that the selected final remedy represents the maximum extent to which permanent solutions and treatment technologies can be utilized in a practicable manner at the site. In situ bioremediation will lower groundwater COC concentrations in the most contaminated portion of the groundwater plume. Biobarriers between the landfill and Harrison Bayou will provide additional reduction of COC concentrations in the groundwater through degradation by biological processes prior to seeping into Harrison Bayou. The active biodegradation that occurs as part of the natural attenuation, together with dilution, dispersion, and other natural processes has the capability to ultimately reduce the groundwater contaminants to cleanup levels. Although none of the landfill waste will be actively treated, the long-term reliability of the landfill cap to control infiltration, contaminant runoff, and contaminant exposure depends on adequate long-term inspection and maintenance. If a portion of the cap is breached and contaminants subsequently leach into the groundwater, the biobarrier would capture the additional contamination. However, the breach would need to be corrected in a reasonable time frame, and the increased groundwater contaminant loading would increase the frequency of bioremediation amendment injections at the biobarrier.

Alternative 7 would provide almost immediate protection because the LUCs would be implemented relatively quickly. Maintenance of this control would be required until ~~natural attenuation processes reduce~~ COC ~~and by-product (daughter) contaminant~~ concentrations in soil and groundwater allow ~~to below cleanup levels~~ for unlimited use and unrestricted exposure.

2.13.5 Preference for Treatment as a Principal Element

The selected remedy satisfies the statutory preference for treatment as a principal element of the remedy. The selected final remedy will reduce the toxicity, mobility, or volume of COCs in groundwater through the implementation of in situ bioremediation and biobarriers. The in situ bioremediation will lower COC concentrations in the most contaminated portion of the shallow groundwater plume to levels that can be effectively treated by the biobarrier near Harrison bayou. The biological activity in the biobarriers and the bioremediation treatment area will significantly reduce the overall mass of COCs in the groundwater. In conjunction with natural attenuation, these treatments will convert the COCs to innocuous byproducts, thereby reducing the toxicity of the contaminants. In addition, natural attenuation will provide a reduction in the volume of contaminated groundwater. Although none of the landfill waste will be actively treated, the potential mobility and toxicity of the landfill waste contaminants will be minimized through proper landfill cap maintenance, and the biobarrier near the landfill fence line.

2.13.6 Five-Year Review Requirements

Section 121(c) of CERCLA and NCP §300.430(f)(5)(iii)(C) provide the statutory and legal bases for conducting five-year reviews. Because this remedy will result in contaminants that remain onsite above levels that allow unlimited use and unrestricted exposure, a review will be conducted at least every 5 years to ascertain that the remedy continues to provide adequate protection of human health and the environment.

2.14 Significant Changes from the Proposed Plan

The Proposed Plan for LHAAP-16 was released for public comments on October 10, 2010. The Proposed Plan identified Alternative 7 as the Preferred Alternative for groundwater remediation.

The U.S. Army reviewed all written comments during the public comment period (there were no verbal comments). After careful consideration of the comments, it was determined that no significant changes to the remedy, as originally identified in the Proposed Plan, were necessary or appropriate.

Table 2-1
Summary of Chemicals of Potential Concern and Medium-Specific Exposure Point Concentrations

Scenario Timeframe: Future
Medium: Soil
Exposure Medium: Soil (0 to 5.0 feet below ground surface)

Exposure Point	Chemical	Concentration Detected[1] (mg/kg)		Number of Samples with Detectable Conc.	Exposure Point Concentration (mg/kg)	Statistical Measure
		Minimum	Maximum			
Incidental ingestion, inhalation of particulates, inhalation of volatiles, dermal contact	Metals					
	Aluminum	4.52E+03	2.15E+04	20	2.15E+04	maximum
	Antimony	4.8E-01	4.8E-01	1	1.64E+00	95% UCL
	Arsenic	1.43E+00	1.44E+01	36	7.44E+00	95% UCL
	Barium	4.67E+01	3.84E+02	34	1.72E+02	95% UCL
	Beryllium	3.80E-01	1.4E+00	9	1.4E+00	maximum
	Cadmium	5.10E-01	8.60E-01	4	5.70E-01	95% UCL
	Chromium	7.80E+00	4.09E+01	40	2.27E+01	95% UCL
	Cobalt	2.80E+00	1.98E+01	19	1.98E+01	maximum
	Copper	3.40E+00	1.05E+01	14	9.17E+00	95% UCL
	Lead	3.02E+00	4.93E+01	41	1.81+01	95% UCL
	Manganese	2.92E+01	1.27E+03	20	1.27E+03	maximum
	Mercury	2.00E-02	6.20E-02	7	7.00E-02	95% UCL
	Nickel	4.10E+00	1.73E+01	29	1.18E+01	95% UCL
	Selenium	6.10E-01	1.40E+00	6	7.40E-01	95% UCL
	Silver	5.50E-01	5.50E-01	1	6.9E-01	95% UCL
	Strontium	2.4E+00	6.27E+01	14	6.27E+01	maximum
	Thallium	1.80E-01	5.96E+00	8	1.18+00	95% UCL
	Vanadium	1.43E+01	4.33E+01	9	4.33E+01	maximum
	Zinc	1.19E+01	1.68E+02	20	7.92E+01	95% UCL
	Semivolatile Organics					
	Butyl Benzyl Phthalate	9.60E-01	9.60E-01	1	3.32E-01	95% UCL
	Di-N-Butyl Phthalate	1.60E+00	1.90E+00	8	6.75E-01	95% UCL
	Volatile Organics					
	Acetone	2.20E-02	1.03E-01	4	1.60E-02	95% UCL
	Methylene Chloride	5.00E-03	1.00E-02	3	6.40E-03	95% UCL
	Styrene	2.00E-03	9.30E-02	2	8.10E-03	95% UCL
	Trichloroethene	6.50E-02	2.20E-01	4	1.10E-02	95% UCL

Table 2-1 *(continued*)
Summary of Chemicals of Potential Concern and Medium-Specific Exposure Point Concentrations

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater

Exposure Point	Chemical	Concentration Detected[1] (µg/L)		Number of Samples with Detectable Conc.	Exposure Point Concentration (µg/L)	Statistical Measure
		Minimum	Maximum			
Incidental ingestion, inhalation of volatiles, dermal contact	Explosive					
	1,3-Dinitrobenzene	3.29E-01	1.56E+00	18	1.56E+00	maximum
	2,4,6-Trinitrotoluene	9.00E-01	1.56E+00	3	2.40E+02	maximum[a]
	4-Amino-2,6-Dinitrotoluene	5.90E-02	1.00E+00	18	1.00E+00	maximum
	2,6-Dinitrotoluene	4.50E-02	2.63E-01	10	2.63E-01	maximum
	HMX	1.20E-01	2.90E+00	2	2.90E+00	maximum
	Nitrobenzene	6.20E-02	1.50E+00	8	2.00E+01	maximum[a]
	3-Nitrotoluene	2.00E-01	1.00E+00	3	1.10E+01	maximum[a]
	Tetryl	3.49E-01	4.40E+00	3	3.60E+01	maximum[a]
	RDX	2.70E-01	4.75E+00	15	2.00E+02	maximum[a]
	1,3,5-Trinitrobenzene	3.02E-01	7.40E-01	3	2.20E+00	maximum[a]
	Metals					
	Aluminum	1.10E+02	6.70E+04	34	6.70E+04	maximum
	Arsenic	7.00E+00	3.40E+01	24	3.40E+01	maximum
	Barium	1.70E+01	9.90E+03	78	9.90E+03	maximum
	Beryllium	6.00E-01	7.40E+00	6	7.40E+00	maximum
	Cadmium	1.10E+00	5.45E+00	7	8.00E+00	maximum[a]
	Chromium	1.00E+01	5.22E+03	52	5.22E+03	maximum
	Cobalt	5.30E+01	1.10E+03	4	1.10E+03	maximum
	Copper	2.10E+01	4.84E+02	19	4.84E+02	maximum
	Lead	3.00E+00	5.70E+01	14	2.00E+02	maximum[a]
	Manganese	1.50E+01	2.98E+04	50	2.98E+04	maximum
	Mercury	2.00E-01	8.60E-01	12	1.60E+00	maximum[a]
	Nickel	1.50E+01	1.63E+03	45	1.63E+03	maximum
	Selenium	7.00E+00	1.56E+01	8	1.56E+01	maximum
	Silver	1.40E+01	1.14E+02	4	1.14E+02	maximum
	Strontium	5.80E+01	1.04E+04	51	1.04E+04	maximum
	Thallium	1.20E+01	1.20E+01	1	1.20E+01	maximum
	Vanadium	9.70E+01	1.46E+02	3	1.46E+02	maximum
	Zinc	2.10E+01	3.70E+04	26	3.70E+04	maximum
	Pesticides					
	Aldrin	4.00E-02	4.00E-02	1	4.00E-02	maximum
	Semivolatile Organics					
	Bis(2-ethylhexyl)phthalate	1.10E+01	2.60E+01	5	2.60E+01	maximum
	Butyl Benzyl Phthalate	5.00E+00	7.00E+00	3	7.00E+00	maximum

Table 2-1 *(continued)*
Summary of Chemicals of Potential Concern and Medium-Specific Exposure Point Concentrations

Scenario Timeframe: Future
Medium: Groundwater
Exposure Medium: Groundwater

Exposure Point	Chemical	Concentration Detected[1] (µg/L)		Number of Samples with Detectable Conc.	Exposure Point Concentration (µg/L)	Statistical Measure
		Minimum	Maximum			
Incidental ingestion, inhalation of volatiles, dermal contact	*Volatile Organics*					
	Acetone	1.00E+01	3.92E+03	4	3.92E+03	maximum
	Benzene	8.30E-01	5.00E+00	4	5.00E+00	maximum
	Bromodichloromethane	1.10E+00	8.40E+00	3	8.40E+00	maximum
	2-Butanone	6.50E+00	6.50E+00	1	3.40E+01	maximum[a]
	Chloroform	5.20E-01	3.60E+01	21	1.20E+02	maximum
	1,1-Dichloroethane	6.00E-01	3.60E+01	4	3.60E+01	maximum
	1,1-Dichloroethene	9.90E-01	7.40E+02	16	7.40E+02	maximum
	1,2-Dichloroethane	2.20E+01	1.60E+02*	6	1.60E+02	maximum
	1,2-Dichloroethene	1.60E+01	2.75E+05	11	2.75E+05	maximum
	cis-1,2-Dichloroethene	5.20E-01	2.70E+05	53	5.20E+05	maximum[a]
	1,1,2-Trichloroethane	1.20E+01	1.20E+01	1	1.20E+01	maximum
	Ethylbenzene	5.00E+00	5.00E+00	1	5.00E+00	maximum
	Methylene chloride	5.6E-01*	3.50E+03	16	3.50E+03	maximum
	Toluene	2.90E+01	2.90E+01	1	2.90E+01	maximum
	Trichloroethene	8.40E-01	5.8E+04*	104	1.60E+05	maximum[a]
	Trichlorofluoromethane	8.00E-01	8.92E+02	2	8.92E+02	maximum
	1,2,4-Trimethylbenzene	6.80E-01	2.40E+01	2	2.40E+01	maximum
	1,3,5-Trimethylbenzene	1.60E+01	1.60E+01	1	1.60E+01	maximum
	Vinyl Chloride	4.80E+00	1.10E+04	17	1.10E+04	maximum
	Xylene	8.00E-01	1.20E+01	2	1.20E+01	maximum

Notes

[1] Minimum/maximum detected concentration above the reporting limit

* Maximum concentration was from a duplicate sample collected during the sampling event

[a] Maximum detected concentration from a grab sample

---: No information available

µg/L	micrograms per liter
HMX	high melting explosives
mg/kg	milligrams per kilogram
RDX	1,3,5-Trinitroperhydro-1,3,5-triazine
UCL	upper confidence limit

References

Jacobs Engineering Group, Inc. (Jacobs), 2001, *Final Baseline Risk Assessment Human Health Evaluation, Site 16 Landfill remedial Investigation/Feasibility Study, Longhorn Army Ammunition Plant, Karnack, Texas*, Final, June.

Summary of Chemicals of Potential Concern and Medium-Specific Exposure Point Concentrations

The table presents the chemicals of potential concern (COPCs) and exposure point concentration (EPC) for each (i.e. the concentration used to estimate the exposure and risk from each COPC). The table includes the range of concentrations detected for each COPC, the frequency of detection (i.e. the number of times the chemical was detected in the samples collected at the site), the EPC, and the statistical measure upon which the EPC was based. The COPCs listed are the ones that were quantitatively evaluated for carcinogenic risk and non-carcinogenic hazard in the Baseline Human Health Risk Assessment (Jacobs, 2001a).

Table 2-2
Carcinogenic Toxicity Data Summary

Pathway: Ingestion, Dermal Contact

Chemical of Concern	Oral Cancer Slope Factor (mg/kg-day)	Dermal Cancer Slope Factor (mg/kg-day)	Weight of Evidence/ Carcinogen Guideline Description	Source/Date
Explosive				
1,3-Dinitrobenzene	---	---	---	---
2,4,6-Trinitrotoluene	3.00E-02	3.00E-02	--	USEPA-IRIS, 1999
4-Amino-2,6-Dinitrotoluene	1.00E-02	1.00E-02	---	TNRCC, 2000
2,6-Dinitrotoluene	6.80E-01	6.80E-01	---	USEPA-IRIS, 1999
HMX	---	---	---	---
Nitrobenzene	---	---	---	---
3-Nitrotoluene	---	---	---	---
Tetryl	---	---	---	---
RDX	1.10E-01	1.10E-01	---	USEPA-IRIS, 1999
1,3,5-Trinitrobenzene	---	---	---	---
Metals				
Aluminum	---	---	---	---
Antimony	---	---	---	---
Arsenic	1.50E+00	5.00E+00	---	USEPA-IRIS, 1999
Barium	---	---	---	---
Beryllium	---	---	---	---
Cadmium	---	---	---	---
Chromium	---	---	---	---
Cobalt	---	---	---	---
Copper	---	---	---	---
Lead	---	---	---	---
Manganese	---	---	---	---
Mercury	---	---	---	---
Nickel	---	---	---	---
Selenium	---	---	---	---
Silver	---	---	---	---
Strontium	---	---	---	---
Thallium	---	---	---	---
Vanadium	---	---	---	---
Zinc	---	---	---	---
Pesticides				
Aldrin	1.70E+01	1.70E+01	--	USEPA-IRIS, 1999
Semivolatile Organics				
Bis(2-ethylhexyl)phthalate	1.40E-02	1.40E-02	--	USEPA-IRIS, 1999
Butyl Benzyl Phthalate	---	---	---	---
Di-N-Butyl Phthalate	---	---	---	---
Volatile Organics				
Acetone	---	---	---	---
Benzene	2.90E-02	2.90E-02	--	USEPA-IRIS, 1999
Bromodichloromethane	6.20E-02	6.20E-02		USEPA-IRIS, 1999
2-Butanone (MEK)	---	---	---	---
Chloroform	6.10E-03	6.10E-03	--	USEPA-IRIS, 1999

Table 2-2 *(continued)*
Carcinogenic Toxicity Data Summary

Chemical of Concern	Oral Cancer Slope Factor (mg/kg-day)	Dermal Cancer Slope Factor (mg/kg-day)	Weight of Evidence/ Carcinogen Guideline Description	Source/Date
1,1-Dichloroethane	---	---	---	---
1,1-Dichloroethene	6.00E-01	6.00E-01	--	USEPA-IRIS, 1999
1,2-Dichloroethane	9.10E-02	9.10E-02	--	USEPA-IRIS, 1999
1,2-Dichloroethene	---	---	---	---
cis-1,2-Dichloroethene	---	---	---	---
1,1,2-Trichloroethane	5.70E-02	5.70E-02	--	USEPA-IRIS, 1999
Ethylbenzene	---	---	---	---
Methylene chloride	7.50E-03	7.50E-03	--	USEPA-IRIS, 1999
Styrene	---	---	---	---
Toluene	---	---	---	---
Trichloroethene	1.10E-02	1.10E-02	--	USEPA-NCEA, 1999
Trichlorofluoromethane	---	---	---	---
1,2,4-Trimethylbenzene	---	---	---	---
1,3,5-Trimethylbenzene	---	---	---	---
Vinyl Chloride	1.90E+00	1.90E+00	--	USEPA-HEAST, 1997
Xylene	---	---	---	---

Pathway: Inhalation

Chemical of Concern	Unit Risk Factor (µg/m^3)	Inhalation Cancer Slope Factor (mg/kg-day)	Weight of Evidence/ Carcinogen Guideline Description	Source/Date
Explosive				
1,3-Dinitrobenzene	---	---	---	---
2,4,6-Trinitrotoluene	---	---	---	---
4-Amino-2,6-Dinitrotoluene	---	---	---	---
2,6-Dinitrotoluene	---	---	---	---
HMX	---	---	---	---
Nitrobenzene	---	---	---	---
3-Nitrotoluene	---	---	---	---
Tetryl	---	---	---	---
RDX	---	---	---	---
1,3,5-Trinitrobenzene	---	---	---	---
Metals				
Aluminum	---	---	---	---
Antimony	---	---	---	---
Arsenic	4.30E-03	1.50E+01	---	USEPA-IRIS, 1999
Barium	---	---	---	---
Beryllium	2.40E-03	8.40E+00	--	USEPA-IRIS, 1999
Cadmium	1.80E-03	6.30E+00	--	USEPA-IRIS, 1999
Chromium	1.20-E02	4.20+01	---	USEPA-IRIS, 1999
Cobalt	---	---	---	---
Copper	---	---	---	---
Lead	---	---	---	---

Table 2-2 *(continued)*
Carcinogenic Toxicity Data Summary

Chemical of Concern	Oral Cancer Slope Factor (mg/kg-day)	Dermal Cancer Slope Factor (mg/kg-day)	Weight of Evidence/ Carcinogen Guideline Description	Source/Date
Manganese	---	---	---	---
Mercury	---	---	---	---
Nickel	---	---	---	---
Selenium	---	---	---	---
Silver	---	---	---	---
Strontium	---	---	---	---
Thallium	---	---	---	---
Vanadium	---	---	---	---
Zinc	---	---	---	---
Pesticides				
Aldrin	4.90E-03	1.72E+01	--	USEPA-IRIS, 1999
Semivolatile Organics				
Bis(2-ethylhexyl)phthalate	---	---	---	---
Butyl Benzyl Phthalate	---	---	---	---
Di-N-Butyl Phthalate	---	---	---	---
Volatile Organics				
Acetone	---	---	---	---
Benzene	7.80E-06	2.70E-02	--	USEPA-IRIS, 1999
Bromodichloromethane	---	---	---	---
2-Butanone (MEK)	---	---	---	---
Chloroform	2.30E-05	8.10E-02	--	USEPA-IRIS, 1999
1,1-Dichloroethane	---	---	---	---
1,1-Dichloroethene	5.00E-05	1.80E-01	--	USEPA-IRIS, 1999
1,2-Dichloroethane	2.60E-05	9.10E-02	--	USEPA-IRIS, 1999
1,2-Dichloroethene	---	---	---	---
cis-1,2-Dichloroethene	---	---	---	---
1,1,2-Trichloroethane	1.60E-05	5.60E-02	--	USEPA-IRIS, 1999
Ethylbenzene	---	---	---	---
Methylene chloride	4.70E-07	1.65E-03	--	USEPA-IRIS, 1999
Styrene	---	---	---	---
Toluene	---	---	---	---
Trichloroethene	1.70E-06	5.95E-03	--	---
Trichlorofluoromethane	---	---	---	---
1,2,4-Trimethylbenzene	---	---	---	---
1,3,5-Trimethylbenzene	---	---	---	---
Vinyl Chloride	---	3.00E-01	--	USEPA-HEAST, 1997
Xylene	---	---	---	---

Notes
--- : No information available
µg/m³: micrograms per cubic meter
HMX: High melting explosives
mg/kg-day: milligrams per kilogram per day
RDX: 1,3,5-Trinitroperhydro-1,3,5-triazine

Weight of Evidence/Carcinogen Guideline Description Information:
Not provided in the Final Baseline Risk Assessment Human Health Evaluation(Jacobs, 2001a)

Table 2-2 *(continued)*
Carcinogenic Toxicity Data Summary

References

Jacobs Engineering Group, Inc. (Jacobs), 2001a, *Final Baseline Risk Assessment Human Health Evaluation for the Site 16 Landfill Remedial Investigation/Feasibility Study, Longhorn Army Ammunition Plant, Karnack, Texas*, Final, June.

Texas Natural Resources Conservation Commission (TNRCC), 2000. Toxicity Factors Table, October 2000.

USEPA-HEAST, 1997, *Health Effects Assessment Summary Tables (HEAST), FY-1997, Update*. Office of Emergency and Remedial Response, USEPA, Washington, D.C. EPA/540/R-97-036, July.

USEPA-IRIS, 1999. Integrated Risk Information System (IRIS). United States Environmental Protection Agency Online Database for Toxicity Information on Hazardous Chemicals, 1999.

USEPA-NCEA, USEPA Region 3 Risk-Based Concentration Tables Referenced values from National Center for Environmental Assessment (NCEA).

Summary of Toxicity Assessment

The table provides carcinogenic risk information which is relevant to the contaminants of potential concern in soil and groundwater. The list of chemicals of concern presented here are the ones that were quantitatively evaluated for carcinogenic risk and non-carcinogenic hazard in the Baseline Human Health Risk Assessment (Jacobs, 2001a).

Table 2-3
Non-Carcinogenic Toxicity Data Summary

Pathway: Ingestion, Dermal Contact

Chemical of Concern	Chronic/ Subchronic	Oral RfD Value (mg/kg-day)	Dermal RfD (mg/kg-day)	Primary Target Organ	Combined Uncertainty/ Modifying Factors	Source/Date
Explosive						
1,3-Dinitrobenzene	Chronic	1.00E-04	1.00E-04	Splenic weight	---	USEPA-IRIS, 1999
2,4,6-Trinitrotoluene	Chronic	5.00E-04	5.00E-04	Liver effects	---	USEPA-IRIS, 1999
4-Amino-2,6-Dinitrotoluene	Chronic	1.67E-04	1.67E-04	---	---	TNRCC, 2000
2,6-Dinitrotoluene	Chronic	1.00E-03	1.00E-03	Whole body	---	USEPA-HEAST, 1997
HMX	Chronic	5.00E-02	5.00E-02	Hepatic lesions	---	USEPA-IRIS, 1999
Nitrobenzene	Chronic	5.00E-04	5.00E-04	Hematological effects, adrenal, renal, hepatitis lesions	---	USEPA-IRIS, 1999
3-Nitrotoluene	Chronic	1.00E-02	1.00E-02	Spleen lesions	---	USEPA-HEAST, 1997
Tetryl	Chronic	---	---		---	---
RDX	Chronic	3.00E-03	3.00E-03	Prostate	---	USEPA-IRIS, 1999
1,3,5-Trinitrobenzene	Chronic	3.00E-02	3.00E-02	Increased splenic weight	---	USEPA-IRIS, 1999
Metals						
Aluminum	Chronic	---	---	---	---	---
Antimony	Chronic	4.00E-04	1.20E-04	Whole body	---	USEPA-IRIS, 1999
Arsenic	Chronic	3.00E-04	9.00E-05	Skin, blood vessels	---	USEPA-IRIS, 1999
Barium	Chronic	7.00E-02	2.10E-02	Increased blood pressure	---	USEPA-IRIS, 1999
Beryllium	Chronic	2.00E-03	6.00E-04	Small intestine	---	USEPA-IRIS, 1999
Copper	Chronic	---	---	---	---	---
Cadmium	Chronic	5.00E-04	1.50E-04	Proteinuria	---	USEPA-IRIS, 1999
Chromium	Chronic	1.50E+00	4.50E-01	---	---	USEPA-IRIS, 1999
Manganese	Chronic	1.40E-01	4.20E-02	CNS effects	---	USEPA-IRIS, 1999
Mercury	Chronic	---	---	---	---	---
Nickel	Chronic	2.00E-02	6.00E-03	Body weight	---	USEPA-IRIS, 1999
Selenium	Chronic	---	---	---	---	---
Silver	Chronic	5.00E-03	1.50E-03	Argyria	---	USEPA-IRIS, 1999
Strontium	Chronic	6.00E-01	1.80E-01	Rachitic bone	---	USEPA-IRIS, 1999
Thallium	Chronic	---	---	---	---	---
Vanadium	Chronic	7.00E-03	2.10E-03	---	---	USEPA-HEAST, 1997
Zinc	Chronic	3.00E-01	9.00E-02	---	---	USEPA-IRIS, 1999
Pesticides						
Aldrin	Chronic	3.00E-05	3.00E-05	Liver toxicity	---	USEPA-IRIS, 1999
Semivolatile Organics						
Bis(2-ethylhexyl)phthalate	Chronic	2.00E-02	2.00E-02	Liver	---	USEPA-IRIS, 1999
Butyl Benzyl Phthalate	Chronic	2.00E-01	2.00E-01	Liver	---	USEPA-IRIS, 1999
Di-N-Butyl Phthalate	Chronic	1.00E-01	1.00E-01	Increased mortality		USEPA-IRIS, 1999

Table 2-3 *(continued)*
Non-Carcinogenic Toxicity Data Summary

Chemical of Concern	Chronic/ Subchronic	Oral RfD Value (mg/kg-day)	Dermal RfD (mg/kg-day)	Primary Target Organ	Combined Uncertainty/ Modifying Factors	Source/Date
Volatile Organics						
Acetone	Chronic	1.00E-01	1.00E-01	Liver, kidney		USEPA-IRIS, 1999
Benzene	Chronic	---	---	---	---	---
Bromodichloromethane	Chronic	2.00E-02	2.00E-02	Renal cytomegaly	---	USEPA-IRIS, 1999
2-Butanone (MEK)	Chronic	6.00E-01	6.00E-01	Fetal birth weight	---	USEPA-IRIS, 1999
Chloroform	Chronic	1.00E-02	1.00E-02	Liver	---	USEPA-IRIS, 1999
1,1-Dichloroethane	Chronic	1.00E-01	1.00E-01	---	---	USEPA-HEAST, 1997
1,1-Dichloroethene	Chronic	9.00-E03	9.00E-03	Hepatic lesions	---	USEPA-IRIS, 1999
1,2-Dichloroethane	Chronic	---	---	---	---	---
1,2-Dichloroethene	Chronic	2.00E-02	2.00E-02	Blood	---	USEPA-IRIS, 1999
cis-1,2-Dichloroethene	Chronic	1.00E-02	1.00E-02	Blood	---	USEPA-HEAST, 1997
1,1,2-Trichloroethane	Chronic	4.00E-03	4.00E-03	Clinical serum chemistry	---	USEPA-IRIS, 1999
Ethylbenzene	Chronic	1.00E-01	1.00E-01	Liver, kidney	---	USEPA-IRIS, 1999
Methylene chloride	Chronic	6.00E-02	6.00E-02	Liver	---	USEPA-IRIS, 1999
Styrene	Chronic	2.00E-01	2.00E-01	Red blood cells, Liver effects	---	USEPA-IRIS, 1999
Toluene	Chronic	2.00E-01	2.00E-01	Liver, kidney	---	USEPA-IRIS, 1999
Trichloroethene	Chronic	6.00E-03	6.00E-03	NA	---	USEPA-NCEA, 1999
Trichlorofluoromethane	Chronic	3.00E-01	3.00E-01	Whole body (increased mortality)	---	USEPA-IRIS, 1999
1,2,4-Trimethylbenzene	Chronic	5.00E-02	5.00E-02	---	---	TNRCC, 2000
1,3,5-Trimethylbenzene	Chronic	5.00E-02	5.00E-02	---	---	TNRCC, 2000
Vinyl Chloride	Chronic	---	---	---	---	---
Xylene	Chronic	2.00E+00	2.00E+00	Hyperactivity, body weight	---	USEPA-IRIS, 1999

Pathway: Inhalation

Chemical of Concern	Chronic/ Subchronic	Inhalation RfC (mg/m^3)	Primary Target Organ	Combined Uncertainty/ Modifying Factors	Source/Date
Explosive					
1,3-Dinitrobenzene	Chronic	---	---	---	---
2,4,6-Trinitrotoluene	Chronic	---	---	---	---
4-Amino-2,6-Dinitrotoluene	Chronic	0.0001	---	---	TNRCC, 2000
2,6-Dinitrotoluene	Chronic	---	---	---	---
HMX	Chronic	---	---	---	---
Nitrobenzene	Chronic	0.002	Blood effects	----	USEPA-HEAST, 1997
3-Nitrotoluene	Chronic	---	---	---	---
Tetryl	Chronic	---	---	---	---
RDX	Chronic	---	---	---	---
1,3,5-Trinitrobenzene	Chronic	---	---	---	---
Metals					
Aluminum	Chronic	---	---	---	---

Table 2-3 (*continued*)
Non-Carcinogenic Toxicity Data Summary

Chemical of Concern	Chronic/ Subchronic	Inhalation RfC (mg/m^3)	Primary Target Organ	Combined Uncertainty/ Modifying Factors	Source/Date
Antimony	Chronic	---	---	---	---
Arsenic	Chronic	---	---	---	---
Barium	Chronic	0.0005	Fetal toxicity	---	USEPA-HEAST, 1997
Beryllium	Chronic	0.00002	Lungs	---	USEPA-IRIS, 1999
Cadmium	Chronic	---	---	---	---
Chromium	Chronic	0.0001	---	---	USEPA-IRIS, 1999
Cobalt	Chronic	---	---	---	---
Copper	Chronic	---	---	---	---
Lead	Chronic	---	---	---	---
Manganese	Chronic	0.00005	Impairment of neurobehavioral function	---	USEPA-IRIS, 1999
Mercury	Chronic	0.0003	Nervous system/neurotoxicity	---	USEPA-IRIS, 1999
Nickel	Chronic	---	---	---	---
Selenium	Chronic	---	---	---	---
Silver	Chronic	---	---	---	---
Strontium	Chronic	---	---	---	---
Thallium	Chronic	---	---	---	---
Vanadium	Chronic	---	---	---	---
Zinc	Chronic	---	---	---	---
Pesticides					
Aldrin	Chronic	---	---	---	---
Semivolatile Organics					
Bis(2-ethylhexyl)phthalate	Chronic	---	---	---	---
Butyl Benzyl Phthalate	Chronic	---	---	---	---
Di-N-Butyl Phthalate	Chronic	---	---	---	---
Volatile Organics					
Acetone	Chronic	---	---	---	---
Benzene	Chronic	---	---	---	---
Bromodichloromethane	Chronic	---	---	---	---
2-Butanone (MEK)	Chronic	1	Decreased fetal birth weight	---	USEPA-IRIS, 1999
Chloroform	Chronic	---	---	---	---
1,1-Dichloroethane	Chronic	0.5	Kidney		USEPA-HEAST, 1997
1,1-Dichloroethene	Chronic	---	---	---	---
1,2-Dichloroethane	Chronic	---	---	---	---
1,2-Dichloroethene	Chronic	0.79	---	---	TNRCC, 2000
cis-1,2-Dichloroethene	Chronic	---	---	---	---
1,1,2-Trichloroethane	Chronic	---	---	---	---
Ethylbenzene	Chronic	1	Developmental toxicity	---	USEPA-IRIS, 1999
Methylene chloride	Chronic	3	Liver	---	USEPA-HEAST, 1997
Styrene	Chronic	1	CNS effects	---	USEPA-IRIS, 1999
Toluene	Chronic	0.4	Neurological effects	---	USEPA-IRIS, 1999
Trichloroethene	Chronic	---	---	---	---
Trichlorofluoromethane	Chronic	0.7	Kidney	---	USEPA-HEAST, 1997
1,2,4-Trimethylbenzene	Chronic	0.125	---	---	TNRCC, 2000

Table 2-3 *(continued)*
Non-Carcinogenic Toxicity Data Summary

Chemical of Concern	Chronic/ Subchronic	Inhalation RfC (mg/m^3)	Primary Target Organ	Combined Uncertainty/ Modifying Factors	Source/Date
1,3,5-Trimethylbenzene	Chronic	0.125	---	---	TNRCC, 2000
Vinyl Chloride	Chronic	---	---	---	---
Xylene	Chronic	---	---	---	---

Notes

---: No information for a compound with no toxicity value (NTV)

CNS	central nervous system
HMX	high melting explosives
IRIS	Integrated Risk Information System, USEPA
mg/kg-day	milligrams per kilogram per day
mg/m^3	milligrams per cubic meter
NA	Information not available
RDX	1,3,5-Trinitroperhydro-1,3,5-triazine
RfC	reference concentration
RfD	reference dose

References

Agency for Toxic Substances and Disease Registry (ATSDR), 1997, Minimal Risk Levels (MRLs) for Hazardous Substances.

Jacobs Engineering Group, Inc. (Jacobs), 2001a, *Final Baseline Risk Assessment Human Health Evaluation for the Site 16 Landfill Remedial Investigation and Feasibility Study, Longhorn Army Ammunition Plant, Karnack, Texas*, Final, June.

Texas Natural Resources Conservation Commission (TNRCC), 2000. Toxicity Factors Table, October 2000.

USEPA-HEAST, 1997, *Health Effects Assessment Summary Tables (HEAST), FY-1997, Update*. Office of Emergency and Remedial Response, USEPA, Washington, D.C. EPA/540/R-97-036, July.

USEPA-IRIS, 1999. Integrated Risk Information System. United States Environmental Protection Agency Online Database for Toxicity Information on Hazardous Chemicals, 1999.

Summary of Toxicity Assessment

This table provides non-carcinogenic risk information relevant to the contaminants of concern in both soil and groundwater. The list of chemicals of potential concern presented here are the ones that were quantitatively evaluated for carcinogenic risk and non-carcinogenic hazard in the Baseline Human Health Risk Assessment (Jacobs, 2001a). The uncertainty factor and modifying factor used in the development of a references dose were not available in the risk assessment evaluation report (Jacobs, 2001a).

Table 2-4
Risk Characterization Summary – Carcinogens

Scenario Timeframe: Future
Receptor Population: Maintenance Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Carcinogen Risk				
				Ingestion	Inhalation (particulates)	Inhalation (volatiles)	Dermal	Exposure Routes Total
Soil (0 to 5.0 ft)	Soil and particulates	Incidental ingestion, dermal contact, inhalation of particulates, inhalation of volatiles	***Metals***					
			Arsenic	3.9E-06	5.9E-09		4.2E-06	8.1E-06
			Beryllium		6.2E-10			6.2E-10
			Cadmium		1.9E-10			1.9E-10
			Chromium		5.0E-08			5.0E-08
			Volatile Organics					
			Methylene Chloride	1.7E-11	5.6E-16	3.3E-10	5.4E-11	4.0E-10
			Trichloroethene	4.2E-11	3.5E-15	4.7E-09	1.3E-10	4.87E-09
							Soil risk total	8.1E-06

Scenario Timeframe: Future
Receptor Population: Maintenance Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Carcinogen Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Incidental ingestion, inhalation of volatiles, dermal contact	***Explosives***				
			2,4,6-Trinitrotoluene	2.5E-05	NE		2.5E-05
			4-Amino-2,6-Dinitrotoluene	3.5E-08	NE		3.5E-08
			2,6-Dinitrotoluene	6.3E-07	NE		6.3E-07
			RDX	7.7E-05	NE	NE(Kp<=0.01)	7.7E-05
			Metals				
			Arsenic	1.8E-04	NE	NE(Kp<=0.01)	1.8E-04
			Pesticides				
			Aldrin	2.4E-06	NE	NE(Kp<=0.01)	2.4E-06
			Semivolatile Organics				
			Bis(2-ethylhexyl)phthalate	1.3E-06	NE		1.3E-06
			Volatile Organics				
			Benzene	4.9E-07	1.8E-06	2.3E-07	2.52E-06
			Bromodichloromethane	1.8E-06			1.8E-06

Table 2-4 *(continued)*
Risk Characterization Summary – Carcinogens

Scenario Timeframe: Future
Receptor Population: Maintenance Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Carcinogen Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
			Chloroform	2.6E-06	1.3E-04	1.2E-06	1.3E-04
			1,1-Dichloroethene	1.6E-03	1.7E-03	1.1E-04	3.41E-03
			1,2-Dichloroethane	5.1E-05	1.9E-04		2.41E-04
			1,1,2-Trichloroethane	2.4E-06	9.0E-06		1.14E-05
			Methylene Chloride	9.0E-05	7.4E-05	NE(Kp<=0.01)	1.64E-04
			Trichloroethene	6.2E-03	1.2E-02	5.6E-03	2.38E-02
			Vinyl Chloride	7.0E-02	4.1E-02	NE(Kp<=0.01)	1.11E-01
						Groundwater risk total =	1.4E-01
						Total risk =	1.4E-01

Notes

Kp	Dermal permeability coefficient
NE	Not evaluated through this exposure pathway. Chemical is not identified as volatile.
NE(Kp<=0.01)	Based on USEPA Region 6 guidance, COPCs with a Kp<=0.01 were not evaluated for dermal contact while showering (USEPA, 1995)
RDX	1,3,5-Trinitroperhydro-1,3,5-triazine

References

U.S. Environmental Protection Agency (USEPA), *National Oil and Hazardous Substances Pollution Contingency Plan, Final Rule, 40 CFR Part 300*, March 8, 1990.

USEPA, *Supplemental Region VI Risk Assessment Guidance, May 5, 1995*.

Summary of Risk Characterization

The table provides risk estimates for the significant routes of exposure at LHAAP-16. These risk estimates are based on a reasonable maximum exposure and were developed by taking into account various conservative assumptions about the frequency and duration of a hypothetical future maintenance worker's exposure to groundwater, as well as the toxicity of the chemicals of concern. The total risk from exposure to contaminated soil and groundwater at this site is estimated to be 1.4E-01. A risk below 10^{-4} is generally considered to be acceptable (USEPA, 1990). The soil risk is acceptable, while the groundwater risk is not. The COCs contributing the most to the groundwater risk are TCE, VC, cis-1,2-DCE and perchlorate. This risk level indicates that if no clean-up action is taken, an individual would have an increased probability of 1 in 10 of developing cancer as a result of site-related exposure to the COCs.

Table 2-5
Risk Characterization Summary – Non-Carcinogens

Scenario Timeframe:	Future
Receptor Population:	Maintenance Worker
Receptor Age:	Adult

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Primary Target Organ	Non-Carcinogenic Hazard Quotient			
					Ingestion	Inhalation	Dermal	Exposure Routes Total
Ground-water	Ground-water	Ingestion or exposure through showering	*Explosives*					
			1,3-Dinitrobenzene	--	1.5E-01			1.5E-01
			2,4,6-Trinitrotoluene	--	4.6E+00			4.6E+00
			4-Amino-2,6-Dinitrotoluene	--	5.9E-02	1.28E+00		1.3E+00
			2,6-Dinitrotoluene	--	2.6E-03			2.6E-03
			HMX	--	5.6E-04			5.6E-04
			Nitrobenzene	--	4.0E-01	1.28E+00		1.68E+00
			3-Nitrotoluene	--	1.1E-02		7.4E-04	1.17E-02
			RDX	--	6.7E-01			6.7E-01
			1,3,5-Trinitrobenzene	--	7.3E-04			7.3E-04
			Metals					
			Arsenic	--	1.1E+00	NE	NE (Kp<=0.01)	1.1E+00
			Barium	--	1.39E+00	NE	NE (Kp<=0.01)	1.39E+00
			Beryllium	--	3.6E-02	NE	NE (Kp<=0.01)	3.6E-02
			Cadmium	--	1.6E-01	NE	NE (Kp<=0.01)	1.6E-01
			Chromium	--	1.7E+01	NE	NE (Kp<=0.01)	1.7E+01
			Manganese	--	2.07E+00	NE	NE (Kp<=0.01)	2.07E+00
			Nickel	--	8.0E-01	NE	NE (Kp<=0.01)	8.0E-01
			Selenium	--	3.0E-02			3.0E-02
			Silver	--	2.2E-01	NE	NE (Kp<=0.01)	2.2E-01
			Strontium	--	1.7E-01	NE	NE (Kp<=0.01)	1.7E-01
			Vanadium	--	2.0E-01	NE	NE (Kp<=0.01)	2.0E-01
			Zinc	--	1.2E+00	NE	NE (Kp<=0.01)	1.2E+00
			Pesticides					
			Aldrin	--	1.3E-02	NE	NE (Kp<=0.01)	1.3E-02
			Semivolatile Organics					
			Bis(2-ethylhexyl)phthalate		1.3E-02	NE	NE (Kp<=0.01)	1.3E-02
			Butyl Benzyl Phthalate	--	3.4E-04	NE	2.90E-05	3.69E-04
			Acetone	--	3.8E-01			3.8E-01
			Bromodichloromethane	--	4.1E-03			4.1E-03
			2-Butanone (MEK)	--	5.5E-04	4.2E-03		4.75E-03
			Chloroform	--	1.2E-01		5.4E-02	1.74E-01
			1,1-Dichloroethane	--	3.5E-03	9.1E-03		1.26E-02
			1,1-Dichloroethene	--	8.0E-01		5.9E-02	8.59E-01
			1,2-Dichloroethene	--	1.4E+02	4.54E+01		1.85E+02
			cis-1,2-Dichloroethene	--	5.1E+02			5.1E+02
			1,1,2-Trichloroethane	--	3.0E-02			3.0E-02
			Ethylbenzene	--	4.9E-04	6.0E-04	2.3E-03	3.39E-03

Table 2-5 *(continued)*
Risk Characterization Summary – Non-Carcinogens

Scenario Timeframe: Future
Receptor Population: Maintenance Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Primary Target Organ	Non-Carcinogenic Hazard Quotient			
					Ingestion	Inhalation	Dermal	Exposure Routes Total
			Methylene chloride	--	5.7E-01	1.5E-01	NE (Kp<=0.01)	7.2E-01

Scenario Timeframe: Future
Receptor Population: Maintenance Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Primary Target Organ	Non-Carcinogenic Hazard Quotient			
					Ingestion	Inhalation	Dermal	Exposure Routes Total
			Toluene	--	1.4E-03	9.6E-03	6.5E-03	1.75E-02
			Tetrachloroethene	--	1.4E-03		2.5E-03	3.9E-03
			Trichloroethene	--	2.7E+02		2.3E+02	5.0E+02
			Trichlorofluoromethane	--	2.9E-02	1.65E-01	2.3E-03	1.96E-01
			1,2,4-Trimethylbenzene	--	4.6E-03	2.51E-02	3.0E-03	3.27E-02
			1,3,5-Trimethylbenzene	--	3.2E-03	1.69E-02	1.3E-03	2.14E-02
			Xylene		6.0E-05		2.2E-05	8.2E-05
Groundwater Hazard Index Total =								1.23E+03
Receptor Hazard Total (soil and groundwater) =								1.23E+03

Notes

---	No information available
CNS	Central nervous system
Kp	Dermal permeability coefficient
HMX	High melting explosives
NE	Not evaluated through this exposure pathway
NE (Kp<=0.01)	Based on USEPA Region 6 guidance, chemicals of potential concern with a Kp<=0.01 were not evaluated for dermal contact while showering (USEPA, 1995)
RDX	1,3,5-Trinitroperhydro-1,3,5-triazine

References

U.S. Environmental Protection Agency (USEPA), 1989, *Risk Assessment Guidance for Superfund, Vol. I: Human Health Evaluation Manual, (Part A)*, EPA/540/1-89/002, December.

USEPA, *Supplemental Region 6 Risk Assessment Guidance*, May 5, 1995.

Summary of Risk Characterization

The table provides hazard quotients (HQs) for each route of exposure and the hazard index (sum of hazard quotients) for all routes of exposure for LHAAP-46. The Risk Assessment Guidance for Superfund (USEPA, 1989) states that, generally, a hazard index (HI) greater than 1 indicates the potential for adverse non-carcinogenic effects. The estimated HI of 31 for groundwater indicates that the potential for adverse non-carcinogenic effects could occur from exposure to contaminants in that medium; the components having HQs greater than 1 are thallium, antimony, and manganese. The non-carcinogenic risk from exposure to trichloroethene in groundwater could not be evaluated due to the lack of non-carcinogenic toxicity criteria for trichloroethene. The estimated HI of 0.12 for soil is acceptable.

Table 2-6
Chemicals of Potential Concern in Groundwater

Chemical	Baseline Risk Assessment Results			Comparison Value		Maximum Result (µg/L)	Maximum Result from Post Risk Assessment Data	Retained as Chemical of Concern?
	EPC (µg/L)	Risk	HI	Value (µg/L)	Basis			
Perchlorate	none	-	-	72	GW-Ind	5,990	Yes	YES, 3
1,3-Dinitrobenzene	1.56	-	0.15	10	GW-Ind	1.56	No	NO, 6
2,4,6-Trinitrotoluene	240	2.50E-05	4.6	51	GW-Ind	240	No	NO, 5
4-Amino-2,6-dinitrotoluene	1	3.50E-08	1.34	17	GW-Ind	1	No	NO, 6
Nitrobenzene	20	-	1.68	51	GW-Ind	20	No	NO, 5
RDX	200	7.70E-05	0.67	26	GW-Ind	200	No	NO, 5
Arsenic	34	1.80E-04	1.1	10	MCL	123	Yes	YES, 1
Barium	9,900	-	1.39	2,000	MCL	9,900	No	NO, 2
Cadmium	8	-	0.16	5	MCL	29	No	NO, 2
Chromium	5,220	-	17	100	MCL	32,400	Yes	YES, 3
Manganese	29,800	-	2.07	7,820	95% UTL Background	29,800	No	YES, 1
Nickel	1,630	-	0.8	2,040	GW-Ind	1,803.5	No	YES, 1
Silver	114	-	0.22	511	GW-Ind	114	No	NO, 6
Strontium	10,400	-	0.17	61,300	GW-Ind	12,300	Yes	NO, 6
Thallium	12	-	-	2	MCL	90.5	Yes	YES, 1
Zinc	37,000	-	1.2	31,000	GW-Ind	37,000	No	NO, 5
Trichloroethene	160,000	2.38E-02	500	5	MCL	173,000	Yes	YES, 3
1,1-Dichloroethene	740	3.41E-04	0.859	7	MCL	740	No	YES, 3
1,2-Dichloroethane	160	2.41E-04	-	5	MCL	161	Yes	YES, 3
1,2-Dichloroethene	275,000	-	185.4	70	MCL for cis-1,2-DCE	275,000	No	NO, 4
cis-1,2-Dichloroethene	520,000	-	510	70	MCL	520,000	No	YES, 3
Vinyl chloride	11,000	1.11E-01	-	2	MCL	11,000	No	YES, 3
1,1,2-Trichloroethane	12	1.14E-05	0.03	5	MCL	23.6	Yes	YES, 1
Acetone	3,920	-	0.38	92,000	GW-Ind	14,000	Yes	NO, 6
Chloroform	120	1.34E-04	0.17	80	MCL for trihalomethanes	36	No	NO, 6
Methylene chloride	3,500	1.64E-04	0.72	5	MCL	9,500	Yes	YES, 3
Trichlorofluoromethane	892	-	0.196	80	MCL for trihalomethanes	892	No	NO, 5

Table 2-6 *(continued)*
Chemicals of Potential Concern in Groundwater

Notes:

List of Chemicals is from Table 4-9 of the Final Baseline Human Health Risk Assessment for Site 16 Landfill (plus perchlorate).
Constituents/Parameters with Hazard Index (HI) > 0.1 or Cancer Risk (Risk) > 1.00E-5 are selected.

(1) Retained as a COC to be monitored for 5 years, then evaluated again.
(2) Excluded as a COC because earlier exceedances of MCL were not confirmed by subsequent sampling.
(3) Retained as a COC because a significant number of results exceed the MCL or GW-Ind.
(4) Excluded as a COC because the parameter will be superseded by cis-1,2-DCE.
(5) Excluded as a COC because only one or 2 anomalous sample results in early sampling were above the Comparison Value.
(6) Excluded as a COC because no detected result ever exceeded the comparison value.

µg/L	micrograms per liter
GW-Res	Texas Groundwater Medium-Specific Concentration for Residential Use
HI	Hazard Index
MCL	maximum contaminant level
95% UTL	Value from Final Evaluation of Perimeter Well Data for Use as Groundwater Background (Shaw, 2007).

Table 2-7
Groundwater and Surface Water Cleanup Levels

	Cleanup Level	
Chemical of Concern	Onsite Groundwater (µg/L)	Compliance Zone (Harrison Bayou) (µg/L)
	MCL	MCL
Trichloroethene	5	5
cis-1,2-Dichloroethene	70	70
1,1-Dichloroethene	7	7
1,2-Dichloroethane	5	5
Vinyl Chloride	2	2
1,1,2-Trichloroethane	5	5
Methylene Chloride	5	5
Chromium	100	100
Arsenic	10	10
Thallium	2	2
	GW-Ind	GW-Res
Nickel	2,040	730
Perchlorate	72	26
	GW-Ind	95% UTL Background
Manganese	14,300	7,820

Notes and Abbreviations:

All values are in micrograms per liter (µg/L).

Source: TCEQ, 2006.

GW-Res	Texas Groundwater Medium-Specific Concentration for Residential Use
MCL	maximum contaminant level
NE	not established
95% UTL	value from Final Evaluation of Perimeter Well Data for Use as Groundwater Background (Shaw, 2007)

Table 2-8
Comparative Analysis of Alternatives

Criteria	Alternative 1 No Further Action (Maintenance of Existing Landfill Cap, Land Use Controls [Cap Only])	Alternative 2 Cap, Enhanced Groundwater Extraction, Land Use Controls	Alternative 3a/3b Cap, Monitored Natural Attenuation, Land Use Controls[1]	Alternative 4 Cap, In Situ Permeable Reactive Barrier, Land Use Controls	Alternative 5a/5b Landfill Removal, In Situ Permeable Reactive Barrier, Land Use Controls[2]	Alternative 6 Landfill Source Treatment, Monitored Natural Attenuation, Land Use Controls	Alternative 7 Cap, Monitored Natural Attenuation, Land Use Controls, In Situ Enhanced Bioremediation, Biobarriers
Overall protection of human health and the environment	Protection of human health provided by cap and associated LUCs. No additional protection from exposure to groundwater. Does not demonstrate protection of Harrison Bayou from potential groundwater impacts.	Protection of human health provided by cap and land use controls. Protection of Harrison Bayou provided by groundwater extraction.	Protection of human health provided by cap and land use controls. Protection of Harrison Bayou provided by natural attenuation.	Protection of human health provided by cap and land use controls. Protection of Harrison Bayou provided by permeable reactive barrier.	Protection of human health provided by cap (5a), source removal (5b) and land use controls. Protection of Harrison Bayou provide by groundwater treatment.	Protection of human health provided by removal and treatment of some source material and by cap and land use controls. Protection of Harrison Bayou provided by natural attenuation.	Protection of human health provided by cap and land use controls. Protection of Harrison Bayou provided by biobarriers, in situ bioremediation, and natural attenuation.
Compliance with ARARs	No compliance with chemical-specific ARARs in groundwater. Complies with location- and action-specific ARARs.	Does not comply with ARARs that apply drinking water requirements to groundwater. Complies with location-and action-specific ARARs.	Meets all ARARs.	Does not comply with ARARs that apply drinking water requirements to groundwater. Complies with location-and action-specific ARARs.	Does not comply with ARARs that apply drinking water requirements to groundwater. Complies with location-and action-specific ARARs.	Meets all ARARs.	Meets all ARARs.
Long-term effectiveness and permanence	Landfill cap and associated LUCs would be effective and reliable so long as they are maintained indefinitely. Not effective for groundwater.	Effective reliability depends on long-term maintenance and controls and ability to locate extraction wells in complex geology.	Alternative 3b enhances effectiveness of MNA by reducing the mass of contamination. If MNA is not proven effective in the long term, a contingent action of groundwater extraction would be implemented (see Alternative 2)	Effectiveness of permeable reactive barrier is uncertain and relies on adequate long-term maintenance.	Similar to Alternative 4, but reliability enhanced with source removal. More aggressive remedial approach.	Similar to Alternative 3a but reliability is enhanced by source treatment.	Should be effective and permanent as indicated by the results of the technology demonstration and the preliminary MNA evaluation. In situ bioremediation will permanently reduce contaminant mass in its treatment area.

Table 2-8 *(continued)*
Comparative Analysis of Alternatives

Criteria	Alternative 1 No Further Action (Maintenance of Existing Landfill Cap, Land Use Controls [Cap Only])	Alternative 2 Cap, Enhanced Groundwater Extraction, Land Use Controls	Alternative 3a/3b Cap, Monitored Natural Attenuation, Land Use Controls[1]	Alternative 4 Cap, In Situ Permeable Reactive Barrier, Land Use Controls	Alternative 5a/5b Landfill Removal, In Situ Permeable Reactive Barrier, Land Use Controls[2]	Alternative 6 Landfill Source Treatment, Monitored Natural Attenuation, Land Use Controls	Alternative 7 Cap, Monitored Natural Attenuation, Land Use Controls, In Situ Enhanced Bioremediation, Biobarriers
Reduction of toxicity, mobility, or volume through treatment	No active reduction.	Some reduction in groundwater toxicity and volume through active treatment. No source treatment.	Alternative 3a includes no active reduction in toxicity, mobility, or volume. Alternative 3b includes a small reduction in toxicity and volume. No source treatment.	Moderate reduction in groundwater toxicity. No source treatment.	Longer trench results in larger reduction in groundwater toxicity than Alternative 4. Source treatment only if RCRA waste is identified.	Significant source reduction in toxicity and volume. Groundwater COC reduction is identical to Alternative 3.	No source treatment. Provides permanent and irreversible reduction in groundwater toxicity and volume via in situ bioremediation, biobarriers, and MNA.
Short-term effectiveness	Minimal impact to the community, workers, or the environment from short-term activities.	Minimal impact to the community, workers, or the environment from short-term activities. Provides almost immediate protection.	Minimal impact to the community, workers, or the environment from short-term activities. Provides almost immediate protection.	Minor disruption due to installation of the permeable reactive barrier.	Significant short-term impacts to the community from transportation and for worker risk from excavation activities. Risks can be controlled.	Potential for worker risk during source treatment. Risks can be controlled.	Minimal disruption due to implementation of in situ bioremediation and biobarrier. Provides almost immediate protection with the implementation of land use controls.
Implementability	Readily implemented.	Readily implemented. Most of the components of this alternative are already in place.	If natural attenuation does not occur, Alternative 2 would be implemented.	Need to design an effective system considering hydraulics and biological process in situ.	Most difficult to implement. Coordination of excavation, waste sampling, transportation, and disposal would be difficult. Also, need to minimize releases of contaminated material during excavation activities.	Source action not typically applied to landfills. Therefore, initial testing will be required.	Readily implemented because equipment and personnel required for implementation of this alternative (including the design of the biobarrier) are readily available.

Table 2-8 *(continued)*
Comparative Analysis of Alternatives

Criteria	Alternative 1 No Further Action (Maintenance of Existing Landfill Cap, Land Use Controls [Cap Only])	Alternative 2 Cap, Enhanced Groundwater Extraction, Land Use Controls	Alternative 3a/3b Cap, Monitored Natural Attenuation, Land Use Controls[1]	Alternative 4 Cap, In Situ Permeable Reactive Barrier, Land Use Controls	Alternative 5a/5b Landfill Removal, In Situ Permeable Reactive Barrier, Land Use Controls[2]	Alternative 6 Landfill Source Treatment, Monitored Natural Attenuation, Land Use Controls	Alternative 7 Cap, Monitored Natural Attenuation, Land Use Controls, In Situ Enhanced Bioremediation, Biobarriers
Cost[3]							
• Capital Expenditures	$0	$777,000	$620,000 (a) $1,307,000 (b)	$2,596,000	$3,138,000 (a) $111,826,000 (b)	$2,781,000	$393,000
• O&M Expenditures	$914,000	$13,898,000	$2,943,000 (a) $3,011,000 (b)	$2,889,000	$15,289,000 (a) $14,585,000 (b)	$4,676,000	$2,004,000
• Total Present Worth	$632,000	$9,816,000	$2,713,000 (a) $3,426,000 (b)	$4,563,000	$13,070,000 (a) $115,606,000 (b)	$6,399,000	$1,980,000

Notes and Abbreviations:

[1] Alternative 3b is identical to Alternative 3a except an extraction well network will be operated in the groundwater hot spot for approximately 5 years to reduce contaminant mass, followed by MNA throughout the rest of the O&M period.

[2] Alternative 5b is identical to Alternative 5a except all of the landfill waste will be removed (compared with hot spot removal under Alternative 5a).

[3] Costs have been rounded to the nearest $1,000. The capital and O&M expenditures are the sums of each year's costs without regard to discount rates or escalation rates. Each year's expenditures were converted to present worth using a 2.7% discount rate and were summed to yield the total present worth. The costs of Alternatives 1 through 6 have been updated to January 2008 using the Engineering News Record construction cost index, and the costs of five-year reviews have been added to all alternatives. Per the Army's request, the costs for all alternatives have been modified by removing the standard escalation rate (average 3 percent per year) from the present worth calculation. Also, the cost of Alternative 1 has been updated to reflect the ongoing cap maintenance/inspection activities and the implementation of LUCs under the ROD for LHAAP-16.

ARAR	applicable or relevant and appropriate requirement
COC	chemical of concern
LUCs	land use controls
MNA	monitored natural attenuation
O&M	operation and maintenance
RCRA	Resource Conservation and Recovery Act

Table 2-9
Remediation Cost Table, Selected Remedy (Alternative 7)
Present Worth Analysis

PROJECT LOCATION:	Karnack, Texas								DATE:	January 2010	
			O & M Costs						Present Value (NPV)		
FY	Capital Costs	Capital Costs							Discount Rate	Capital	O & M
	ISEB	Other	Cap Maintenance	Biobarrier	Performance Monitoring	MNA	LTM	Total	2.7%		
									NPV	392,596	1,587,057
2010	201,713	190,882	30,568	82,364	169,844		0	282,776			
2011	0	0	22,689		136,228		0	158,916			
2012	0	0	22,689			140,863	0	163,551			
2013	0	0	22,689			149,397	0	172,086			
2014	0	0	22,689				72,058	94,746			
2015	0	0	30,568	82,364			0	112,932			
2016	0	0	22,689				0	22,689			
2017	0	0	22,689				0	22,689			
2018	0	0	22,689				0	22,689			
2019	0	0	22,689				72,058	94,746			
2020	0	0	30,568	82,364			0	112,932			
2021	0	0	22,689				0	22,689			
2022	0	0	22,689				0	22,689			
2023	0	0	22,689				0	22,689			
2024	0	0	22,689				72,058	94,746			
2025	0	0	30,568				0	30,568			
2026	0	0	22,689				0	22,689			
2027	0	0	22,689				0	22,689			
2028	0	0	22,689				0	22,689			
2029	0	0	22,689				72,058	94,746			
2030	0	0	30,568				0	30,568			
2031	0	0	22,689				0	22,689			

Table 2-9 *(continued)*
Remediation Cost Table, Selected Remedy (Alternative 7)
Present Worth Analysis

PROJECT LOCATION:	Karnack, Texas								DATE:	January 2010	
			O & M Costs						Present Value (NPV)		
FY	Capital Costs	Capital Costs							Discount Rate	Capital	O & M
	ISEB	Other	Cap Maintenance	Biobarrier	Performance Monitoring	MNA	LTM	Total	2.7%		
									NPV	392,596	1,587,057
2032	0	0	22,689				0	22,689			
2033	0	0	22,689				0	22,689			
2034	0	0	22,689				72,058	94,746			
2035	0	0	30,568				0	30,568			
2036	0	0	22,689				0	22,689			
2037	0	0	22,689				0	22,689			
2038	0	0	22,689				0	22,689			
2039	0	0	22,689				72,058	94,746			
Total Expenditures	201,713	190,882	727,934	247,091	306,072	290,260	432,346	2,003,703			$1,979,653

Notes and Abbreviations:

Major assumptions are as described below. Quantities and assumptions are for cost estimating purposes only. For further details, refer to the Final Addendum to Final Feasibility Study, LHAAP-16 (Shaw, 2010).

Capital costs include: in situ bioremediation, the first injection for the biobarriers, and establishment of LUCs.

O&M costs for the MNA evaluation, maintenance of the cap, maintenance of the LUCs, long-term monitoring, and two additional emulsified vegetable oil injections subsequent to the initial implementation of the biobarriers. LTM would support the required CERCLA five-year reviews.

Monitoring costs are based on the assumption that sampling is conducted at 7 shallow zone wells and 5 intermediate zone wells, with one quality control sample in each zone and one surface water location in Harrison Bayou. The sampling frequency is quarterly for 2 years (Years 1 and 2), then semiannual for 3 years (Years 3 through 5), then annual for Years 6 through 10, and finally every5 years (Years 15, 20, 25, and 30). Analysis of the initial groundwater sampling event is for VOCs and perchlorate and MNA parameters. Samples collected in subsequent monitoring events will be analyzed for VOCs, metals, perchlorate and MNA parameters. Five year reviews are conducted in Years 5, 10, 15, 20, 25, and 30.

The discount rate of 2.7% is based on the 30-year Real Interest Rate from Office of Management and Budget Circular A-94, Appendix B, Revised December 2009.

CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
ISEB	in situ enhanced bioaugmentation
LTM	long-term monitoring
LUC	land use control
MNA	monitored natural attenuation
NPV	net present value
O&M	operation & maintenance
VOC	volatile organic compounds

Table 2-10
Description of ARARs for Final Selected Remedy

Citation	Activity or Prerequisite/Status	Requirement
Groundwater		
Federal Safe Drinking Water Act Maximum Contaminant Levels (MCLs) 40 CFR 141	Applicable to drinking water for a public water system—**relevant and appropriate** for water that could potentially be used for human consumption	Must not exceed MCLs/non-zero MCLGs for water designated as a current or potential source of drinking water. See Table 2-7 for specific numeric criteria
TCEQ Texas Risk Reduction Rules 30 TAC 335	Applicable to industrial groundwater—**relevant and appropriate** for hypothetical future maintenance worker exposure to groundwater .	If no maximum contaminant level has been promulgated, groundwater must not exceed the industrial medium-specific concentration. See Table 2-7 for specific numeric criteria.
Surface Water		
State of Texas Surface Water Quality Standards: General Criteria and Toxic Materials Criteria 30 TAC 307.4 30 TAC 307.6	Applicable to surface waters of the state - **applicable** if water is discharged to a surface water body or surface waters are remediated as part of the remedial action.	Discharges to waters of the state must not cause in-stream exceedance of numeric and narrative water quality standards. Remediation of contaminated surface waters must ensure that numeric and narrative water quality standards are achieved, as determined by 307.8 (Application of the Standards) and Section 307.9 (Determination of Standards Attainment). See Table 2-7 for specific numeric criteria.
State of Texas Surface Water Quality Standards: Antidegradation 30TAC 307.5	Applicable to surface waters of the state – **applicable** if water is discharged directly to a surface water body or surface waters are remediated as part of the remedial action.	No activity subject to regulatory action that would cause degradation of waters that exceed fishable/swimmable quality will be allowed. Degradation is defined as a lowering of water quality by more than a de minimis extent but not to the extent than an existing use is impaired. Water quality sufficient to protect existing uses will be maintained. The highest water quality sustained since November 28, 1975, defines baseline conditions for determination of degradation.
General Site Preparation, Construction, and Excavation Activities		
Air Contaminants – General Nuisance Rules 30 TAC 101.4	Emissions of air contaminants—**applicable**.	No person shall discharge from any source whatsoever one or more air contaminants or combinations thereof, to exceed an opacity of 30 percent for any 6-minute period as are or may tend to be injurious to or to adversely affect human health or welfare, animal life, vegetation, or property, or as to interfere with the normal use and enjoyment of animal life, vegetation, or property.
Storm Water Runoff Controls 40 CFR 122.26; 30 TAC 205, Subchapter A; 30 TAC 308.121	Storm water discharges associated with construction activities—**applicable** to disturbances of equal to or greater than 1 acre of land.	Good construction management techniques, phasing of construction projects, minimal clearing, and sediment, erosion, structural, and vegetative controls shall be implemented to mitigate storm water run-on/runoff in areas of active remediation.
Waste Management		

Table 2-10 *(continued)*
Description of ARARs for Final Selected Remedy

Citation	Activity or Prerequisite/Status	Requirement
Characterization of Solid Waste 40 CFR 262.11 30 TAC 335.62 30 TAC 335.504 30 TAC 335.503(a)(4)	Generation of solid waste, as defined in 30 TAC 335.1—**applicable**.	Must determine whether the generated solid waste is RCRA hazardous waste by using prescribed testing methods or applying generator knowledge based on information regarding material or process used. If the waste is determined to be hazardous, it must be managed in accordance with 40 CFR 262–268. After making the hazardous waste determination as required, if the waste is determined to be nonhazardous, the generator shall then classify the waste as Class 1, Class 2, or Class 3 (as defined in Section 335.505 through Section 335.507) using one or more of the methods listed in Section 335.503(a)(4) and Section 335.508 and manage the waste in accordance with the requirements of Chapter 335 of the TAC for industrial solid waste.
Characterization of Hazardous Waste 40 CFR 268.7 30 TAC 335.504(3) 30 TAC 335.509 30 TAC 335.511	Generation of a RCRA hazardous waste for treatment, storage, or disposal—**applicable** if hazardous waste is generated (e.g., personal protective equipment [PPE]).	Must obtain a detailed chemical and physical analysis of a representative sample of the waste(s) that at a minimum contains all the information that must be known to treat, store, or dispose of the waste in accordance with 40 CFR 264 and 268. Must also determine whether the waste is restricted from land disposal under 40 CFR 268 et seq. by testing in accordance with prescribed methods or use of generator knowledge of waste.
Requirements for Temporary Storage of Hazardous Waste in Accumulation Areas 40 CFR 262.34(a) and (c)(1) 30 TAC 335.69(a) and (d)	On-site accumulation of 55 gallons or less of RCRA hazardous waste for 90 days or less at or near the point of generation—**applicable** if hazardous waste is generated (e.g., PPE) and stored in an accumulation area.	Remedial activities derived waste (from monitoring, intercepting and treating contaminated groundwater) is expected for this facility. A generator may accumulate hazardous waste at the facility provided that • Waste is placed in containers that comply with 40 CFR 264.171 to 264.173 (Subpart I); and • Container is marked with the words “hazardous waste”; or • Container may be marked with other words that identify the contents.
Well Construction		
Well Construction Standards—Monitoring or Injection Wells 16 TAC 76.1000	Construction of water wells—**applicable** to construction of new monitoring or injection wells, if needed.	Injection wells shall be completed in accordance with the technical requirements of Section 76.1000, as appropriate. Substantive requirements applicable to the injection wells will be adhered to.
Class V Injection Wells 30 TAC 331, Subchapters A,C and H	Installation, operation, and closure of injection wells fall in the category of Class V Injection Wells – **relevant and appropriate**.	Injection wells shall be constructed to the required specifications for isolation casing, surface completion, prevention of commingling, and confinement of undesirable groundwater to its zone of origin. Closure shall be accomplished by removing all of the removable casing and the entire well shall be pressure filled via a tremie pipe with cement from bottom to the land surface, or closure shall be performed by the alternative method for Class V Wells completed in zones of undesirable groundwater. Groundwater concentrations at time of well closure will determine the appropriate method of abandonment. Substantive requirements applicable to the injection wells will be adhered to.
Treatment/Disposal		
Disposal of Wastewater (e.g., contaminated groundwater, dewatering fluids, decontamination liquids) 40 CFR 268.1(c)(4)(i) 30 TAC 335.431(c)	RCRA-restricted characteristically hazardous waste intended for disposal—**applicable** if extracted groundwater or rinsate from incinerator is determined to be RCRA characteristically hazardous.	Disposal is not prohibited if such wastes are managed in a treatment system subject to regulation under Section 402 of the CWA that subsequently discharges to waters of the United States.

Table 2-10 *(continued)*
Description of ARARs for Final Selected Remedy

Citation	Activity or Prerequisite/Status	Requirement
Closure		
Standards for Plugging Wells that Penetrate Undesirable Water or Constituent Zones 16 TAC 76.1004(a) through (c)	Plugging and abandonment of wells—**applicable** to plugging and closure of monitoring and/or extraction wells.	If a well is abandoned, all removable casing shall be removed and the entire well pressure filled via a tremie pipe with cement from bottom up to the land surface. In lieu of this procedure, the well shall be pressure-filled via a tremie tube with bentonite grout of a minimum 9.1 lb/gal weight followed by a cement plug extending from land surface to a depth of not less than 2 feet. Undesirable water or constituents or the freshwater zone(s) shall be isolated with cement plugs.
Post Closure Care		
Post Closure Care Requirements for Hazardous Waste Landfills 40 CFR 264.310(b)(1)(4)(5)(6) 40 CFR 264.228(b)(1)(3)(4) 30 TAC 335.174(b) 40 CFR 264.117 - 264.120	Closure of a RCRA landfill – **relevant and appropriate** to closure or post closure under CERCLA of landfills containing RCRA hazardous waste	Owner or operator must • Maintain the effectiveness and integrity of the final cover including making repairs to the cap as necessary to correct effects of settling, erosion, etc.; • Prevent run-on and runoff from eroding or otherwise damaging final cover; and • Maintain and monitor a groundwater monitoring system.

Abbreviations:

CFR	Code of Federal Regulations
FR	Federal Register
PPE	personal protective equipment
RCRA	Resource Conservation and Recovery Act of 1976
TAC	Texas Administrative Code

Figure 2-1
LHAAP Location Map

Figure 2-2
Site Location Map

Figure 2-3
Soil and Groundwater Sample Locations and Extent of Groundwater Contamination Map

Figure 2-4
Surface Water / Sediment Sample Locations Map

Figure 2-5
Site Map

Figure 2-6
Conceptual Site Model – LHAAP-16 Source Area

Figure 2-7
Conceptual Site Model – LHAAP-16 Non-Source Area

Figure 2-8
Shallow Zone Groundwater Elevation Map June 2007 Data

Figure 2-9
Intermediate Zone Groundwater Elevation Map June 2007 Data

3.0 Responsiveness Summary

The Responsiveness Summary serves three purposes. First, it provides the U. S. Army, USEPA, and TCEQ with information about community concerns with the preferred alternative at LHAAP-16 as presented in the Proposed Plan. Second, it shows how the public's comments were considered in the decision-making process for selection of the remedy. Third, it provides a formal mechanism for the U.S. Army to respond to public comments.

The U.S. Army, USEPA, and TCEQ provide information regarding LHAAP-16 through public meetings, the Administrative Record for the facility, and announcements published in the Shreveport Times and Marshall News Messenger newspapers. **Section 2.3** discusses community participation on LHAAP-16, including the dates for the public comment period, the date, location, and time of the public meetings, and the location of the Administrative Record. The following documents related to community involvement were added to the Administrative Record:

- Transcript of the public meeting on October 19, 2010
- Presentation slides from the October 19, 2010 public meeting
- Written questions and comments from the public during the public comment period, and the U.S. Army response to those comments dated March 14, 2011.

3.1 Stakeholder Issues and Lead Agency Responses

This section responds to significant issues raised by stakeholders including the public and community groups that were received in written or verbal form.

Question/comment: The Army states that it could take 280 years to reduce groundwater contaminant concentrations to acceptable levels. It is not reasonable to propose plans that could require water quality monitoring, maintenance of the landfill cap, maintenance of the biobarriers, and maintenance of LUCs for such a length of time.

The Army should take steps to reduce the length of time that will be required to achieve acceptable contaminant concentrations. These steps could include: installation of an effective pump and treat system, modification of the proposed in-situ bioremediation system to cover a greater portion of the site and to operate until acceptable concentrations are achieved, thermal treatment (e.g., steam stripping), and elimination or reduction of the contaminant source by removing the landfill or reducing the mass of contaminants that it contains.

Response: Given the nature of the residual contaminants that are present at LHAAP-16, the length of time that will be required to achieve cleanup levels would be long for any of the remedial alternatives, whether treatment, migration control, or source control by removal.

It is believed that TCE was present within the landfill as DNAPL has dissolved into the groundwater at very high concentrations and migrated to the east (down-gradient of the landfill). This high concentration region acts as a secondary source of groundwater contamination. Although TCE may remain in the landfill, the landfill cover system has significantly reduced the driving force of recharge and added a degree of isolation to the remaining waste. Removal of the landfill would not affect the secondary source of groundwater contamination outside the landfill and would be a very large cost without corresponding benefit.

The LUCs restricting the use of groundwater will be highly effective as will be long term maintenance of the LUCs, given that the reasonably anticipated future use of the site is as a national wildlife refuge (i.e., Caddo Lake National Wildlife Refuge) and the owner a federal agency. Once the property is transferred into the refuge system, the property must be kept as a National Wildlife Refuge unless there is an act of Congress which removes the parcel or the land is exchanged in accordance with the National Wildlife Refuge System Administration Act of 1966 and the National Wildlife Refuge System Act Amendments of 1974. A national wildlife refuge by its very nature includes physical access and use restrictions, and is subject to control and continual inspection by Refuge personnel. The LUCs will restrict access to the groundwater for purposes other than environmental testing until cleanup levels are met. Additionally, access of groundwater through well installations requires a permit from the Texas Department of Licensing and Regulation or Texas Water District authority. The department will be provided a copy of the county recordation that indicates the location of contaminated groundwater at the site and associated restriction.

Since LHAAP-16 is enclosed within a national wildlife refuge with no current or planned use of groundwater for human consumption, plume stability and protection of Harrison Bayou are key measures for evaluation of a remedial strategy. A detailed analysis of alternatives, including those with aggressive treatments, was conducted according to the evaluation criteria identified in the NCP (40CFR 300.430). Advantages, disadvantages, and trade-offs were considered as part of the evaluation process during the feasibility study (Jacobs, 2002). The suggested alternatives were considered in the FS and were not seen as sufficiently advantageous over the preferred alternative (Shaw, 2010).

Question/Comment: Groundwater contamination at LHAAP-16 is caused by contaminants being leached from wastes in the landfill. The landfill could continue to generate large amounts of contaminants for decades or centuries. The Army's preferred alternative does not attempt to reduce the length of time that the landfill will generate contaminants.

The Army should attempt to reduce the length of time the landfill will generate large amounts of contaminants. This could be done by 1) removing the landfill or 2) treating the landfill to reduce the mass of contaminants it contains (e.g., hot-spot removal, flushing with surfactants or solvents, bioremediation, vapor extraction).

Response: It is believed that TCE was present within the landfill as DNAPL has dissolved into the groundwater at very high concentrations and migrated to the east (down-gradient of the landfill). This high concentration region acts as a secondary source of groundwater contamination. Although TCE may remain in the landfill, the landfill cover system has significantly reduced the driving force of recharge and added a degree of isolation to the remaining waste. The biobarrier will be installed at the edge of the landfill to treat/remediate and thereby control potential migration of contaminants from the landfill. Removal of the landfill would not affect the secondary source of groundwater contamination outside the landfill and would be a very large cost without corresponding benefit. Since LHAAP-16 is enclosed within a national wildlife refuge with no current or planned use of groundwater for human consumption, plume stability and protection of Harrison Bayou are more important measures for evaluation of remedial alternatives than the time factor.

In 1998 a landfill system was placed over the site and was completed as part of an early Interim Remedial Action (IRA) in accordance with the USEPA presumptive remedy guidance under CERCLA for municipal landfills (EPA 540-F-93-035) and for military landfills (EPA 540-F-96-020). Capping as opposed to waste treatment or removal, is a presumptive remedy at landfills as it has been shown to be more appropriate in comparison to other remedies. The IRA was intended to be consistent with the final remedy and is considered a component of the final remedy being proposed for LHAAP-16.

Landfill removal and landfill source treatment alternatives were included in the comparative analysis of alternatives performed during the feasibility study (Jacobs, 2002) and during the generation of the proposed plan (Shaw 2010) for LHAAP-16. These remedial alternatives did not demonstrate increases in effectiveness that were balanced by their increased costs and short-term impacts.

Question/Comment: The Army's 280 year estimate of cleanup time due to natural attenuation is not based on solid evidence. It appears that the Army chose this number because it was the cleanup time calculated for natural attenuation of TCE at well 16WW16. However, a longer TCE cleanup time (492 years) was calculated for well 16WW12. In addition, contaminant concentrations in some wells are stable or increasing rather than decreasing (e.g., perchlorate in well 16WW12, and TCE in well 16WW36). The calculated cleanup time due to natural attenuation for these wells would be infinity.

The Army does not address the question of whether the remedial actions it has conducted at the site have affected the cleanup time calculations. That is, are the contaminant reductions seen at the site due to natural attenuation, the remedial actions, or both?

Response: The duration of 280 years was considered as a reasonable estimate based on the prior history of TCE concentrations at 16WW16. The wells with stable or increasing concentrations are in areas where treatment will be applied, or where biobarriers will cut off renewal of contaminants from upgradient areas. Implementing the remedy is expected to expedite attenuation rates, making them faster, so the worst case scenario at 16WW12 was not chosen as a representative case. Instead the second slowest measurable attenuation was used as an initial estimate for duration.

Contaminant reductions thus far are due to a combination of past actions and natural attenuation. Past actions have removed contaminant mass in some areas of the site and can thus be assumed to have reduced cleanup time in those specific areas, though there is insufficient historical data to quantify the extent of that reduction. The areas most affected in this way would be the capture zone of the extraction wells and a small area immediately down-gradient of the semi-passive biobarrier. The cleanup times at locations that are outside the immediate down-gradient vicinity of the semi-passive biobarrier and far from the extraction wells can be assumed to be outside any significant influence from either of those past actions. Most of the wells at the site (e.g., 16WW16, 16WW12, 16WW43, etc.) are outside those influences.

Question/Comment: The Army intends to evaluate the effectiveness of natural attenuation in a 28 month period following the installation of the biobarriers and the in-situ bioremediation system, and after groundwater extraction has been discontinued. This does not appear to make sense. The effects of the remedial actions will persist for some unknown period of time. How will the Army distinguish between the effects of the remedial actions, and the effects of natural attenuation?

Response: The application of biobarriers and bioremediation will be in discrete areas. The effectiveness of remedial actions will be evaluated for wells in those areas. MNA will be evaluated for wells that are outside the remedial action areas.

Question/Comment: The Army should clearly explain how it will determine whether natural attenuation is reducing contaminants concentrations at an acceptable rate.

Response: The Army intends to present details of the MNA remedy implementation in a remedial design for LHAAP-16. The regulatory guidance established by USEPA (1998) for MNA will be followed to demonstrate that natural attenuation is occurring.

Question/Comment: The passive biobarriers will intercept groundwater only in the shallow zone. However, the intermediate zone also contains high concentrations of contaminants. The Army should explain why it chose not to extend the passive barriers into the intermediate zone.

Response: Biobarriers were not extended into the intermediate zone because the intermediate zone does not intersect surface water in Harrison Bayou. The intermediate zone is deeper than the flowline elevation of the bayou. The highest recent COC concentrations in the intermediate zone are more than 10 times lower than recent COC concentrations in the shallow zone. Nonetheless, the intermediate zone will be addressed via bioremediation injections in the most contaminated locations that have been detected within that zone. MNA will be implemented for areas outside the influence of the active remedies. Monitoring will verify protection of human health and the environment by documenting that further reductive dechlorination is occurring within the plume, that the plume is not migrating, and that contaminant concentrations are being reduced to cleanup levels.

Question/Comment: The pumping of the extraction wells may be limiting the lateral expansion of the contaminant plume. After the extraction wells are shut down, the plume may expand such that it will flow around the ends of the down gradient biobarrier. The Army should consider this possibility in its final remedial design.

Response: There are no plans to remove the extraction system, just to turn it off. The extraction wells will be shut down after application of in situ bioremediation. In situ bioremediation is expected to greatly reduce contaminant concentrations in the application area, minimizing the migration of contaminants toward the biobarrier that will be installed near the bayou. The biobarrier at the landfill is expected to treat contaminated groundwater thereby controlling renewal of the plume at the landfill boundary. The biobarrier is a treatment remedy for contaminated groundwater and not a physical barrier to preventing flow of groundwater. The remnants of the plume are expected to attenuate over time, and groundwater monitoring will continue to check for future potential migration.

Question/Comment: Groundwater up-gradient of Harrison Bayou is highly contaminated, and the contaminant plume emanating from the landfill is discharging to Harrison Bayou. However, there is no reason to believe that Harrison Bayou acts as a complete barrier to groundwater flow. A portion of the contaminant plume may extend beyond the bayou. The Army should install monitor wells to the east of Harrison Bayou to determine the full extent of groundwater contamination.

Response: Since 1999, the Army has collected quarterly surface water samples from three locations in Harrison Bayou. During August 2003 and August 2007, perchlorate was detected in the surface water samples collected from one sampling location in Harrison Bayou (HBW-1) indicating there is some discharge by seepage into Harrison Bayou. Except for the 2 quarters, perchlorate was not detected in any other samples during any other sampling events.

Many wells exist on the east side of Harrison Bayou. The pair of wells closest to the east is 18WW10 (shallow) and 18WW11 (intermediate), which show no COC contamination.

Question/Comment: The proposed monitor well network will not detect contaminants that flow to the southeast of the down gradient barrier. The Army should install at least one shallow and one intermediate monitor well between the southeast end of the barrier and Harrison Bayou.

The proposed monitor well network does not include an intermediate monitor well between the down gradient barrier and Harrison Bayou. The Army should install an intermediate monitor well next to well 16WW40.

The proposed monitor well network will not detect contaminants that flow thorough the northern portion of the down gradient barrier. The Army should install at least one shallow and one intermediate monitor well between the northern portion of the barrier and Harrison Bayou.

The extent of the contaminant plume in the shallow aquifer north of well 16WW22, and in the intermediate aquifer north of well 16WW41, is unknown. The Army should install at least one shallow well and one intermediate monitor well to the north of these wells.

Response: The need for installation of additional monitoring wells will be evaluated during the remedial design.

Question/Comment: The Army Corps of Engineers determined that the eastern portion of the site is within the floodplain of Harrison Bayou. It is not clear, however, whether any portion of the landfill itself is in the floodplain. The Army should determine whether any portion of the landfill is within the floodplain. If it is, steps should be taken to protect the landfill from the effects of flooding.

Response: The southeastern edge of the landfill is within the floodplain (U.S. Department of Housing and Urban Development, Flood Hazard Boundary Map, Harrison County, Texas, Unincorporated Area, Community Panel Number 480847 0004 A, Effective date: September 6, 1977, Converted by Letter Effective 11/1/89). This was known at the time the record of decision was signed for design and construction of the landfill. The southeastern portion of the landfill was designed with a compacted soil berm to protect the cap from flood waters. Additionally, the landfill cap is inspected periodically and maintenance is performed as necessary. The design and the follow-up inspection/maintenance activities are expected to be sufficient to protect the landfill from the effects of flooding.

Question/Comment: The Army is proposing only one sampling point on Harrison Bayou near site 16. Thus, if contaminants are detected, the Army will not be able to determine whether they are coming from site 16 or from an upstream source. In addition, this single sampling point will not detect any site 16 contaminants that enter Harrison Bayou downstream of the point. That is, it will not detect contaminants that may flow around the northern end of the biobarrier, or through the barrier if it fails to function as intended.

Response: Based on groundwater flow and the proximity of Harrison Bayou, sampling location HBW-1 is considered the location most likely to reveal contamination resulting from LHAAP-16. Continued sampling of HBW-1 or a nearby location will be required by the ROD for LHAAP-16. In accordance with a 1999 agreement between Army, TCEQ, and EPA, the Army currently collects quarterly surface water samples from HBW-1 plus two other locations in Harrison Bayou - HBW-10, which is upstream, and HBW-7, which is downstream. While the Army, TCEQ, and EPA might agree to alter the locations of HBW-7 and HBW-10 at some later date, perchlorate results over the last 10 years have indicated that HBW-1 is the location of greatest concern.

In addition, the selected remedy also includes a network of monitoring wells down gradient of the biobarrier in addition to the surface water sampling. Therefore, concentrations of groundwater that has the potential to enter into Harrison Bayou would be known.

Question/Comment: Although Harrison Bayou was not flowing on October 19, 2010, there was a pool of standing water in the streambed. This pool was about 30 feet upstream of well 16WW40, and in the same area as the seep that was sampled in 1995. The pool was approximately 20 feet long, three feet wide, and a few inches deep. This pooled water may be groundwater that has discharged to the streambed. During periods when Harrison Bayou was not flowing, the Army should monitor the streambed for pools of water. If they are present, they should be sampled. The Army should also monitor the banks of Harrison Bayou for seeps and should attempt to sample any that are discovered.

Response: Previous sampling of the standing water in Harrison Bayou indicated that in the past contaminated groundwater discharged by seepage into Harrison Bayou. Because the basis for sampling is protection of human health by protecting the surface water that flows through Harrison Bayou to Caddo Lake, continued sampling of standing water in pools will serve no purpose. Periodic sampling of surface water is already conducted on a quarterly basis at three locations in Harrison Bayou. The banks of Harrison Bayou will be inspected for locations of possible seeps.

Question/Comment: The Army performed a 'streamlined' Human Health Risk Assessment for Harrison Bayou at site 16. This risk assessment found that the excess lifetime cancer risk for dermal contact with Harrison Bayou surface water was 1.62 x 10^{-5}. This is higher than the lower bound (1.0 x 10^{-6}) of the EPA target risk range. The streamlined assessment did not estimate the human health risk from drinking the water, nor did it estimate the effects that the water could have on Caddo Lake. The Army stated that a full risk assessment of Harrison Bayou would be conducted as part of the Group 2 risk assessment. However, site 16 does not appear to have been included in the Group 2 risk assessment. The Army should perform a full Human Health Risk Assessment for Harrison Bayou at site 16.

Response: The calculated risk from surface water (1.62×10^{-5}) was within the range of acceptable risk levels for excess lifetime cancer risk (1×10^{-4} to 1×10^{-6}). The Group 2 Risk Assessment included a risk assessment for Harrison Bayou and sampling location HBW-1, which is associated with LHAAP-16 was included as part of that assessment. Additionally the risk assessment report states "because the depth of this surface water body ranges from a few inches to a few feet, it is unlikely that it would be used to any significant extent for swimming; therefore, the incidental ingestion of surface water is not evaluated".

Question/Comment: Concentrations of antimony and thallium that exceed the EPA MCL are commonly detected in groundwater at site 16. However, the Army has not included antimony or thallium as contaminants of concern (COC). The Army should either include antimony and thallium as a COCs for groundwater at site 16, or explain why they are omitted.

Response: Antimony and thallium are commonly found in groundwater and were detected in groundwater at LHAAP-16. However, they were not found to be significant contributors to cancer risk or non-cancer hazard in groundwater at LHAAP-16 during the human health risk assessment conducted for the site (Jacobs, 2001). The detections of antimony and thallium were erratic and did not appear to represent a plume of contamination. Additionally, they were not detected above background levels in soil at the landfill. These factors indicated that their occurrence was unlikely to be associated with contamination from the landfill. The detections of antimony in groundwater were also within the range of groundwater background values at Longhorn AAP (Shaw, 2007) indicating antimony is naturally occurring at the site. Therefore, antimony has not been included in the list of contaminants of concern at the site. Since thallium does not have a background value and has had historically high detection limits (2003 and 2004 analytical results), additional groundwater sampling for thallium will be integrated into the RD phase for LHAAP-16.

Question/Comment: The Army is using reporting limits for thallium in groundwater that are higher than the EPA MCL. Thus, concentrations of thallium that exceed the MCL may be undetected or unreported. The Army should use a thallium reporting limit that is less than the MCL.

Response: Given the results from 1997 (which had appropriate detection limits) and the lack of significant soil results, the U.S. Army considered thallium in the LHAAP-16 groundwater samples to be naturally occurring sporadic detections that were unrelated to site contamination. However, the Army concurs that analytical results in 2003 and 2004 samples had high detection limits and drive the need for further evaluation of thallium. Thus, thallium will be added to the COC list and will be the subject of additional groundwater monitoring. Monitoring results will be evaluated at the first five-year review to determine if any further monitoring for thallium is warranted.

Question/Comment: High concentrations of dioxins and/or furans have been detected in surface water and groundwater at site 16. However, neither dioxins nor furans are included as COCs for surface water or groundwater. The Army should either include dioxins and furans as COCs, or explain why they are omitted.

Response: The concentrations of dioxins/furans were evaluated as a composited value for total dioxins/furans based on relative toxicities of the individual chemicals. That composited value is the toxicity equivalent (TEQ), and it can be directly compared with the MCL for dioxin. The highest TEQ dioxin concentration was lower than the MCL, so dioxins/furans were not selected as a COC.

Question/Comment: The Army's cleanup level for perchlorate is 26 µg/L. This is TCEQ's groundwater medium specific concentration for residential use (GW-Res). However, the EPA's Health Advisory (HA) level for perchlorate is 15 µg/L. Although the HA is not an enforceable MCL, it is reasonable to assume that when it is finally established, the perchlorate MCL will be similar to the HA. The Army should explain why it did not use the HA level as the cleanup level.

Response: The cleanup level for perchlorate is 26 µg/L, from the TCEQ GW-Res value, which is enforceable in the State of Texas. The Army does not propose unenforceable limits as cleanup levels. If enforceable limits change in the future, or are newly introduced, the difference between the cleanup level and any such new limits will be a subject for discussion during the five-year reviews.

Question/Comment: The final details of the remedial action will be presented in a Remedial Design (RD). The Army should make the RD available for public review and comment as soon as it is developed. The Army's Proposed Plan does not mention the development of a contingency plan to be invoked if the remedial actions are not performing satisfactorily. A contingency plan should be included in the RD.

Response: The public will be provided with updates on remedial design and remedial action status through the RAB meeting and any concerns can be addressed through this forum. The RD will include performance objectives, schedule and other design criteria and will follow established regulatory guidance for MNA.

The concept of a contingency plan for what to do if the remedy is unsuccessful as implemented is inherent in the process of remediation. The remedy must be determined to be operating properly and successfully. Other opportunities for implementing contingency plans will occur with each five-year review.

Question/Comment: The Army reported an average groundwater speed in the shallow zone of 36.7 ft/yr. However, groundwater speeds in the shallow zone range from 0.44 ft/yr - 990 ft/yr.

The higher values may be associated with paleochannels, while the lower values may be associated with ancient overbank deposits that border the paleochannels. When evaluating the transport of contaminants in groundwater, we are usually more concerned with the contaminants that flow most rapidly, rather than those that flow at average or lower speeds.

Response: Noted. The groundwater velocity is not directly measured, but is estimated from groundwater gradients and the average of hydraulic conductivities measured in individual wells. There can be considerable variability of hydraulic conductivity from well to well, so using the average hydraulic conductivity is reasonable for calculating the overall groundwater velocity for the entire site.

Question/Comment: Alternative 7 seems to be the path of least resistance rather than a proactive approach. It appears the Army is trying to do as little as possible for a very contaminated site and not fix the problems for LHAAP-16. The relative low cost was based on the Army's 30 year payout and the possible length of time to remediate the landfill is projected to be 280 years. More investigation should be conducted before finalizing the plans for Site 16 Landfill.

Response: More investigation is not considered necessary to understand the contamination and hydrogeology at LHAAP-16. Additional investigations are unlikely to alter the conclusions that have led to the development of remedial alternatives for the site. Delaying implementation of a remedy to perform more investigations would be less protective of human health than proceeding with the preferred remedy. Besides actively treating the more contaminated portions of the groundwater, the preferred remedy will require monitoring, control of groundwater use, and periodic review of the conditions of the site. The components of the remedy that apply to the more contaminated portions of the groundwater would be implemented within a few years – well within the 30 year period of the cost estimate. Due to the future land use, it is reasonable to utilize monitored natural attenuation to address the remaining contamination over a much longer time period. The preferred remedy has been deemed to be protective of the human health and the environment.

Question/Comment: The Army's proposal for dealing with this highly contaminated landfill consist mostly of future monitoring, periodic groundwater water treatment, and implementing some small barrier walls to hopefully slow down the migration of contaminated groundwater into nearby Caddo Lake. Unfortunately, this is already happening, although the Army claims to not know to what extent. Site 16 landfill remedy has a projected cost of a little less than 2 million dollars for its proposed 30 year clean-up plan. The Army says it will possibly take 280 years to complete the site 16 landfill clean-up; this must indicate that the site is highly contaminated.

Response: A landfill cap and cover system was placed over the site and was completed as part of an early IRA. Landfill cap is a presumptive remedy for municipal landfills (USEPA, 1993) and for military landfills (USEPA, 1996). A landfill cap and cover system eliminated the direct exposure pathway to source area waste material, preventing contaminant transport to surface water via surface runoff, and reducing leaching of contaminants to the groundwater The IRA was intended to be consistent with the final remedy and is considered a component of the final remedy being proposed for LHAAP-16.

Rather than slowing the migration of the contamination, the proposed biobarriers and bioremediation injections are intended to destroy much of the identified contamination. The active remedies that apply to the more contaminated portions of the groundwater would be implemented first and followed by monitored natural attenuation. Due to the future land use, it is reasonable for the preferred alternative to utilize monitored natural attenuation to address the areas outside of the active remedies over a much longer time period.

Question/Comment: Does the Army have a plan for what it intends to do after the first 30 year segment of the clean-up project has been completed? Could it possibly be the same remedy continued, or a new plan at a much greater cost? Or, could it be that nothing will be done because the sands of time have by then washed away all the records and memory of site 16, leaving it for future generations to unknowingly suffer from and possibly have to deal with?

Response: The expectation at this time is that the remedy would continue. At the five-year reviews, the remedy is evaluated and adjusted or changed if necessary.

Question/Comment: The remediation cost is $183.00 per day for LHAAP-16 for 'no' removal of many "known" and "unknown" toxic chemicals buried at the site. Site 16 landfill has been determined by the EPA to be so contaminated it is listed as a Federally Funded Military Superfund Clean-up site. There are most likely metal containers of toxic chemicals buried at the site that will eventually rust through and cause additional soil and groundwater contamination beyond what is currently known or detected.

Response: A detailed analysis of several alternatives including landfill removal was conducted in accordance with the evaluation criteria identified in the NCP (40CFR 300.430). Advantages, disadvantages, and trade-offs were considered as part of the evaluation process during the feasibility study (Jacobs, 2002). The selected remedy for LHAAP-16 was preferred over other alternatives because it provides the best combination of major trade-offs, is protective of human health and the environment and is compliant with regulatory requirements.

Question/Comment: Nearby Caddo Lake may eventually be home to this toxic waste since it is migrating through the soil and groundwater in that direction.

Response: The history of LHAAP-16 indicates the contamination migrates via groundwater flow, not through transport of soil. Contaminated groundwater does exist at LHAAP-16, but is not flowing into Caddo Lake. While sample results for Harrison Bayou surface water indicate that it is within the allowable water quality limits for the contaminants of concern, the groundwater near the bayou has elevated concentrations of those contaminants. The concern for preventing seepage of contaminants to the bayou was a significant factor in proposing a remedial action that includes a biobarrier to intercept that contamination.

3.2 Technical and Legal Issues

This section is used to expand on technical and legal issues. However, there are no issues of that nature beyond the technical issues already discussed in **Section 3.1**.

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Glossary of Terms

Glossary of Terms

Administrative Record File – The body of reports, official correspondence, and other documents that establishes the official record of the analysis, clean up, and final closure of a site.

ARARs – Applicable or relevant and appropriate requirements. Refers to the federal and state requirements that a selected remedy will attain.

Attenuation – The process by which a compound is reduced in concentration over time, through absorption, adsorption, degradation, dilution, and/or transformation.

Background Levels – Naturally-occurring concentrations of inorganic elements (metals) that are present in the environment and have not been altered by human activity.

Baseline Ecological Risk Assessment (BERA) – A study conducted as part of a remedial investigation to determine the risk posed to environmental receptors by site-related chemicals.

Baseline Human Health Risk Assessment (BHHRA) – A study conducted as part of a remedial investigation to determine the risk posed to human health by site-related chemicals.

Characterization – The compilation of available data about the waste site to determine the rate and extent of contaminant migration resulting from the site, and the concentration of any contaminants that may be present.

Chemicals of Concern (COCs) – Those chemicals that significantly contribute to a pathway in an exposure model of a hypothetical receptor (e.g., a child that resides on a site). They exceed either the calculated numerical limit for cumulative site carcinogenic risk (1 in 10,000 exposed individuals) or the calculated numerical limit of 1 for non-carcinogenic effects, a value proposed by the USEPA.

Chemical of Potential Concern (COPCs) – Those chemicals that are identified as a potential threat to human health or the environment and are evaluated further in the baseline risk assessment. COCs are a subset of the COPCs that are identified in the Remedial Investigation/Feasibility Study as needing to be addressed by the response action proposed in the Record of Decision.

Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) – CERCLA was enacted by Congress in 1980 and was amended by the Superfund Amendments and Reauthorization Act in 1986. CERCLA provides federal authority to respond directly to releases or threatened releases of hazardous substances that may endanger public health or the

Glossary of Terms (continued)

environment. CERCLA established prohibitions and requirements concerning closed and abandoned hazardous waste sites and established the Superfund Trust Fund.

Contaminant Plume – A column of contamination with measurable horizontal and vertical dimensions that is suspended and moves with groundwater.

Exposure – Contact of an organism with a chemical or physical agent. Exposure is quantified as the amount of the agent available at the exchange boundaries of the organism (e.g., skin, lungs, gut) and available for absorption.

Federal Facility Agreement – A binding legal agreement among USEPA, TCEQ, and U.S. Army that sets the standards and schedules for the comprehensive remediation of Longhorn Army Ammunition Plant.

Groundwater – Underground water that fills pores in soil or openings in rocks to the point of saturation.

Human Health Risk Assessment – A study conducted as part of a remedial investigation to determine the risk posed to human health by site-related chemicals.

Maximum Contaminant Level (MCL) – The maximum contaminant level is the maximum permissible level of a contaminant in a public water system. MCLs are defined in the Code of Federal Regulation (40 CFR 141, National Primary Drinking Water Regulations, which implement portions of the Safe Drinking Water Act). The TCEQ has adopted MCLs as the regulatory cleanup levels for both industrial and residential uses. Any detected compound in the groundwater samples with a MCL was evaluated by comparing it to its associated MCL.

National Priorities List (NPL) – The USEPA's list of the most serious uncontrolled or abandoned hazardous waste sites identified for possible long-term remedial action under Superfund. USEPA is required to update the NPL at least once a year. A site must be on the NPL to receive money from the Trust Fund for remedial action.

Organic Compounds – Carbon compounds such as solvents, oils, and pesticides. Most are not readily dissolved in water.

Perchlorate – Ammonium perchlorate is a strong oxidizing compound that was used in various industries (solid rocket and jet propellant, medical field, and other processes).

Glossary of Terms (continued)

Record of Decision – A legal document presenting the remedial action selected for a site or operable unit. It is based on information and technical analyses generated during the remedial investigation/feasibility study process and consideration of public comments on the proposed plan and community concerns.

Remedial Investigation – A study designed to gather data needed to determine the nature and extent of contamination at a Superfund site.

Resource Conservation and Recovery Act (RCRA) – Gives USEPA the authority to control the generation, transport, treatment, storage, and disposal of hazardous waste. RCRA focuses only on active and future facilities and does not address abandoned or historical sites.

Responsiveness Summary – A summary of oral and/or written comments received during the proposed plan comment period, including responses to these comments. The responsiveness summary is a key part of a ROD highlighting community concerns.

Proposed Plan – A plan for a site cleanup that proposes a recommended or preferred remedial alternative. The Proposed Plan is available to the public for review and comment. The preferred alternative may change based on public and other stakeholder input.

Superfund Amendments and Reauthorization Act (SARA) – Amended CERCLA in 1986. SARA resulted in more emphasis on permanent remedies for cleaning up hazardous waste sites, increased the focus on human health problems posed by hazardous waste sites, and encouraged greater citizen participation in making decisions on how sites should be cleaned up.

Surface Media – The soil (surface or subsurface), surface water, and sediment present at a site as applicable.

Superfund – The common name used for CERCLA; also referred to as the Trust Fund. The Superfund Program was established to help fund cleanup of hazardous waste sites. It also allows legal action to force those responsible for sites to clean them up.

Trichloroethene (TCE) – TCE is a colorless or blue liquid with an odor similar to ether. It is man-made and does not occur naturally in the environment. TCE was once commonly used to remove oils and grease from metal parts and is used in the dry cleaning industry.

Appendix A

Public Meeting Newspaper and Media Notices

PUBLIC NOTICE
THE UNITED STATES ARMY INVITES PUBLIC COMMENT ON THE PROPOSED PLAN FOR ENVIRONMENTAL SITE LHAAP-16
LONGHORN ARMY AMMUNITION PLANT, TEXAS
PUBLIC MEETING ON OCTOBER 19, 2010, AT THE CADDO LAKE STATE PARK RECREATIONAL FACILITY

The U.S. Army is the lead agency for environmental response actions at Longhorn Army Ammunition Plant (LHAAP). In partnership with Texas Commission on Environmental Quality and the U.S. Environmental Protection Agency Region 6 (USEPA), the U.S. Army has developed the Proposed Plan for NPL site LHAAP-16. Although the Proposed Plan for LHAAP-16 identifies the preferred remedy for the site, the U.S. Army welcomes the public's review and comments. Beginning on October 10, 2010 copies of the Proposed Plan and supporting documentation will be available for public review at the Marshall Public Library, 300 S. Alamo, Marshall, Texas, 75670. The public comment period is October 10, 2010, through November 9, 2010. **The public meeting will be held on Tuesday, October 19, 2010 at the Caddo Lake State Park Group Recreation Hall from 7:00 PM to 9:00 PM.** Caddo Lake State Park is located at 245 Park Road 2 near Karnack, Texas off of FM 2198 between SH 43 and Old Farm to Market Road 134, approximately 1 mile north from the Karnack Pos Office (and front gate of the former Longhorn Army Ammunition Plant). The park entrance fee will be waived for the attendees of this meeting. Questions, comments, and responses on the Proposed Plan will be recorded by a court reporter during the public meeting. Written comments will be accepted throughout the public comment period.

Longhorn Army Ammunition Plant (LHAAP) is an inactive, government-owned, formerly contractor-operated and -maintained industrial facility located in central-east Texas in the northeastern corner of Harrison County. The installation occupies nearly 8,416 acres between State Highway 43 at Karnack, Texas, and the western shore of Caddo Lake. LHAAP was established in December 1941 near the beginning of World War II for the manufacture of trinitrotoluene. Other past industrial operations at the installation included the use of secondary explosives, rocket motor propellants, and various pyrotechnics, such as illuminating and signal flares and ammunition. LHAAP was found to have actual and potential releases of hazardous substances or pollutants or contaminants associated with past operations, and it was added to the National Priorities List (NPL) in 1990.

LHAAP-16 encompasses an area of approximately 20 acres in the south-central portion of LHAAP. Harrison Bayou runs along the northeastern edge of LHAAP-16. The landfill was established in the 1940s and was used for disposal of solid and industrial wastes until the 1980s when disposal activities were terminated. The Army and USEPA signed a Record of Decision in 1995 approving an interim remedial action for LHAAP-16 to mitigate potential risks posed by buried source material at the landfill. The interim remedial action included the construction of a multilayer landfill cap, which was completed in 1998.

The current Proposed Plan for LHAAP-16 addresses groundwater contamination as well as material buried in the landfill at the site. Continued maintenance of the existing landfill cap has been retained as a component of most of the remedial alternatives considered for the site. In addition, most alternatives include specific measures for groundwater remediation, and all alternatives utilize some degree of land use controls (LUCs). The full list of alternatives is: I) No action; 2) Cap, enhanced groundwater extraction; 3a) Cap, monitored natural attenuation; 3b) Cap, hot spot extraction, monitored natural attenuation; 4) Cap, passive groundwater treatment; 5a) Landfill hotspot removal, passive groundwater treatment; 5b) Complete landfill removal, passive groundwater treatment; 6) Landfill Source Treatment (in situ), monitored natural attenuation; and 7) Cap, monitored natural attenuation, in situ enhanced bioremediation, passive bio barriers. Based on available information, the preferred remedy is Alternative 7, which addresses the groundwater contamination at LHAAP-16 in a manner that is cost-effective and consistent with the Army's intent to transfer the site to the USFWS for use as a wildlife refuge. Alternative 7 would be protective of human health due to the implementation of LUCs prohibiting unauthorized use of the cap and groundwater, thereby eliminating the potential contaminant exposure pathways for human receptors. The bioremediation and bio barriers would reduce contaminant concentrations in groundwater and prevent discharge of contamination to Harrison Bayou.

For further information or to submit written comments, contact: Dr. Rose M. Zeiler, Longhorn Army Ammunition Plant,
P.O. Box 220, Ratcliff, Arkansas, 72951; phone number 479-635-0110 or e-mail rose.zeiler@us.army.mil.

MEDIA RELEASE

The United States Army has prepared a Proposed Plan for the environmental site LHAAP-16 Landfill, at the Longhorn Army Ammunition Plant. The Proposed Plan is the document that describes LHAAP-16 and its proposed remedies. The Proposed Plan was developed to facilitate public involvement in the remedy selection process.

Copies of the Proposed Plan and other supporting documentation for LHAAP-16 are available for public review at the Marshall Public Library, 300 S. Alamo, Marshall, Texas, 75670. The public comment period is October 10, 2010 through November 9, 2010.

A public meeting will be held on October 19, 2010, from 7:00 to 9:00 p.m. at the Caddo Lake State Park Group Recreation Hall located at 245 Park Road 2 off FM 2198, between SH 43 and Old Farm to Market Road 134 near Karnack, Karnack, Texas approximately 1 mile north from the front gate of the former Longhorn Army Ammunition Plant. The park entrance fee will be waived for attendees of this meeting.

All written public comments on the Proposed Plan must be postmarked on or before November 9, 2010. Written comments may be provided to Dr. Rose M. Zeiler, Longhorn Army Ammunition Plant, P.O. Box 220, Ratcliff, Arkansas, 72951 or e-mailed to rose.zeiler@us.army.mil. E-mailed comments must be submitted by close of business on November 9, 2010.

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DRAFT FINAL
RECORD OF DECISION
LHAAP-17, BURNING GROUND NO. 2/FLASHING AREA, GROUP 2
LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS

Prepared for

U.S. Army Corps of Engineers
Tulsa District
1645 South 101st East Avenue
Tulsa, Oklahoma

Prepared by

Shaw Environmental, Inc.
1401 Enclave Parkway, Suite 250
Houston, Texas 77077

Contract No. W912QR-04-D-0027, Task Order No. DS02
Shaw Project No. 117591

October~~June~~~~November~~ 2012~~1~~

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Glossary of Terms

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Acronyms and Abbreviations

µg/L	micrograms per liter
ARAR	applicable or relevant and appropriate requirement
BERA	baseline ecological risk assessment
bgs	below ground surface
BHHRA	baseline human health risk assessment
CDI	chronic daily intake
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
COC	chemical of concern
COPC	chemical of potential concern
COPEC	chemical of potential ecological concern
CSM	conceptual site model
DCA	Dichloroethane
DCE	Dichloroethene
DNT	Dinitrotoluene
DPT	direct-push technology
EcoPRG	ecological preliminary remediation goal
ECP	environmental condition of property
EEQ	ecological effects quotient
EPC	exposure point concentration
ESD	Explanation of Significant Differences
FFA	Federal Facility Agreement
FS	feasibility study
ft^2	square feet
GWP-Ind	TCEQ soil MSC for industrial use based on groundwater protection
HEAST	Health Effects Assessment Summary Tables
HI	hazard index
HQ	hazard quotient
HRC®	Hydrogen Release Compound®
IRIS	Integrated Risk InformationSystem
Jacobs	Jacobs Engineering Group
LHAAP	Longhorn Army Ammunition Plant
LTM	long-term monitoring
LUC	land use control
MCL	maximum contaminant level
mg/kg	milligrams per kilogram (parts per million [ppm] – soil analyses)
mg/kg-day	milligrams per kilogram per day
MNA	monitored natural attenuation
MOA	memorandum of agreement
MSC	medium-specific concentration
NCP	National Oil and Hazardous Substances Pollution Contingency Plan

Acronyms and Abbreviations (continued)

NOAEL	no-observed adverse effect level
NPL	National Priorities List
O&M	operation and maintenance
PEC	Planteco Environmental Consultants, LLC
Plexus	Plexus Scientific Corporation
RAB	Restoration Advisory Board
RAO	remedial action objective
RCRA	Resource Conservation and Recovery Act
RD	remedial design
RFA	RCRA Facility Assessment
RfD	reference dose
RI	remedial investigation
ROD	record of decision
RRS	Risk Reduction Standards
SARA	Superfund Amendments and Reauthorization Act
SDWA	Safe Drinking Water Act
Shaw	Shaw Environmental, Inc.
STEP	Solutions to Environmental Problems, Inc.
SVOC	semivolatile organic compound
TAC	Texas Administrative Code
TCDD	tetrachlorodibenzo-p-dioxin
TCE	Trichloroethene
TCEQ	Texas Commission on Environmental Quality
TEC	toxicity equivalence concentration
TNT	Trinitrotoluene
TRV	toxicity reference level
U.S. Army	U.S. Department of the Army
UCL	upper confidence limit
USACE	U.S. Army Corps of Engineers
USAEHA	U.S. Army Environmental Hygiene Agency
USATHAMA	U.S. Army Toxic and Hazardous Materials Agency
USC	U.S. Code
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
VC	vinyl chloride
VOC	volatile organic compound

1.0 The Declaration

1.1 Site Name and Location

LHAAP-17, Burning Ground No. 2/Flashing Area, Group 2

Longhorn Army Ammunition Plant
Karnack, Texas

Comprehensive Environmental Response, Compensation, and Liability Information System, U.S. Environmental Protection Agency (USEPA) Identification Number: TX6213820529.

1.2 Statement of Basis and Purpose

This decision document presents the selected remedy for LHAAP-17, Burning Ground No. 2/Flashing Area, located at the Longhorn Army Ammunition Plant (LHAAP) in Karnack, Texas. The remedy was chosen in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980, as amended by the Superfund Amendments and Reauthorization Act (SARA) of 1986, and, to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), Code of Federal Regulations (CFR) Title 40 §300.

The remedy selection was based on the Administrative Record for the site, including the remedial investigation (RI) (Jacobs Engineering Group, Inc. [Jacobs], 2001), baseline human health risk assessment (BHHRA) report (Jacobs, 2002), installation-wide baseline ecological risk assessment (BERA) report (Shaw Environmental, Inc. [Shaw], 2007a), feasibility study (FS) (Shaw, 2010), and Proposed Plan (U.S. Department of the Army [U.S. Army], 2010).

The U.S. Army is the lead agency for the environmental response actions at LHAAP. The U.S. Army, USEPA, and the Texas Water Commission (currently known as the TCEQ) entered into the FFA for remedial activities at LHAAP on December 30, 1991. The U.S. Army is acting in partnership with the USEPA Region 6 and the Texas Commission on Environmental Quality (TCEQ), the regulatory agencies providing technical support, project review and comment, and oversight of the U.S. Army cleanup program. The USEPA and the U.S. Army jointly select the remedy and TCEQ concurs with the selected remedy in this Record of Decision (ROD).

1.3 Assessment of the Site

The response action selected in this ROD is necessary to protect the public health or welfare or the environment from actual or threatened releases of hazardous substances, pollutants, or contaminants into the environment.

1.4 Description of the Selected Remedy

The selected remedy for LHAAP-17 protects human health and the environment by preventing human and ecological receptors from exposure to contaminated soil and contaminated groundwater. The human health scenarios evaluated were based on the hypothetical future maintenance worker. In the soil, chemicals of concern (COCs) are explosives (2,4,6-trinitrotoluene [TNT], 2,4-dinitrotoluene [DNT], 2,6-DNT) and perchlorate (potential soil COC based on groundwater concentrations); and chemicals of potential ecological concern (COPECs) are explosives (2,4,6-TNT, 2,4-DNT, 2,6-DNT); dioxins (2,3,7,8-tetrachlorodibenzo-p-dioxin [TCDD] toxicity equivalence concentration [TEC]); and barium. In the shallow groundwater zone, the COCs are perchlorate and volatile organic compounds (VOCs) (1,2-dichloroethane [DCA], 1,1-dichloroethene [DCE], cis-1,2-DCE, trichloroethene [TCE], and vinyl chloride [VC]). In the intermediate groundwater zone, the COCs are TCE and its daughter products (DCE and VC). The contaminated soil has been identified as a principal threat material. The components of the selected remedy are summarized below:

- Contaminated soil removal with off-site disposal to protect the hypothetical future maintenance worker and ecological receptors and to eliminate the soil-to-groundwater pathway.
- Extraction and treatment of groundwater until the trigger level of 20,000 micrograms per liter (µg/L) of perchlorate is reached. The trigger level in this ROD is an interim cleanup level. Upon reaching the trigger level, the remedial action will transition from the initial measure of groundwater extraction to the primary remedy of monitored natural attenuation (MNA). Reduction of the perchlorate concentration to the trigger level is anticipated to expedite MNA.
    - If the 20,000 µg/L of perchlorate level is not reached after approximately 1.5 years, a contingency remedy of in situ bioremediation will be implemented to reduce the perchlorate levels more quickly so the conditions become amenable for TCE to attenuate naturally.
- MNA to confirm protection of human health and the environment by documenting that the contaminated groundwater remains localized with minimal migration and that contaminant concentrations are being reduced to cleanup levels.
    - Performance objectives will be evaluated after 2 years of MNA. During those 2 years, monitoring will be quarterly. If MNA is found to be ineffective, a contingency remedy to enhance MNA will be implemented. If MNA is found to be effective, it will be continued, and long-term monitoring (LTM) will be semiannual for 3 years. In subsequent years, LTM will be annual until the next five-year review and annually thereafter until recommended otherwise by the five-year review. The monitoring and reporting associated with this remedy will be used to track the effectiveness of MNA and will continue until recommended otherwise at the five-year review.

- Groundwater Monitoring System Maintenance. A groundwater monitoring system will be implemented to demonstrate the active groundwater treatment and MNA remedies are protective of human health and the environment. The groundwater monitoring system will remain in place until the groundwater cleanup levels specified in Table 2-10 are achieved. If any of the elements of the groundwater monitoring system are damaged, destroyed, or become ineffective, they will be repaired or replaced.

- A land use control (LUC) performance objective to prevent human exposure to contaminated groundwater by prohibiting the potable use of groundwater above the cleanup levels specified in Table 2-10 ~~except for environmental monitoring and testing~~. A preliminary LUC boundary is presented in **Section 2.12.2** and a final LUC boundary will be determined during the RD/Remedial Action. When the ~~cleanup~~ levels of COCs in soil and groundwater allow for unlimited use and unrestricted exposure~~is achieved~~, the LUC will be terminated.

- ~~A LUC performance objective to maintain the integrity of any current or future remedial or monitoring systems to prevent the use of groundwater contaminated above cleanup levels as a potable water source. It will remain in place until groundwater cleanup levels are met.~~

- A LUC performance objective to restrict land use to nonresidential use only. The LUC restricting land use to nonresidential will remain in place until it is demonstrated that the levels of COCs in surface ~~soil~~ and subsurface soil and groundwater are at levels that allow for unlimited use and unrestricted exposure.

- CERCLA five-year reviews until cleanup levels are achieved.

Based on a preliminary natural attenuation evaluation and groundwater modeling, cleanup levels are expected to be met through natural attenuation in approximately 117 years (Shaw, 2010). Specifically, TCE should attenuate to its maximum contaminant level (MCL) in approximately 117 years, 1,2-DCA in 10 years, and perchlorate in 15 years without groundwater extraction and treatment. With groundwater extraction and treatment, cleanup times should be reduced. Considering the lithologic variability, particularly the lateral and vertical change from sand to clay, the time to achieve cleanup levels may vary. In the course of the remedy, the additional monitoring results will allow more accurate time estimates.

The groundwater flow rates are within the normal range for the formation material at the site. Thus, no adverse impact is expected to the surface water during the time it would take natural attenuation to reduce contaminant concentrations to cleanup levels.

A LUC Remedial Design (RD) will be finalized as the land use component of the Remedial Design. Within 21 days of the issuance of the ROD~~Record of Decision~~, the Army will propose deadlines for completion of the R~~emedial~~ D~~esign~~ Work Plan, R~~emedial~~ D~~esign~~, and Remedial Action Work Plan. The documents will be prepared and submitted to EPA and TCEQ ~~for~~

~~Consultation~~ pursuant to the FFA. ~~and~~ T~~t~~he LUC RD~~remedial design that~~ will contain implementation and maintenance actions, including periodic inspections. The groundwater extraction and MNA performance monitoring plan will also be presented in the RD. ~~The U.S. Army, USEPA, and the Texas Water Commission (currently known as the TCEQ) entered into the FFA for remedial activities at LHAAP on December 30, 1991.~~

The Army will implement, maintain, monitor, report on and enforce land use controls at Army-owned property. The Army shall perform those actions related to land use control activities described in this ROD and in the Remedial Design for the ROD. For portions of the Site subject to land use controls that are not owned by the Army, the Army will monitor and report on the implementation, maintenance, and enforcement of land use controls, and coordinate with federal, state, and local governments and owners and occupants of properties subject to land use controls. The Army will provide notice of the groundwater and soil contamination and any land use restrictions referenced in the ROD. The Army will send these notices to the federal, state and local governments involved at this site and the owners and occupants of the properties subject to those use restrictions and land use controls. The Army shall provide the initial notice within 90 days of ROD signature. The frequency of subsequent notifications will be described in the Remedial Design for the ROD. The Army remains responsible for ensuring that the remedy remains protective of human health and the environment. The Army will fulfill its responsibility and obligations under CERCLA and the NCP as it implements, maintains, and reviews the selected remedy.

Upon transfer of Army-owned property, the Army will provide written notice of the land use controls to the transferee of the groundwater and soil contamination and any land use restrictions referenced in the ROD. Within 15 days of transfer, the Army shall provide EPA and TCEQ with written notice of the division of implementation, maintenance, and enforcement responsibilities unless such information has already been provided in the LUC RD. The LUC RD will address the procedures to be used by the Army and the transferee to document compliance with the LUCs described in this ROD. In the event property is transferred out of Federal control, the land use controls relating to property and groundwater restrictions shall be recorded in the deed and shall be enforceable by the United States and the state of Texas.~~The U.S. Army will be responsible for implementation, maintenance, periodic inspection, reporting on, and enforcement of the LUCs in accordance with the RD. Although the U.S. Army may transfer these responsibilities to another party through property transfer agreement or other means, the U.S. Army will remain ultimately responsible for: (1) CERCLA §121(c) five-year reviews; (2) notification of the appropriate regulators of any known LUC deficiencies or violations; (3) access to the property to conduct any necessary response; (4) reservation of the authority to change, modify or terminate the LUCs and any related transfer or lease provisions; and (5) ensuring the protectiveness of the selected remedy.~~

U.S. Army and regulators will consult to determine appropriate enforcement actions should there be a failure of a LUC objective at these sites after they have been transferred. ~~The U.S. Army shall consult with TCEQ and obtain USEPA concurrence prior to termination or significant modification of a LUC, or in the highly unlikely event of a land use change inconsistent with the industrial/recreational use assumptions of the remedy. (There is no reasonably anticipated use of the property for other than wildlife refuge purposes.) In the event that TCEQ and/or USEPA and the U.S. Army agree with respect to any significant modification of the selected remedy, including the LUC component of the selected remedy, the remedy will be changed consistent with the FFA, 40 CFR 300.435(c)(2).~~

The management strategy at LHAAP is to approach each site separately to address human health issues and to approach the sites by sub-area to address ecological risk (Shaw, 2007a). Thus, the implementation of this remedy at LHAAP-17 is independent of any other remedial action at LHAAP to address human health issues. To address ecological risk, LHAAP-17 was grouped with several other sites as part of the Waste Sub-Area. The final COPECs in soil that require remedial action in the Waste Sub-Area are barium, 2,4-DNT, 2,6-DNT, 2,4,6-TNT, and dioxins (Shaw, 2010). The remedial actions at LHAAP-17 will be sufficient to remove ecological risks for the sub-area. This management strategy is considered to be endorsed by regulators as evidenced by the regulatory approval of the BERA (Shaw, 2007a).

1.5 Statutory Determinations

The selected remedy is protective of human health and the environment, complies with Federal and State requirements that are applicable or relevant and appropriate to the remedial action, and is cost-effective. In addition, the remedy offers long-term effectiveness through excavation of soil and the implementation of LUCs, which will minimize the potential risk to the hypothetical future maintenance worker posed by the contaminated soil and groundwater. Furthermore, evaluation of MNA including routine monitoring of the attenuation until cleanup levels are met would document the effectiveness of the selected remedy. The selected remedy is easily and immediately implementable and has a moderate cost compared to the other alternatives considered for LHAAP-17 with the exception of Alternative 1 (No Action).

The groundwater extraction component of the selected remedy satisfies the statutory preference for treatment as a principal treatment element of the remedy. The MNA component does not address the statutory preference for treatment to the maximum extent practicable; MNA is a passive remedial action using natural processes.

The selected remedy would reduce the toxicity, mobility, or volume of contaminants in the groundwater through active and passive remedial actions. There is no known principal threat material or contaminant source in the LHAAP-17 groundwater.

Because hazardous substances, pollutants, or contaminants will remain at the site above levels that allow for unlimited use and unrestricted exposure, a five-year review will be conducted every 5 years to ensure protection of human health and the environment under CERCLA §121(c), U.S. Code (USC) Title 42 §9621(c). In accordance with Texas Administrative Code (TAC) Title 30 §335.566, a notification will be recorded in Harrison County records stating that the site is suitable for nonresidential use and that a prohibition of groundwater potable use ~~(except for environmental monitoring and testing)~~ is in place until the levels of COCs in ~~soil and~~ groundwater achieve cleanup levels. Additionally, a restriction against residential land use will remain in place until the levels of COCs in soil and groundwater allow ~~cleanup levels~~ for unlimited use and unrestricted exposure~~are achieved and that the integrity of any current or future remedial or monitoring systems to prevent the use of groundwater contaminated above cleanup levels as a potable water source must be maintained until those cleanup levels are met~~. Although the U.S. Army may later pass these procedural responsibilities to the transferee by property transfer agreement, the U.S. Army shall retain ultimate responsibility for remedy integrity per the FFA and CERCLA §121.

1.6 ROD Data Certification Checklist

The following information is included in the Decision Summary section of this ROD. Additional information can be found in the Administrative Record for this site.

- Current and reasonably anticipated future land use assumptions and current and potential future beneficial uses of groundwater as identified in the baseline risk assessment and ROD (**Section 2.6**).
- Potential land and groundwater use that will be available at the sites as a result of the selected remedy (**Section 2.6**).
- COCs and their concentrations (**Section 2.7**).
- Baseline risk represented by the COCs (**Section 2.7**).
- Cleanup levels established for COCs and the basis for these levels (**Sections 2.7.3** and **2.8**).
- Absence of source materials constituting principal threats that need to be addressed at this site (**Section 2.11**).
- Key factor(s) that led to selecting the remedy (**Section 2.12**).
- Estimated capital, annual operation and maintenance (O&M), and total present worth costs, discount rate, and the number of years over which the remedy cost estimates are projected (**Section 2.12**).

1.7 Authorizing Signatures

As the lead agency, the U.S. Army issues this ROD for LHAAP-17 which documents the final selected remedy. The undersigned is the appropriate approval authority for this decision.

(*Name*) (*Date)*
Lynne Anderson~~Clarence D. Turner~~
~~Colonel, U.S. Army~~
Chief, Base Realignment and Closure Division

The United States Environmental Protection Agency approves the selected remedy as provided in the ROD for LHAAP-17.

(*Name*) (*Date*)
Samuel Coleman, P.E.
Director
Superfund Division
U.S. Environmental Protection Agency
Region 6

2.0 Decision Summary

2.1 Site Name, Location, and Description

LHAAP-17, Burning Ground No. 2/Flashing Area, Group 2

Longhorn Army Ammunition Plant
Karnack, Texas

Comprehensive Environmental Response, Compensation, and Liability Information System USEPA Identification Number: TX6213820529

Lead Agency: U.S. Army, Department of Defense
Support Agencies: USEPA Region 6, TCEQ

Source of Cleanup Money: U.S. Army, Department of Defense
Site Type: Industrial Facility

The former LHAAP is an inactive, government-owned, formerly contractor operated and maintained, Department of Defense facility located in central east Texas (see **Figure 2-1**) in the northeast corner of Harrison County. LHAAP is approximately 14 miles northeast of Marshall, Texas, and approximately 40 miles west of Shreveport, Louisiana. The former U.S. Army installation occupied 8,416 acres between State Highway 43 at Karnack, Texas, and the southwestern shore of Caddo Lake. The facility can be accessed via State Highways 43 and 134.

LHAAP was placed on the Superfund National Priorities List (NPL) on August 9, 1990. Activities to remediate contamination began in 1990. After its listing on the NPL, the U.S. Army, the USEPA, and the Texas Water Commission (currently known as the TCEQ) entered into a CERCLA §120 FFA for remedial activities at LHAAP. The FFA became effective December 30, 1991. LHAAP operated until 1997 when it was placed on inactive status and classified by the U.S. Army Armament, Munitions, and Chemical Command as excess property. The majority of LHAAP has been transferred by the U.S. Army to the U.S. Fish and Wildlife Service (USFWS) for management as the Caddo Lake National Wildlife Refuge.

LHAAP-17, known as the Burning Ground No. 2/Flashing Area, is a 3.9-acre site located within a heavily wooded section in the southeastern portion of LHAAP (**Figure 2-2**). The site has two 185-feet by 305-feet cleared areas, separated by a gravel access road. The site is covered with grass and scattered brush, has been graded above the surrounding terrain, and is relatively flat.

2.2 Site History and Enforcement Activities

2.2.1 History of Site Activities

LHAAP was established in December 1941 with the primary mission of manufacturing TNT. Production of TNT began at Plant 1 in October 1942 and continued through World War II until August 1945, when the facility was placed on standby status until February 1952. In 1952, the LHAAP facility was reactivated with the opening of Plant 2, where pyrotechnic ammunition, such as photoflash bombs, simulators, hand signals, and tracers for 40 millimeter ammunition, were produced until 1956.

In December 1954, a third facility, Plant 3, began production of solid-fuel rocket motors for tactical missiles. Rocket motor production at Plant 3 continued to be the primary operation at LHAAP until 1965 when Plant 2 was reactivated for the production of pyrotechnic and illuminating ammunition. In the years following the Vietnam conflict, LHAAP continued to produce flares and other basic pyrotechnic or illuminating items for the U.S. Department of Defense inventory. From September 1988 to May 1991, LHAAP was also used for the static firing and elimination of Pershing I and II rocket motors in compliance with the Intermediate-Range Nuclear Force Treaty in effect between the United States and the former Union of Soviet Socialist Republics. LHAAP operated until 1997 when it was placed on inactive status and classified by the U.S. Army Armament, Munitions, and Chemical Command as excess property.

LHAAP-17 was used as a burning ground from 1959 through 1980 (Plexus Scientific Corporation [Plexus], 2005). Bulk TNT, photo flash powder, and reject material from Universal Match Corporation operations were burned at LHAAP-17. In 1959, the materials removed from the former TNT Production Area (LHAAP-29) and the former TNT Waste Disposal Plant (LHAAP-32) during demolition were burned and/or flashed at LHAAP-17. The site was used as a flashing area to decontaminate recoverable metal byproducts until 1980, when it became inactive. Burning trenches were located around the inside perimeter of the previously fenced area and within the open area on the western boundary of the site. As each trench filled with ash, it was covered and a new trench was dug. The waste residues were reportedly removed from the trenches in 1984, and the site was allowed to revegetate (Jacobs, 2002).

2.2.2 History of Investigative Activities

As part of the Installation Restoration Program, the U.S. Army began an environmental investigation in 1976 at LHAAP followed by installation wide assessments/investigations that included the following:

- In 1980, U.S. Army Toxic and Hazardous Materials Agency (USATHAMA) conducted a record search to assess the impact of the LHAAP installation activities including usage, storage, treatment, and disposal of toxic and hazardous materials on the environment, and defined conditions that may have adversely affected human health and the environment (USATHAMA, 1980).

- Contamination Survey – In 1982, as part of the LHAAP contamination survey, Environmental Protection Systems collected six groundwater samples for laboratory analyses. Subsequently in 1987, as part of the Resource Conservation and Recovery Act (RCRA) permit application process, and as a continuation of the contamination survey, U.S. Army Environmental Hygiene Agency (USAEHA) identified, described, and evaluated all solid waste management units at LHAAP (USAEHA, 1987). Units requiring further sampling, investigation, and corrective action were delineated.
- RCRA Facility Assessment (RFA) – In 1988, a preliminary RFA was conducted by the U.S. Army (Maley, 1988). Waste at the various sites was characterized, but no samples were collected.

Several investigations to determine the nature and extent of contamination in the soil, groundwater, surface water, and sediments at LHAAP-17 were conducted and are listed below. Samples were analyzed for VOCs, semivolatile organic compounds (SVOCs), metals, explosive compounds, perchlorate, pesticides, polychlorinated biphenyls, and/or dioxins/furans, depending on the focus of the investigation. For some of the earlier investigations, LHAAP sites were organized into groups, and LHAAP-17 was included in Group 2. The group designation was de-emphasized as the complexities of the individual sites became greater. The following summarizes the investigations at LHAAP-17:

- **Multi-phase investigation of Group 2 sites**: Between 1982 and 1998 numerous investigations were conducted in a phased approach by Jacobs, U.S. Army Corps of Engineers (USACE), and Environmental Protection System. Activities included installation of monitoring wells and analysis of groundwater, surface water, soil, and sediment samples. The results are documented in the RI for Group 2 sites (Jacobs, 2001). **Figures 2-3** and **2-4** show the sample locations at LHAAP-17 for soil and surface water/sediment, respectively. **Figures 2-5** and **2-6** show the well locations for the shallow and intermediate groundwater zones, respectively.
- **Plant-wide perchlorate investigation**: The groundwater investigation was conducted by Solutions to Environmental Problems, Inc. (STEP) from 2000 through 2002 (STEP, 2005).
- **Baseline Human Health Risk Assessment**: The BHHRA (Jacobs, 2002) used data from the investigations conducted through 2001, including the plant-wide perchlorate investigation results up to that time. The report concluded that the soil and groundwater at LHAAP-17 both posed unacceptable carcinogenic risk and non-carcinogenic hazard to the hypothetical future maintenance worker.
- **Environmental Site Assessment**: Media investigated in 2003 included soil and groundwater (Plexus, 2005), although no sampling was conducted at LHAAP-17 for this assessment.

- **Perchlorate treatability demonstration**: The study was conducted by Planteco Environmental Consultants, LLC (PEC) in 2003 and 2004 to demonstrate that perchlorate concentrations in soil can be reduced by soil composting. Organic amendments were added to a 1-acre area in the western portion of LHAAP-17, where the highest concentrations of perchlorate-contaminated soil were located. Decreased concentrations for perchlorate and explosive compounds were observed in the soil, as well as for perchlorate in groundwater (PEC, 2004).
- **Baseline Ecological Risk Assessment**: The BERA (Shaw, 2007a) identified COPECs for the Waste Sub-Area, which includes LHAAP-17. COPECs for the sub-area are addressed in the remedial actions for LHAAP-17. The evaluation was based on environmental investigations from 1993 to 2006.
- **Data gaps**: Additional investigations were conducted by Shaw in 2004 after the BHHRA was finalized to further delineate the extent of groundwater contamination identified during previous sampling events. The results of the 2004 investigation were presented in the *Data Gaps Investigation* (Shaw, 2007b).
- **Feasibility Study**: The FS (Shaw, 2010) was based on the available results from previous investigations. In addition, it included the natural attenuation evaluation based on sampling results from 2009, 2007, and earlier.

2.2.3 History of CERCLA Enforcement Activities

Due to the releases of chemicals from facility operations, the USEPA placed LHAAP on the Superfund NPL on August 9, 1990. Activities to remediate contamination associated with the listing of LHAAP as a Superfund site began in 1990. After the listing on the NPL, the U.S. Army, the USEPA, and the Texas Water Commission (currently known as the TCEQ) entered into a CERCLA §120 FFA for remedial activities at LHAAP. The FFA became effective December 30, 1991.

LHAAP-17 was one of the originally listed NPL sites in the FFA. The FS for LHAAP-17 (Shaw, 2010) was issued in April 2010, and the Proposed Plan (U.S. Army, 2010) was issued in May 2010. This ROD follows that Proposed Plan and precedes the more detailed RD.

2.3 Community Participation

The U.S. Army, USEPA, TCEQ and the LHAAP Restoration Advisory Board (RAB) have provided public outreach to the surrounding community concerning LHAAP-17 and other environmental sites at LHAAP. The outreach program has included fact sheets, media interviews, site visits, invitations to attend quarterly RAB and regulatory review meetings, and public meetings consistent with its public participation responsibilities under Sections 113(k)(2)(B), 117(a), and 121(f)(1)(G) of CERCLA.

The Final Proposed Plan (U.S. Army, 2010) for the selection of the remedy for LHAAP-17 was released to the Administrative Record and made available to the public for review and comment on May 26, 2010. A media release was sent to radio stations KETK, KMSS, KSLA, and KTBS on May 26, 2010. The notice of availability of the Proposed Plan and other related documents in the Administrative Record file was published in *The Shreveport Times* and the *Marshall News Messenger* on May 27, 2010. The newspaper and media notices for the meeting are provided in **Appendix A**. The public comment period for the Proposed Plan began on June 10, 2010 and ended July 10, 2010. A public meeting was held on June 29, 2010 in a formal format and with a court reporter. The transcript for the meeting is part of the Administrative Record. The significant comments (oral or written) are addressed in the Responsiveness Summary, which is included in this ROD as **Section 3.0**.

The Administrative Record may be found locally at the information repository maintained at the following location:

Location: Marshall Public Library
300 S. Alamo
Marshall, Texas 75670

Business Hours: Monday – Thursday 10:00 a.m. – 8:00 p.m.
Friday – Saturday 10:00 a.m. – 5:00 p.m.

2.4 Scope and Role of Response Action

The selected action at LHAAP-17 will prevent potential risks associated with exposure to contaminated groundwater. Although groundwater at LHAAP is not currently being used as drinking water, nor may it be used in the future based on its reasonably anticipated use as a national wildlife refuge, when establishing the remedial action objectives (RAOs) for this response action, the U.S. Army has considered the NCP's expectation to return usable groundwaters to their potential beneficial uses wherever practicable and has also considered the State of Texas designation of all groundwater as potential drinking water, unless otherwise classified, and consistent with 30 TAC 335.563(h)(1) [background total dissolved solids (TDS) content less than or equal to 10,000 mg/L and that occurs within a geologic zone that is sufficiently permeable to transmit water to a pumping well in usable quantities]. The U.S. Army intends to return the contaminated shallow and intermediate groundwater zones at LHAAP-17 to their potential beneficial uses, which for the purposes of this ROD is considered to be attainment of the Safe Drinking Water Act (SDWA) MCLs to the extent practicable, and consistent with 40 CFR §300.430(e)(2)(i)(B&C). For perchlorate, no MCL has been promulgated, so the TCEQ soil medium-specific concentration (MSC) for industrial use based on groundwater protection (GWP-Ind) is used in place of the MCL, in accordance with 30 TAC 335.559(d)(2). If a return to potential beneficial uses is not practicable, the NCP expectation is to prevent further migration of the plume, prevent exposure to the contaminated groundwater, and evaluate further risk reduction.

The selected remedial action will also ensure containment of the plume to prevent potential impact to surface water. The potential exists for contaminated shallow groundwater to migrate to Harrison Bayou.

In addition, the selected action will include groundwater monitoring to demonstrate that the plume is not migrating at levels that present a potential impact to surface water bodies and to verify that contaminant levels are being reduced to cleanup levels.~~when the LUC for groundwater use prohibition may be terminated.~~

2.5 Site Characteristics

This section of the ROD presents a brief comprehensive overview of the LHAAP-17 site characteristics with respect to the conceptual site model (CSM), physical site features, known or suspected sources of contamination, types of contamination, and affected media. Known or potential routes of contaminant migration are also discussed. Detailed information about the site characteristics can be found in the RI (Jacobs, 2001).

2.5.1 Conceptual Site Model

Figure 2-7 illustrates the human health conceptual site model for LHAAP-17. The model presents the human health pathways that may impact a hypothetical future maintenance worker and are being considered for remediation. Those pathways that are likely to be incomplete or have negligible impact are not being considered for remediation. **Figure 2-8** illustrates the ecological conceptual model for LHAAP-17, which is similar to the one presented for human health in terms of the origin and fate and transport mechanisms of the contaminants present at the site. However, only exposure pathways and routes associated with soil are relevant for ecological risk assessment.

Explosive compound releases resulting from the burning of explosive type materials removed from the TNT Production Area and the TNT Waste Disposal Plant are the suspected contamination sources at LHAAP-17. Residual contamination as a result of deposition, spills, and runoff of contamination on the surface poses potential risk to the hypothetical future maintenance worker.

Contamination in the form of VOCs and perchlorate is present in groundwater at LHAAP-17 and poses potential risk to the hypothetical future maintenance worker. Perchlorate and VOC concentrations have been detected consistently throughout the shallow groundwater zone. Two VOCs (1,1-DCE and 1,2-DCA) are found only in the shallow groundwater zone. TCE has been detected in both the shallow and intermediate zones. The horizontal extent of contamination in the shallow and intermediate groundwater zones has been defined as presented in **Figures 2-9** and **2-10**, respectively.

The soil and groundwater at LHAAP-17 may pose a risk for the hypothetical future maintenance worker, and the soil may pose a risk for ecological receptors. Thus the pathways considered for remediation include soil, soil to groundwater, and future industrial groundwater use. Analytical results showing soil contamination are presented in **Figure 2-11**.

2.5.2 Overview of the Site

The site boundary of LHAAP-17 comprises approximately 3.9 acres in the southern portion of LHAAP. The surface features include two 185-feet by 305-feet cleared areas, separated by a gravel access road. The site is covered with grass and scattered brush and has been graded above the surrounding terrain. The topography is relatively flat. Surface drainage flows to ditches along the eastern and western boundaries of the site and then to Harrison Bayou, which is located to the west of LHAAP-17. The entire site is within the 100-year floodplain of the bayou. There are no surface water bodies located on the site.

2.5.3 Geology and Hydrogeology

The local geology at LHAAP-17 consists of silty, clayey and sandy units of the Wilcox Group. The uppermost unit consists predominantly of silty clay to clay extending to depths ranging from 5 to 30 feet. Underlying this layer is a gray to light brown, fine grained silty sandy unit interbedded with silty clay to clay lenses. The clay layers act as an aquitard separating the shallow zone from the intermediate zone. A thick, fine to medium grained sand layer was encountered in boring 17WW05 from 50 to 151 feet in depth without encountering the silty clay lenses. The sand layer was underlain by a dense, dark gray clayey shale.

Figures 2-5 and **2-6** illustrate the groundwater elevations in the shallow zone and intermediate zone, respectively. With the exception of monitoring wells 17WW05 and 17WW16 that were completed in the deep zone, the remainder of the monitoring wells at the site have been completed in the shallow and intermediate saturated zones. The depth of the shallow groundwater zone generally ranges from 18 to 35 feet below ground surface (bgs). The intermediate zone is less defined, but its depth has been measured to approximately 55 feet bgs. The deep groundwater zone extends to a depth of approximately 151 feet bgs. The predominant groundwater flow in the shallow and intermediate zones is generally to the northwest towards Harrison Bayou. Based on historical groundwater flows, the direction can vary more to the west or more to the north. The groundwater elevation between the shallow and intermediate zones is less than 0.1 feet at paired wells, and no distinct vertical gradient is present. The expectation is that the shallow and intermediate zone groundwater contours will be the same. However, due to different data point locations and accepted contouring protocols, slightly different contour lines were produced, but result in the same flow direction. Additional data collected during the RD phase will refine the hydrogeological conditions at the site.

2.5.4 Sampling Strategy

Several sampling events were conducted at LHAAP-17 from 1982 to 2009, as outlined in **Section 2.2.2** on site investigations. In the early investigations, soil samples were collected from throughout the site to determine the areas of contamination. Subsequent investigations focused on the areas where contamination was found, performing additional soil, groundwater, and sediment sampling, and installing monitoring wells to delineate the contamination. Samples were analyzed for various analytes including VOCs, SVOCs, metals, explosives, perchlorate, pesticides, and dioxins/furans. In the area of the contaminant plume, groundwater samples were also analyzed for indicators of conditions that promote natural attenuation (biodegradation), such as dissolved oxygen, conductance, pH, oxidation-reduction potential, sulfide, methane, and chloride.

2.5.5 Nature and Extent of Contamination

Contamination was found in the soil and groundwater (shallow and intermediate zones). The COCs are toxic and carcinogenic. Principal threat waste material is present in the contaminated soil at LHAAP-17.

The COCs and COPECs for LHAAP-17 for the various media are identified below:

- Soil COCs and COPECs are explosives (2,4,6-TNT, 2,4-DNT, 2,6-DNT), dioxins (2,3,7,8-TCDD TEC), perchlorate (potential soil COC based on groundwater concentrations), and barium.
- Shallow zone groundwater COCs are perchlorate and VOCs (1,2-DCA, 1,1-DCE, cis-1,2-DCE, TCE and VC).
- Intermediate zone groundwater COCs are TCE and its daughter products (DCE and VC).

Figure 2-12 shows the approximate areas of contaminated soil that are proposed to be removed for ecological and human health risk mitigation. The maximum 2,4,6-TNT in the soil is 10,000 milligrams per kilogram (mg/kg). Other explosives, 2,4-DNT and 2,6-DNT, have maximum concentrations of 4,000 mg/kg and an estimated concentration of 27 mg/kg, respectively. Additionally, perchlorate has been detected in the soil at a maximum concentration of 7.11 mg/kg. The concentrations of 2,3,7,8-TCDD TEC and barium affecting ecological receptors are 1.9×10^{-4} mg/kg and 20,500 mg/kg, respectively.

The shallow zone plumes for perchlorate and VOCs is shown on **Figure 2-9**. The perchlorate plume, which largely encloses the VOCs plumes, has a lateral extent of approximately 160,000 square feet (ft^2), and a vertical extent of approximately 15 ft. Assuming a total porosity of 0.25, the calculated volume of contaminated groundwater is 4,500,000 gallons. The highest concentration of perchlorate detected was 160,000 µg/L at well 17WW02. The highest concentration of TCE detected in the shallow groundwater was 6,090 µg/L at well 17WW01. Other VOCs detected in the shallow groundwater are 1,2-DCA at an estimated concentration of 35.8 J µg/L and 1,1-DCE at 70 µg/L, also at 17WW01. The daughter product cis-1,2-DCE had a maximum detection of 107 µg/L. The daughter product VC has been nondetect.

The intermediate zone plume for TCE is shown on **Figure 2-10**. In this zone, the lateral extent of contamination is approximately 1,094 ft^2, and the vertical extent is approximately 27 ft. Assuming a total porosity of 0.25, the calculated volume of contaminated groundwater is 55,000 gallons. The highest concentration of TCE detected was 10.8 µg/L at 17WW17. Other COCs identified for the intermediate groundwater zone are degradation daughter products of TCE that have been nondetect or have not been detected above their MCLs. The intermediate zone does not have a perchlorate plume.

2.6 Current and Potential Future Land and Resource Uses

2.6.1 Current and Future Land Uses

LHAAP is located near the unincorporated community of Karnack, Texas. Karnack is a rural community with a population of 775 people. The incorporated community of Uncertain, Texas, population 205, is located to the northeast of LHAAP on the edge of Caddo Lake and is a resort area and an access point to Caddo Lake. The industries in the surrounding area consist of agriculture, timber, oil and natural gas production, and recreation.

LHAAP has been an industrial facility since 1942. Production activities and associated waste management activities continued until the facility was determined to be in excess of the U.S. Army's needs in 1997. The plant area has been relatively dormant since that time. LHAAP is surrounded by a fence (except on the border with Caddo Lake), and current security measures at the LHAAP preclude unlimited public access to areas within the fence. The fence now represents the National Wildlife Refuge boundary. Approved access for hunters is very limited.

The reasonably anticipated future use of LHAAP-17 is as part of a national wildlife refuge. This anticipated future use is based on a Memorandum of Agreement (MOA) (U.S. Army, 2004) between the USFWS and the U.S. Army. That MOA documents the transfer process of the LHAAP acreage to USFWS to become the Caddo Lake National Wildlife Refuge and will be used to facilitate a future transfer of LHAAP-17. Presently the Caddo Lake National Wildlife Refuge occupies approximately 7,000 acres of the 8,416-acre former installation. In accordance with the National Wildlife Refuge System Administration Act of 1966 and its amendments (16 USC 668dd), the land will remain as a national wildlife refuge unless there is a change brought about by an act of Congress, or the land is part of an exchange authorized by the Secretary of the Interior.

2.6.2 Current and Future Surface Water Uses

Streams on LHAAP currently support wildlife and aquatic life. While humans may have limited access to some streams during annual hunts, there is no routine human use of streams on LHAAP. The streams do not carry adequate numbers and size of fish to support either sport or subsistence fishing. During the summer months, the streams cease flowing and/or dry up. The streams flow into Caddo Lake. Caddo Lake is a large recreational area that covers 51 square miles and has a mean depth of 6 feet. The watershed of the lake encompasses approximately 2,700 square miles. It is used extensively for fishing and boating. Caddo Lake is a drinking water supply for multiple cities in Louisiana including Vivian, Oil City, Mooringsport, South Shore, Blanchard, Shreveport, and Bossier City.

The anticipated future uses of the streams and lake are the same as the current uses.

2.6.3 Current and Future Groundwater Uses

Groundwater in the drinking water aquifer (250-430 feet bgs) near LHAAP is currently used as a drinking water source. The drinking water aquifer should not be confused with the deep zone groundwater, which extends only to a depth of approximately 151 feet bgs. The deep zone groundwater and the drinking water aquifer are distinct from each other and there is no connectivity between the contaminated zone and the drinking water aquifer. There are five active water supply wells near LHAAP that are completed in the drinking water aquifer. One well is located in and owned by Caddo Lake State Park. The well is completed to a depth of 315 feet bgs and has been in use since 1935. A second well owned by the Karnack Water Supply Corporation services the town of Karnack and is located approximately 2 miles southeast of town. This well is completed to approximately 430 feet bgs and has been in use since 1942. The Caddo Lake Water Supply Corporation has three wells located both north and northwest of LHAAP. These wells are identified as Caddo Lake Water Supply Corporation Wells 1, 2, and 3, and all are hydraulically upgradient of LHAAP (Jacobs, 2002). These wells are completed deeper than the deepest zone of contamination at LHAAP. Because of this and the large distance between these wells and LHAAP, water removal from these wells is not expected to affect groundwater flow at the site. In addition, there are several livestock and domestic wells located in the vicinity of LHAAP with depths averaging approximately 250 feet bgs.

Three water supply wells are located within the boundary of LHAAP itself. One well is located at the Fire Station; the second well is located approximately 0.35 miles southwest of the Fire Station. The third well is located north of the USFWS administration building for the Caddo Lake National Wildlife Refuge, near the main entrance to LHAAP. The distances from these water supply wells to LHAAP-17 are approximately 2.2 miles, 2.1 miles, and 2.6 miles, respectively. The three water supply wells were completed at a depth much greater than the zone of contamination described at LHAAP-17. Two additional wells previously supplied water to the installation, but these have been plugged and abandoned. None of these three wells are currently used for drinking water at LHAAP, although they may supply water for non-potable uses.

Although the anticipated future use of the facility as a wildlife refuge does not include the use of the groundwater at LHAAP-17 as a drinking water source, the State of Texas designates all groundwater as potential drinking water, unless otherwise classified, and consistent with 30 TAC 335.563(h)(1). To be conservative, a hypothetical industrial use scenario was evaluated for risk. The future industrial scenario for LHAAP assumes limited use of groundwater as a drinking water source.

2.7 Summary of Site Risks

The BHHRA and BERA estimate the risks posed by the site if no action were taken. These assessments provide the basis for taking action and identify the contaminants and exposure pathways that need to be addressed by the remedial action.

2.7.1 Summary of Human Health Risk Assessment

This section is based on the conclusions presented in the *Final Baseline Human Health and Screening Ecological Risk Assessment for the Group 2 Sites* (Jacobs, 2002), in the *Data Gaps Investigations* (Shaw, 2007b), and in additional data collected in preparation of the *Final Feasibility Study, LHAAP-17* (Shaw, 2010). The risk assessment used data from the investigations conducted through 1998 and the plant-wide perchlorate investigation conducted in 2000. Results from the later investigations through 2009 did not change the overall outcome of the risk assessment. During the risk assessment, soil and groundwater data were used to calculate the aggregate risk, which was then compared to the USEPA target risk range of 1×10^{-4} to 1×10^{-6} for the excess lifetime carcinogenic risk and to a hazard index (HI) of 1 for non-carcinogenic hazards. If there is no unacceptable risk associated with a medium, and a cleanup level is not exceeded, then the medium is not identified in this ROD for remediation. The CSM that is associated with the risk assessment was introduced in **Section 2.5.1**, and is presented as **Figure 2-7**.

2.7.1.1 Identification of Chemicals of Potential Concern

The BHHRA identified chemicals of potential concern (COPCs) for LHAAP-17 and evaluated the carcinogenic risk and non-carcinogenic hazard for each. **Table 2-1** summarizes the risk assessment data for the COPCs, including minimum and maximum detected concentrations, frequency of detection, and exposure point concentrations (EPCs). Analytical results for various congeners of dioxins and furans are expressed as 2,3,7,8-TCDD TEC.

2.7.1.2 Exposure Assessment

The Jacobs risk assessment (Jacobs, 2002) presented the human health risks and hazards to a hypothetical future maintenance worker under an industrial scenario for soil and groundwater.

For soil, reasonable exposure pathways according to the CSM are: incidental ingestion of the surface soil (0 to 2 feet bgs), dermal contact with the surface soil, inhalation of particulates, and inhalation of VOCs from the soil (0 to 7 feet bgs). The BHHRA found VOC levels in the soil at 0 to 7 feet bgs to be non-detect; this exposure pathway did not add to carcinogenic risk or non-carcinogenic hazard, thus inhalation of VOCs from the soil (0 to 7 ft bgs) was not included in **Table 2-1**.

For groundwater, reasonable exposure pathways are ingestion of groundwater, dermal contact while showering with contaminated groundwater, and inhalation of VOCs while showering with contaminated groundwater.

2.7.1.3 Toxicity Assessment

The carcinogenic and non-carcinogenic toxicity assessments from the BHHRA are summarized in **Tables 2-2** and **2-3**, respectively. The toxicity data assumes that exposure would be chronic to be conservative. Sources for the data include the Integrated Risk Information System (IRIS) and Health Effects Assessment Summary Tables (HEAST).

2.7.1.4 Risk Characterization

Characterization of the carcinogenic risk and non-carcinogenic hazard are summarized in **Tables 2-4** and **2-5**, respectively. For carcinogens, risks are generally expressed as the incremental probability of an individual's developing cancer over a lifetime as a result of exposure to the carcinogen. Excess lifetime carcinogenic risk is calculated from the following equation:

$$\text{Risk} = \text{CDI} \times \text{SF}$$

where:
risk = unitless probability of an individual developing cancer
CDI = chronic daily intake averaged over 70 years, expressed as milligrams per kilogram per day (mg/kg-day)
SF = slope factor, expressed as $(\text{mg/kg-day})^{-1}$

These risks are probabilities that usually are expressed in scientific notation. An excess lifetime carcinogenic risk of 1×10^{-6} indicates that an individual experiencing the reasonable maximum exposure estimate has a 1 in 1,000,000 chance of developing cancer as a result of site-related exposure. This is referred to as an "excess lifetime carcinogenic risk" because it would be in addition to the risks of cancer that individuals face from other causes such as smoking or exposure to too much sun. The chance of an individual developing cancer from all other causes has been estimated to be as high as one in three. USEPA's generally acceptable risk range for site-related exposures is 1×10^{-4} to 1×10^{-6}.

The potential for non-carcinogenic effects is evaluated by comparing an exposure level over a specified time period (e.g., lifetime) with a reference dose (RfD) derived for a similar exposure period. An RfD represents a level that an individual may be exposed to that is not expected to cause any deleterious effect. The ratio of exposure to toxicity is called a hazard quotient (HQ). An HQ < 1 indicates that a receptor's dose of a single contaminant is less than the RfD, and that toxic non-carcinogenic effects from that chemical are unlikely. The HI is generated by adding the HQs for all COCs that affect the same target organ (e.g., liver) or that act through the same mechanism of action within a medium or across all media to which a given individual may reasonably be exposed. An HI < 1 indicates that, based on the sum of all HQ's from different contaminants and exposure routes, toxic non-carcinogenic effects from all contaminants are unlikely. An HI > 1 indicates that site-related exposures may present a risk to human health.

The HQ is calculated as follows:

Non-carcinogenic HQ = CDI/RfD

Where: CDI = chronic daily intake
RfD = reference dose

Chronic daily intake (CDI) and RfD are expressed in the same units and represent the same exposure period (e.g. chronic, subchronic, or short-term).

The carcinogenic risks for soil and groundwater are 1.4×10^{-3} and 1.6×10^{-3}, respectively (Jacobs, 2002). The HIs for soil and groundwater are 37 and 3,500, respectively. The carcinogenic risks and non-carcinogenic hazards for both soil and groundwater are unacceptable; therefore, the remedial action acts on both the soil and groundwater. Chemicals with a HQ greater than one in groundwater include perchlorate, TCE, and 1,2-DCA, and those in the soil include 2,4,6-TNT and 2,4-DNT. Perchlorate was the single most significant contributor to the HI in groundwater; its HQ of 3,500 eclipses the contributions from other chemicals. Chemicals with a risk greater than 1×10^{-4} in groundwater include TCE, 1,1-DCE, and 1,2-DCA, and those in soil include 2,4-DNT, 2,4,6-TNT, and 2,6-DNT.

The BHHRA included an uncertainty analysis which identified factors that would cause values used in the risk assessment to be over or underestimated. The analysis concluded that the risks and HIs are overestimated, making the BHHRA a conservative evaluation. The analysis listed seven factors that would lead to overestimations, three that would lead to underestimations, and five that could lead to either over or underestimations.

2.7.1.5 Evaluation of COPCs

To further evaluate the occurrence of COPCs, a data gap investigation was conducted (Shaw, 2007b) and additional investigations were conducted when preparing the FS (Shaw, 2010). While these investigations did not change the overall outcome of the earlier BHHRA, they determined what COCs needed to be targeted by the remedial action.

Tables 2-6 and **2-7** list chemicals in the soil that have a carcinogenic risk greater than 1×10^{-6} and those with an HQ greater than 0.1 for the hypothetical maintenance worker. **Tables 2-8** and **2-9** list the chemicals in groundwater that exceed those values for the carcinogenic risk and HQ, respectively. These tables also summarize the justifications for which of the COPCs should be classified as COCs. COPCs in soil were identified as COCs when they posed a carcinogenic risk above the acceptable range (risk greater than 1×10^{-4}) or when their HQ was greater than 1.0. COPCs in groundwater were identified as COCs when they posed a carcinogenic risk above the acceptable range (risk greater than 1×10^{-4}), when their HQ was greater than 1.0, or when the EPC was above the MCL or the GW-Ind. Recent data obtained after the BHRRA investigations was used when possible. **Table 2-10** presents the final list of COCs, along with cleanup levels.

2.7.2 Summary of Ecological Risk Assessment

The *Final Installation-Wide Baseline Ecological Risk Assessment* (Shaw, 2007a) evaluated potential hazards to ecological resources at LHAAP by conducting a screening evaluation to identify initial COPECs in the individual sub-areas and watersheds. The potential of these COPECs to adversely affect communities was evaluated for: (1) organisms that have direct contact with the COPECs (e.g., plants and earthworms growing and living in contaminated soil); and (2) organisms that may be exposed to the chemicals via food chain pathways (e.g., ingestion of an earthworm living in the contaminated soil by a shrew). Potential impacts to invertebrate and plant communities were evaluated by comparing COPEC concentrations to benchmark values available from multiple literature sources. For the food chain exposure assessment, a number of measurement receptors were selected as representative species for the various trophic levels in the food web that could be at risk from contaminants in site media. The measurement receptors that were selected and used in the food chain evaluation included the following:

- Deer Mouse
- Short-Tailed Shrew
- Raccoon
- Modified Raccoon (as a surrogate for the Louisiana Black Bear)
- Red Fox
- Townsend’s Big-Eared Bat
- Bank Swallow
- Belted Kingfisher
- American Woodcock

- Red-Tailed Hawk
- Aquatic Life (benthic invertebrates)

A food chain model was developed and used to estimate the total dose for each measurement receptor based on species-specific considerations such as diet, body weight, ingestion rates, etc., using conservative exposure estimates. Ecological hazard estimates were developed based on exposure to all media including soil in a particular sub-area and surface water and sediment from any watersheds present in the sub-areas. Two different soil depths were used for modeling exposure to ecological receptors: surface soil (0 to 0.5 foot) and total soil (0 to 3 feet). Each receptor was assumed to be exposed to one of the two depths based on its life history characteristics (e.g., burrowing animals were assumed to be exposed to total soil). Bioaccumulation of chemicals up the food chain was initially estimated using uptake factors obtained from available literature, and then refined using site-specific data obtained during the BERA. **Figure 2-8** presents the ecological conceptual model, which lays out the exposure pathways for selected species.

Ecological effects quotients (EEQ) were developed for each of the measurement receptors. EEQs are similar to HQs for human health, and are calculated by dividing the total dose that the receptor is exposed to by the toxicity reference value (TRV), which is based on a no-observed adverse effect level (NOAEL) or the lowest-observed adverse effect level concentration. If the EEQ exceeds 1 for a receptor (based on the NOAEL TRV), then that chemical is considered to have a realistic potential to cause adverse ecological impacts, and is identified as a final COPEC that should be addressed either through remediation or further investigation. As discussed in the BERA, there are several important uncertainties associated with the assumptions used in the EEQ process, and it should be noted that EEQs greater than 1 do not necessarily mean that ecological impacts have occurred, or are occurring.

Several sub-areas were established within LHAAP for the BERA. LHAAP-17 falls within the Waste Sub-Area. The final COPECs in soil that require remedial action in the Waste Sub-Area are barium, 2,4-DNT, 2,6-DNT, 2,4,6-TNT, and dioxin (2,3,7,8-TCDD TEC) because of their potential to cause adverse impacts to one or more ecological receptors. These COPECs pose a potential risk to ecological receptors due to the direct contact with soil and indirect (i.e., dietary) exposure routes. In support of the LHAAP-17 FS, an analysis was performed to determine what sample locations require remediation to meet the ecological preliminary remediation goals (EcoPRGs) developed in the BERA for the final COPECs (Shaw, 2007a) as shown on **Table 2-11**. An excel spreadsheet analysis was performed by ranking the detected concentrations of each final COPEC in the Waste Sub-Area and iteratively re-calculating the 95% upper confidence limit (UCL) on the mean after removing concentrations until the 95% UCL for the Waste Sub-Area was lower than the EcoPRG. (Note: as discussed in the BERA, the EcoPRG is not a "not to exceed" value for all concentrations; rather, it is a conservative estimate of the average concentration that results in no adverse effects, and as such is equivalent to the 95% UCL of chemical concentrations, rather than to individual sample concentrations.) The order of chemical concentrations was altered to preferentially remove LHAAP-17 samples in order to reduce the ecological risk in the Waste-Sub Area. It is assumed that the locations associated with these concentrations will be remediated. The outcome of the analysis is included on **Table 2-11** and the locations that need to be remediated for ecological risk are shown on **Figure 2-12**.

2.7.3 Basis of Action

The remedial action selected in this ROD is necessary to protect the public health or welfare or the environment from actual or threatened releases of hazardous substances, pollutants, or contaminants into the environment. Actions for the groundwater are necessary to address the potential for human health risks in the unlikely event there is an attempt to use groundwater as a potable water source. Actions for soil are necessary to address human health risk including the pathway from soil to groundwater and ecological risks. **Tables 2-10** and **2-11** present the COCs and COPECs, respectively. **Table 2-10** includes cleanup levels for both soil and groundwater with groundwater COCs for the shallow zone and the intermediate zone listed separately. **Table 2-10** includes cleanup levels for daughter products of TCE, even when they are not COCs based on the risk assessment due to their low detections.

A Safe Drinking Water Act MCL has been determined for each of the groundwater COCs except for perchlorate. For the chemicals with an MCL that has been determined, the MCL is used as the cleanup level. If no MCL exists, the GW-Ind is used as the cleanup level (TCEQ, 2006), in accordance with 30 TAC 335.558 and 335.559(d)(2).

2.8 Remedial Action Objectives

The RAOs for LHAAP-17, which address contamination associated with the media at the site and take into account the future uses of LHAAP surface waters, land, and groundwater, are:

- Protection of human health by preventing human exposure to the contaminated groundwater and contaminated soil;
- Protection of human health by preventing further potential degradation of groundwater from contaminated soil;
- Protection of ecological receptors by preventing exposure to the contaminated soil;
- Protection of human health and the environment by preventing contaminated groundwater from migrating into nearby surface water; and
- Return of groundwater to its potential beneficial uses as drinking water, wherever practicable.

The above RAO recognizes USEPA's policy to return all groundwater to beneficial uses, based on the non-binding programmatic expectation in the NCP, and is consistent with the NCP regulations requiring the lead agency, the U.S. Army in this case, to establish RAOs specifying contaminants and media of concern, potential exposure pathways, and remediation goals.

2.9 Description of Alternatives

Four alternatives (including No Action) are proposed. This section introduces the remedy components, identifies the common elements and distinguishing features of each alternative, and describes the expected outcomes of each.

2.9.1 Description of Remedy Components

Alternative 1 – No Action

As required by the NCP, the no action alternative provides a comparative baseline against which the action alternatives can be evaluated. Under this alternative, groundwater would be left "as is" without implementing any additional monitoring, containment, removal, treatment, or other mitigating actions. No actions would be implemented to reduce existing or potential future exposure to human and ecological receptors, although natural attenuation would be ongoing.

Estimated Capital Present Worth Cost: $0
Estimated O&M Present Worth Cost: $0
Cost Estimate Duration: --
Estimated Present Worth Cost: $0

Alternative 2 – Excavation and Off-site Disposal for Soil; MNA and LUCs

The major components of this alternative include the following.

- Excavation and off-site disposal of impacted soil from LHAAP-17 to protect human and ecological receptors, and to eliminate the potential soil-to-groundwater pathway
- MNA to return shallow and intermediate zone groundwater to its potential beneficial use, wherever practicable
- Performance objectives to evaluate the MNA remedy performance after 2 years
- A contingency remedy to reach the RAOs if MNA is found to be ineffective
- LTM semiannually for 3 years, annually until the next five-year review, then annually until recommended otherwise at the five-year review to evaluate remedy performance and determine if plume conditions remain constant, improve, or worsen. Monitoring will continue until five-year review demonstrate that cleanup levels are reached
- Groundwater monitoring system maintenance. A groundwater monitoring system will be implemented to demonstrate the active groundwater treatment and MNA remedies

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are protective of human health and the environment. The groundwater monitoring system will remain in place until the groundwater cleanup levels specified in Table 2-10 are achieved. If any of the elements of the groundwater monitoring system are damaged, destroyed, or become ineffective, they will be repaired or replaced.

- The LUCs' performance objectives are to prohibit potable groundwater use above cleanup levels and ~~except for environmental testing and monitoring~~ ~~until the cleanup levels~~and, ~~are achieved and~~ to restrict land use to nonresidential use until it is demonstrated that the levels of COCs in surface ~~soil~~ and subsurface soil and groundwater~~are at levels that~~ allow for unlimited use and unrestricted exposure~~ and to maintain the integrity of any current or future remedial or monitoring systems to prevent the use of groundwater contaminated above cleanup levels as a potable water source until those cleanup levels are met~~.

Estimated Capital Present Worth Cost: $1,400,000
Estimated O&M Present Worth Cost: $500,000
Cost Estimate Duration: 30 years
Estimated Present Worth Cost: $1,900,000

Alternative 3 – Excavation and Off-site Disposal of Soil; In Situ Bioremediation; MNA and LUCs

The major components of this alternative include the following:

- Excavation and off-site disposal of impacted soil from LHAAP-17 to protect human and ecological receptors, and to eliminate the potential soil-to-groundwater pathway
- In situ bioremediation in the shallow zone groundwater to target perchlorate contaminated groundwater, which leads to favorable conditions for MNA of TCE
- MNA with LTM in the shallow zone (after in situ bioremediation) to reduce groundwater contamination, particularly TCE and daughter products, to cleanup levels
- MNA with LTM in the intermediate zone to reduce groundwater contamination to cleanup levels

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- Groundwater monitoring system maintenance. A groundwater monitoring system will be implemented to demonstrate the active groundwater treatment and MNA remedies are protective of human health and the environment. The groundwater monitoring system will remain in place until the groundwater cleanup levels specified in Table 2-10 are achieved. If any of the elements of the groundwater monitoring system are damaged, destroyed, or become ineffective, they will be repaired or replaced.
- The LUCs' performance objectives are to prohibit potable groundwater use above cleanup levels ~~except for environmental testing and monitoring~~ and ~~until the cleanup~~

~~levels are achieved and~~ to restrict land use to nonresidential use until it is demonstrated that the levels of COCs in surface ~~soil~~ and subsurface soil and groundwater ~~are at levels that~~ allow for unlimited use and unrestricted exposure~~, and to maintain the integrity of any current or future remedial or monitoring systems to prevent the use of groundwater contaminated above cleanup levels as a potable water source until those cleanup levels are met~~.

Estimated Capital Present Worth Cost: $2,000,000
Estimated O&M Present Worth Cost: $600,000
Cost Estimate Duration: 30 years
Estimated Present Worth Cost: $2,600,000

Alternative 4 – Excavation and Off-site Disposal of Soil; Groundwater Extraction; MNA and LUCs

The major components of this alternative include the following:

- Excavation and off-site disposal of impacted soil from LHAAP-17 to protect human and ecological receptors, and to eliminate the potential soil-to-groundwater pathway
- Groundwater extraction in the shallow zone until perchlorate levels are reduced to 20,000 µg/L to make conditions favorable for MNA of TCE
- A contingency remedy of in situ bioremediation in the shallow zone followed by MNA in the event that groundwater extraction cannot reduce perchlorate levels to 20,000 µg/L in the estimated 1.5-year pumping period
- MNA with LTM to reduce groundwater contamination to cleanup levels in the shallow zone (following groundwater extraction) and in the intermediate zone

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- Groundwater monitoring system maintenance. A groundwater monitoring system will be implemented to demonstrate the active groundwater treatment and MNA remedies are protective of human health and the environment. The groundwater monitoring system will remain in place until the groundwater cleanup levels specified in Table 2-10 are achieved. If any of the elements of the groundwater monitoring system are damaged, destroyed, or become ineffective, they will be repaired or replaced.
- The LUCs' performance objectives are to prohibit potable groundwater use ~~except for environmental testing and monitoring~~ above cleanup levels and ~~until the cleanup levels are achieved and~~ to restrict land use to nonresidential use until it is demonstrated that the levels of COCs in surface ~~soil~~ and subsurface soil and groundwater ~~are at levels that~~ allow for unlimited use and unrestricted exposure~~, and to maintain the integrity of any current or future remedial or monitoring systems to prevent the use of groundwater contaminated above cleanup levels as a potable water source until those cleanup levels are met~~.

Estimated Capital Present Worth Cost: $1,600,000
Estimated O&M Present Worth Cost: $500,000
Cost Estimate Duration: 30 years
Estimated Present Worth Cost: $2,100,000

2.9.2 Common Elements and Distinguishing Features of Each Alternative

Common Elements of Alternative 2, 3, and 4

Common elements of Alternatives 2, 3, and 4 are described below.

Soil Excavation – Soil contamination would be excavated at LHAAP-17 under Alternatives 2, 3 and 4 to prevent human and ecological receptors from exposure to contaminants in the soil and to eliminate the soil-to-groundwater pathway. Disposal would be at a RCRA Subtitle D-permitted landfill.

MNA – MNA is a passive remedial action that relies on natural biological, chemical, and physical processes to reduce the mass and concentrations of groundwater COCs under favorable conditions. The natural attenuation evaluation indicates that MNA is a feasible technology for the groundwater at LHAAP-17 (Shaw, 2010). Monitoring activities associated with MNA would confirm the protection of human health and the environment by documenting the return of the groundwater to its potential beneficial use as a drinking water supply, by documenting reduction of the contaminant mass and protection of surface water through containment of the plume. In Alternative 2, contaminant reduction would occur by MNA alone in both the shallow and intermediate zones. In Alternative 3, in situ bioremediation would reduce perchlorate in the shallow zone and condition the shallow zone for MNA of TCE. The treatment in the intermediate zone would be MNA alone. In Alternative 4, groundwater recovery would reduce perchlorate in the shallow zone to 20,000 µg/L, after which MNA would take over and reduce perchlorate and VOCs to cleanup levels. The treatment in the intermediate zone would be MNA alone.

MNA performance monitoring will be conducted quarterly for the first 2 years. After eight quarterly sampling events, MNA effectiveness will be evaluated. The analytical program will consist of VOCs, including chlorinated compounds and degradation products, methane, ethene, and ethane. Initially, the following geochemical parameters will also be included in the analytical program: dissolved oxygen (field), redox potential (field), sulfate, nitrate, nitrites, alkalinity, total organic carbon, and ferrous iron (field).

Groundwater Monitoring System Maintenance - A groundwater monitoring system will be implemented to demonstrate the active groundwater treatment and MNA remedies are protective of human health and the environment. The groundwater monitoring system will remain in place until the groundwater cleanup levels specified in Table 2-10 are achieved. If any of the elements of the groundwater monitoring system are damaged, destroyed, or become ineffective, they will be repaired or replaced.

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- ***LUCs*** – LUCs would be implemented to support the RAOs. ~~The U.S. Army would be responsible for long-term implementation, maintenance, inspection, reporting, and enforcement of the LUCs. The U.S. Army will provide details of the LUC long-term implementation and long-term maintenance actions in the RD for the site.~~ The LUC for groundwater would prevent human exposure to residual groundwater contamination presenting an unacceptable risk to human health ~~and ensure~~ by ensuring that there is no ~~withdrawal or~~ potable use of groundwater above cleanup levels beneath the site~~s above cleanup levels.~~ ~~for anything other than environmental monitoring and testing.~~ The LUC ~~for prohibition of~~restricting groundwater use ~~(except for monitoring and testing)~~ and the LUC restricting land use to nonresidential would be maintained until the concentrations of COCs~~contaminants and by-product (daughter) contaminants~~ in the groundwater and soil allow~~have been reduced to levels below their respective cleanup levels~~ for unlimited use and unrestricted exposure. ~~The LUC restricting land use to nonresidential will remain in place until it is demonstrated that surface soil and subsurface soil are at levels that allow for unlimited use and unrestricted exposure~~~~. The LUC to maintain the integrity of any current or future remedial or monitoring systems to prevent the use of groundwater contaminated above cleanup levels as a potable water source shall remain in effect until those cleanup levels are met.~~

In addition, within 90 days of signature of this ROD, the Army shall request the Texas Department of Licensing and Regulation to notify well drillers of groundwater use prohibitions based on a preliminary LUC boundary. Within 21 days of the issuance of the Record of Decision, the Army will propose target dates for completion of the draft secondary comments and deadlines for completion of the R~~emedial~~ D~~esign~~ Work Plan, R~~emedial~~ D~~esign~~, and Remedial Action Work Plan. The documents will be prepared and submitted to EPA and TCEQ pursuant to the FFA. The LUC RD will contain implementation and maintenance actions, including periodic inspections. Consistent with the dates presented for these documents, the U.S. Army shall: 1) request the Texas Department of Licensing and Regulation to notify well drillers of groundwater use prohibitions; and 2) notify the Harrison County Courthouse of the LUC to include a map showing the areas of groundwater use prohibition at the site, in accordance with 30 TAC 335.565.

The Army will implement, maintain, monitor, report on and enforce land use controls at Army-owned property. The Army shall perform those actions related to land use control activities described in this ROD and in the Remedial Design for the ROD. For portions of the Site subject to land use controls that are not owned by the Army, the Army will monitor and report on the implementation, maintenance, and enforcement of land use controls, and coordinate with federal, state, and local governments and owners and occupants of properties subject to land use controls. The Army will provide notice of the groundwater and soil contamination and any land use restrictions referenced in the ROD. The Army will send these notices to the federal, state and local governments involved at this site and the owners and occupants of the properties subject to those use restrictions and land use controls. The Army shall provide the initial notice within 90 days of ROD signature. The frequency of subsequent notifications will be described in the Remedial Design for the ROD. The Army remains responsible for ensuring that the remedy remains protective of human health and the environment. The Army will fulfill its responsibility and obligations under CERCLA and the NCP as it implements, maintains, and reviews the selected remedy.

Upon transfer of Army-owned property, the Army will provide written notice of the land use controls to the transferee of the groundwater and soil contamination and any land use restrictions referenced in the ROD. Within 15 days of transfer, the Army shall provide EPA and TCEQ with written notice of the division of implementation, maintenance, and enforcement responsibilities unless such information has already been provided in the LUC RD. The LUC RD will address the procedures to be used by the Army and the transferee to document compliance with the LUCs described in this ROD. In the event property is transferred out of Federal control, the land use controls relating to property and groundwater restrictions shall be recorded in the deed and shall be enforceable by the United States and the state of Texas.

To transfer this property (LHAAP-17), an Environmental Condition of Property (ECP) document would be prepared and the Environmental Protection Provisions from the ECP would be attached to the letter of transfer. The ECP would include the LUCs as part of the Environmental Protection Provisions. The property would be transferred subject to the LUCs identified in the ECP. These restrictions would prohibit or restrict property uses that might result in exposure to the contaminated groundwater (e.g., potable use of groundwater~~drilling restrictions~~) or soil (e.g. residential land use prohibition).

The U.S. Army and regulators will consult to determine appropriate enforcement actions should there be a failure of a LUC objective at these sites after they have been transferred. ~~The U.S. Army shall consult with TCEQ and obtain USEPA concurrence prior to termination or significant modification of a LUC, or in the highly unlikely event of a land use change inconsistent with the industrial/recreational use assumptions of the remedy. In the event that TCEQ and/or USEPA and the U.S. Army agree with respect to any significant modification of the selected remedy, including the LUC component of the selected remedy, the remedy will be changed consistent with the FFA and 40 CFR 300.435(c)(2)~~.

Inspection/Long-Term Groundwater Monitoring – Alternatives 2, 3, and 4 include inspection and long-term groundwater monitoring activities. Monitoring would be continued as required to evaluate the effectiveness of the remedy, to demonstrate compliance with applicable or relevant and appropriate requirements (ARARs) and RAOs, and to support five-year reviews.

Distinguishing Features of Alternatives 3 and 4

The distinguishing feature of Alternative 3 and 4 compared to Alternative 2 is the inclusion of in situ bioremediation or groundwater extraction. These actions are described below.

In situ bioremediation – The components of this action include:

- **Performing a treatability study.** A number of environmental conditions can slow or stop the biodegradation process. Therefore, prior to initiation of a bioremediation project, a specific microbial enhancement study and general hydrogeologic investigation will be required for the site. These studies are necessary to identify the types and amounts of substances required to stimulate optimum contaminant degradation and specify geologic and geochemistry information for project design. Some of the parameters that are important to consider include the biodegradability, phase-distribution, leaching potential, and chemical reactivity of the contaminants; the mix of contaminants in the plume; soil type and properties; pH; salinity; competing electron acceptors (e.g., sulfates, nitrates); the presence of adequate microbial populations; the presence of adequate microbial populations; and the presence or absence of inhibitory substances.

- **Retrofitting existing wells for injection.** Chlorinated solvents and perchlorate often require circulation of nutrients and other growth-stimulating additives/materials specific to the contaminants' metabolic degradation process. The wells will be used to inject these materials to accelerate microbial degradation of the plumes. It is anticipated that the material will be injected quarterly for one year, and that the injection will occur in the shallow zone at approximately 15 feet bgs.

- **Injecting nutrients into the subsurface at a predetermined location.** Bacteria present in the groundwater can use chlorinated solvents as electron acceptors. Electron donors may include a wide variety of nutrients: sugars (molasses), alcohols (methanol, ethanol), volatile acids (acetate, lactate), and/or wastes (food processing, manure). The COCs at LHAAP-17 can degrade under anaerobic conditions, but microorganisms, mechanisms, and redox requirements differ. Based on results of a treatability study, appropriate nutrients and other materials will be injected into the subsurface. For this FS, it is assumed that a Hydrogen Release Compound® (HRC®), a sticky gel, will best degrade the COCs at LHAAP-17. HRC® is a polyacetate compound especially formulated for the slow release of lactate into water. The HRC® compound is typically heated to reduce its viscosity and injected with a high viscosity fluid pump. In addition to the application of HRC®, degradation of the 1,1-DCE to vinyl chloride may require the addition of a bacterial consortium. The plume will be gridded with direct-push technology (DPT) injection sites through which the various materials would be injected. For costing purposes in this FS, it is assumed that application would include 10 DPT injection points at approximately 15 feet bgs to cover the groundwater plume.

- **Sampling wells to monitor effectiveness.** Monitoring for contaminants will be performed to assess the effectiveness of the treatment. Anticipated remediation times may be short with appropriate contact of the contaminant and the injected materials. Assuming first order anaerobic degradation rates and reasonable half-lives for the COCs, the COCs could be reduced to their respective levels amenable to MNA remediation in approximately two years. Additional monitoring in the treatment zone is recommended for one to three years after reduction of the COCs to the remediation levels. Since there is considerable uncertainty about achieving sufficient contact between the contaminated groundwater and the injected material, the groundwater in the treatment zone will continue to be monitored for the maximum recommended period, three years, after reduction of the COCs to the preliminary remediation goals.

Groundwater Extraction – The components of this action include:

- **Pre-Design Study.** This action in the shallow groundwater zone will begin with a pre-design study. A pump test will be conducted and hydrogeologic parameters will be measured to better design the system. During the design activities, extraction trenches will also be evaluated. Groundwater flow will be modeled to set performance evaluation parameters and to assess the likely time required for remediation.

- **Construction.** The shallow zone groundwater contamination at LHAAP-17 consists of a VOC plume and an overlapping perchlorate plume. The contamination occurs in the shallow groundwater zone where a sufficient number of groundwater monitoring wells are located throughout the site. To remediate the contaminated groundwater, it is estimated that sufficient flow can be attained by converting three of the existing monitoring wells in the shallow zone into extraction wells to extract the contaminated groundwater from the aquifers. Final number of wells and their placement will be determined in the design. A new piping system will be constructed to transport the water to the groundwater treatment plant at LHAAP-18/24.

- **Performance Monitoring.** During extraction, samples will be collected from the extraction wells to monitor the effectiveness of the action. Monthly sampling will be conducted for approximately six months during startup and initial operation of the extraction system. After six months, monitoring will be reduced to quarterly for approximately 1 year or until pumping ceases. If perchlorate concentrations have not been reduced to levels at or below 20,000 μg/L, a contingency action will be initiated pending lead agency and regulatory approval. If the 20,000 μg/L trigger value has been obtained, then MNA will be implemented.

- **Water Treatment/Surface Water Discharge.** The extracted groundwater from LHAAP-17 will be treated at the LHAAP groundwater treatment plant, which was originally built to treat groundwater containing VOCs and metals extracted from other LHAAP sites. The plant uses air stripping, carbon adsorption, and catalytic oxidation. Perchlorate treatment using a fluidized bed reactor was added in April

2001 to the treatment plant. **Figure 2-13** shows a simplified flow diagram of the primary treatment components in the existing plant. The extracted water from LHAAP-17 will be discharged from the piping into the existing 300,000-gallon equalization tank. This tank receives water from other LHAAP sites which is stored in this tank until treatment. After the water is treated, the effluent will be discharged in accordance with plant procedures to surface water. The plant presently operates at a fraction of its maximum capacity of 1 to 1.5 million gallons of water per month. The original groundwater treatment plant components have adequate capacity to accommodate the increase in volume that will be introduced to the system when the contaminated groundwater is transported through the piping system from LHAAP-17 to the plant. The system capacity is limited by effluent storage and discharge rate, and this concern was addressed. Recent mitigating measures include the replacement of the reinjection pipeline to increase the pipe diameter to 4-inches, and the installation of a sprinkler system. The capacity issue will be revaluated as necessary during the remedial action.

- **Extraction System.** Operation and maintenance will include groundwater extraction system maintenance, groundwater treatment plant operations, and environmental media monitoring. In approximately 1.5 years, the extraction wells are anticipated to remove the highest concentrations of VOCs and perchlorate from the groundwater at LHAAP-17, thus reducing the contaminant mass to make conditions favorable for MNA. During the groundwater extraction operations, the extraction wells will require regular maintenance to prevent fouling of well screens, and the extraction pumps will require routine maintenance and may also require replacement. Cleaning of the pipelines, refurbishing pumps and other maintenance activities will be needed on the groundwater collection and transport system during full-scale operation. O&M costs will include the addition of chemicals, power, and labor; equipment cleaning, tank cleaning, general system maintenance, and replacement; and regulatory monitoring and reporting. O&M activities will also be conducted at the LHAAP plant location as part of the routine plant O&M activities.

2.9.3 Expected Outcomes of Each Alternative

Alternative 1 would allow the site to remain a hazard to human and ecological receptors, since it simply leaves the site as is. Alternatives 2, 3, and 4 all provide the same outcome to mitigate exposure to human and ecological receptors by excavation and off-site disposal of the contaminated soil. Soil excavation would also eliminate the soil-to-groundwater pathway, preventing further potential degradation of groundwater from contaminated soil. Alternatives 3 and 4 have very similar outcomes though they use different treatment processes, and the main difference is that Alternative 4 takes advantage of the existing groundwater treatment plant. Alternative 2 also has the same outcome as Alternatives 3 and 4, but without the benefit of active treatment. Based on the natural attenuation evaluation (Shaw, 2010), cleanup levels should be achieved by MNA alone (Alternative 2) in approximately 117 years (117 years for TCE, and 15 years for perchlorate). Alternatives 3 and 4 would achieve cleanup levels in less time through active treatment. The similar outcomes are considered to be attainment of the SDWA MCLs to the extent practicable, and consistent with 40 CFR §300.430(e)(2)(i)(B&C). For perchlorate, no MCL has been promulgated, so the GW-Ind is used in place of the MCL, in accordance with 30 TAC 335.559(d)(2). In addition, the monitoring activities associated with MNA would confirm the protection of human health and the environment by documenting the return of the groundwater to its potential beneficial use as a drinking water supply, by documenting reduction of the contaminant mass and protection of surface water through containment of the plume. ~~-~~M~~A LUC requiring m~~aintenance of the integrity of any current or future remedial or monitoring systems ~~to prevent the use of groundwater contaminated above cleanup levels as a potable water source would remain in place~~ would be conducted until th~~os~~e cleanup levels ~~of~~for the groundwater COCs are met. ~~Until that time, a~~ LUCs ~~will~~ prohibiting the potable use of the site's groundwater ~~except for environmental monitoring and testing~~ above cleanup levels and ~~. The LUC~~ restricting land use to nonresidential will remain in place until it is demonstrated that COCs in groundwater, surface soil and subsurface soil are at levels that allow for unlimited use and unrestricted exposure.

2.10 *Summary of Comparative Analysis of Alternatives*

Nine criteria identified in the NCP §300.430(e)(9)(iii) are used to evaluate the different remediation alternatives individually and against each other to select a remedy. This section profiles the relative performance of each alternative against the nine criteria, noting how it compares to the other options under consideration. The nine evaluation criteria are discussed below. **Table 2-12** summarizes the comparative analysis of the alternatives.

2.10.1 *Overall Protection of Human Health and the Environment*

Overall protection of human health and the environment addresses whether each alternative provides adequate protection of human health and the environment and describes how risks posed through each exposure pathway are eliminated, reduced, or controlled, through treatment, engineering controls, and/or institutional controls.

The four alternatives provide varying levels of human health protection. Alternative 1, no action, does not confirm achievement of the RAO for the return of groundwater to its potential beneficial use because there is no monitoring involved. Alternative 1 also provides the least protection of all the alternatives; it provides no reduction in risks to human health or the environment because no measures would be implemented to eliminate the pathway for human exposure to soil or to the groundwater contamination and potential groundwater impacts to Harrison Bayou would not be addressed. Additionally, the soil pathway for ecological receptors would not be addressed.

Alternatives 2, 3, and 4 all satisfy the RAOs for LHAAP-17. Alternatives 2, 3, and 4 would remove the contaminated soil and provide confirmation that human health and the environment will be protected because the monitoring will be conducted to confirm that MNA is returning the contaminated shallow and intermediate groundwater zones at LHAAP-17 to their potential beneficial uses as a drinking water, wherever practicable, and to document that the plumes are contained and prevented from impacting surface water at levels that could present a risk to human health and the environment. Furthermore, the LUC for groundwater would protect human health by preventing ~~access to~~ the potable use of contaminated groundwater above cleanup levels until the levels of COCs allow ~~contaminants in the groundwater attain the cleanup levels~~ for unlimited use and unrestricted exposure. ~~(SDWA MCLs or MSC for GW-Ind if no MCL is available) for all contaminants above the cleanup levels and attain the cleanup levels for all and contaminant by-products (daughter contaminants) in soil and groundwater. above the cleanup levels.~~

2.10.2 Compliance with ARARs

Section 121(d) of CERCLA and 40 CFR §300.430(f)(1)(ii)(B) requires that remedial actions at CERCLA sites attain legally applicable or relevant and appropriate Federal and State requirements, standards, criteria, and limitations, which are collectively referred to as "ARARs", unless such ARARs are waived under CERCLA Section 121(d)(4). The ARARs that pertain to this ROD are discussed in **Section 2.13.2**.

Because contaminated groundwater has the potential to flow into Harrison Bayou which flows to Caddo Lake, a drinking water supply, chemical-specific ARARs for surface water consumption are appropriate and relevant. Specifically, Texas surface water quality standards are set forth in 30 TAC 307.6(d)(1) for TCE (5 µg/L), 1,2-DCA (5 µg/L), 1,1-DCE (7 µg/L), and VC (2 µg/L) for LHAAP-17. These standards are equivalent to the MCLs. For contaminants that are not listed in 30 TAC 307.6(d)(1), the GW-Res (MCL) for cis-1,2-DCE (70 µg/L), and the GW-Res (non-MCL) for perchlorate (26 µg/L) apply.

Alternative 1 does not comply with chemical-specific ARARs because no additional remedial action would be implemented. Alternatives 2, 3, and 4 comply with all chemical-specific ARARs for soil because the contaminated soil above the chemical-specific ARAR will be removed. Alternatives 2, 3, and 4 comply with all chemical-specific ARARs for groundwater because they will return the contaminated shallow and intermediate groundwater zones at LHAAP-17 to their potential beneficial use as drinking water, wherever practicable, which for the purposes of this ROD is considered to be attainment of the relevant and appropriate cleanup levels (SDWA MCLs or MSC for GW-Ind if no MCL is available) to the extent practicable, and consistent with 40 CFR 300.430(e)(2)(i)(B&C) and 30 TAC 335.559(d)(2). If a return to potential beneficial uses is not practicable, these alternatives would still meet the NCP expectation to prevent further migration of the plume, prevent exposure to the contaminated groundwater, and evaluate further risk reduction. Alternative 2 complies with surface water ARARs because natural attenuation would reduce the contaminant concentrations in groundwater to the cleanup levels prior to flowing into surface water. Alternatives 3 and 4 also comply with surface water chemical specific ARARs because active remedial processes will reduce contaminant levels in groundwater to levels below water quality standards prior to flowing into surface water.

Location-specific and action-specific ARARs would not apply to Alternative 1 since no remedial activities would be conducted. Alternatives 2, 3, and 4 comply with all location-specific and action-specific ARARs.

2.10.3 Long-Term Effectiveness and Permanence

Long-term effectiveness and permanence refers to expected residual risk and the ability of a remedy to maintain reliable protection of human health and the environment over time, once clean-up levels have been met. This criterion includes the consideration of residual risk that will remain onsite following remediation, and the adequacy and reliability of controls.

For Alternative 1, contaminant removal would occur by natural attenuation processes, but the long-term effectiveness and permanence would be unknown because of the absence of monitoring. No measures would be implemented to control exposure risks posed by contaminated site groundwater. Alternative 1 would also have no effectiveness and permanence with regards to the contaminated soil, since no soil removal would be conducted.

Alternative 2 would provide a moderate degree of long-term effectiveness by removing the source soils and providing restoration of the groundwater by MNA. LUC would be required for groundwater for the protection of human health exposure.

Alternatives 3 and 4 would also provide a moderate degree of long-term effectiveness by removing the source soils and providing better long-term effectiveness by achieving cleanup levels in the shallow zone in a shorter time as compared to Alternative 2. Alternatives 3 and 4 would significantly reduce initial groundwater contaminant concentrations and thereafter rely on natural attenuation~~MNA~~ and LUCs~~ until the levels of COCs allow cleanup levels for unlimited use and unrestricted exposureare achieved~~. Monitoring activities associated with MNA would confirm the protection of human health and the environment by documenting the return of the groundwater to its potential beneficial use as a drinking water supply, by documenting reduction of the contaminant mass and protection of surface water through containment of the plume. Maintenance of the integrity of the monitoring system associated with the groundwater remedy until cleanup levels specified in Table 2-10 have been achieved also provides for the long-term effectiveness of Alternatives 2, 3, and 4.

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2.10.4 Reduction of Toxicity, Mobility, or Volume through Treatment

Reduction of toxicity, mobility, or volume through treatment refers to the anticipated performance of the treatment technologies that may be included as part of a remedy.

Alternative 1 has the potential to reduce the mass and concentration of contaminants through natural attenuation processes, although the progress would be unmonitored and undocumented. Alternative 2 would use MNA to permanently reduce the mass and concentration of contaminants through natural processes and; therefore, the toxicity, mobility, and volume of the contaminants. Alternatives 3 and 4 would use in situ bioremediation or groundwater extraction, followed by MNA, to achieve the same reductions in contamination that are expected from Alternative 2. MNA is a passive remedial action, and bioremediation and groundwater extraction are active treatment processes.

Biological activity would generate daughter products that may temporarily increase toxicity or mobility of the contaminant plume. Alternatives 2, 3, and 4 include monitoring so that daughter products would be quantified, documented, and evaluated. The same biological activities would also consume the daughter products, and it is anticipated that these concentrations would be reduced to levels below their associated cleanup levels to return groundwater to its potential beneficial use, wherever practicable.

For Alternative 3, achievement of cleanup levels in groundwater would be expedited by implementing in situ bioremediation in areas of highest contaminant concentrations. Monitoring for contaminants would be performed to assess the effectiveness of the treatment. It is also anticipated that COCs would remain in the plume outside the treated areas and continue to attenuate to cleanup levels over time.

Achievement of cleanup goals would also be expedited for Alternative 4 by implementing pumping and treatment of the contaminated groundwater to reduce perchlorate concentrations throughout the plume.

The soil excavation in Alternatives 2, 3, and 4 would reduce mobility because perchlorate would be removed from the site and placed in a permitted disposal facility. Toxicity and volume would not be reduced by the excavation portion of the alternatives as the form and quantity of the perchlorate would not be altered.

2.10.5 Short-Term Effectiveness

Short-term effectiveness addresses the period of time needed to implement the remedy and any adverse impacts that may be posed to workers, the community, and the environment during construction and operation of the remedy until cleanup levels are achieved.

Alternative 1 would not involve any remedial measures; therefore, no short-term risk to workers, the community, or the environment would exist. The activities associated with Alternatives 2, 3, and 4 would be protective to the surrounding community from short-term risks except for minimal potential short-term risks during transport (possible accident when soil is transported off site) of perchlorate and explosive contaminated soil.

Alternatives 2, 3, and 4 would involve potential short-term risks to workers associated with exposure to contaminated groundwater from monitoring and/or operation of drilling/construction equipment, and with exposure to contaminated soil during excavation work.

Alternative 3 would have short-term risks to remediation workers associated with exposure while performing in situ bioremediation activities, including handling of additives/materials.

Alternatives 2, 3, and 4 include the LUCs as elements of their remedies and would provide almost immediate protection from the contaminated groundwater by prohibiting groundwater use except for environmental monitoring and testing through LUC implementation. The time period to achieve groundwater cleanup levels is the most significant difference between Alternative 1 versus Alternatives 2, 3, and 4. Alternatives 3 and 4 are expected to take less time to achieve RAOs.

Alternative 4 would have short-term risks to the workers associated with exposure during increased operations at the LHAAP groundwater treatment system, which include chemical handling (caustic acids) and operation of a high-temperature catalytic oxidizer. The implementation of Alternatives 3 and 4 would require more time than Alternative 2.

2.10.6 Implementability

Implementability addresses the technical and administrative feasibility of a remedy from design through construction and operation. Factors such as availability of services and materials, administrative feasibility, and coordination with other governmental entities are also considered.

Under Alternative 1, no remedial action would be taken. Therefore, no difficulties or uncertainties would be associated with its implementation. For Alternatives 2, 3, and 4, soil excavation would require extensive coordination between excavation, sampling, transportation and disposal. The U.S. Army would be responsible for long-term maintenance and enforcement of the LUCs, long-term evaluation of MNA, long-term sampling, and long-term maintenance and operation of sampling equipment. For groundwater, Alternatives 3 and 4 are technically implementable, although less so than Alternative 2 because of the uncertainties associated with hydrogeologic conditions. Those conditions may impact the ability of in situ bioremediation or groundwater extraction to lower perchlorate concentrations quickly to levels that would be more amenable to MNA of TCE.

Alternative 3 would involve the use of in situ bioremediation, which requires specialized expertise to design and construct the in situ bioremediation treatment elements. A groundwater treatment system currently exists at LHAAP and is easily accessible to the site; therefore, groundwater extraction for Alternative 4 technically would be readily implementable.

Administratively, all of the alternatives are implementable.

2.10.7 Cost

Cost estimates are used in the CERCLA process to eliminate those remedial alternatives that are significantly more expensive than competing alternatives without offering commensurate increases in performance or overall protection of human health or the environment. The cost estimates developed are preliminary estimates with an intended accuracy range of –30 to +50 percent. Final costs will depend on actual labor and material costs, actual site conditions, productivity, competitive market conditions, final scope, final schedule, final engineering design, and other variables.

The cost estimates include capital costs (including fixed-price remedial construction) and long-term O&M costs (post-remediation). Overall present worth costs are developed for each alternative assuming a discount rate of 2.8 percent. The duration used for the estimates is a 30-year period.

The progression of present worth costs from the least expensive alternative to the most expensive alternative is as follows: Alternative 1, Alternative 2, Alternative 4, and Alternative 3. No costs are associated with Alternative 1 because no remedial activities would be conducted.

Alternative 2 has the lowest present worth and capital costs of the active remedial alternatives as no active remediation of groundwater would be implemented. Alternative 3 has the highest present worth and capital costs primarily due to the activities associated with the injection phase of in situ bioremediation. Alternative 4 may at first glance be expected to have the highest capital cost because it requires groundwater extraction and treatment. However, the presence of the existing groundwater treatment system at LHAAP greatly reduces the costs associated with Alternative 4. Compared to the selected alternative (Alternative 4), the total present worth cost of Alternative 2 is 9% less and Alternative 3 is 24% more. The capital present worth cost of Alternative 2 is 12% less and Alternative 3 is 25% more.

2.10.8 State/Support Agency Acceptance

The USEPA and TCEQ have reviewed the Proposed Plan, which presented Alternative 4 as the preferred alternative. Comments received from the USEPA and TCEQ during the Proposed Plan development have been incorporated. Both agencies concur with the selected remedial action.

2.10.9 Community Acceptance

Community acceptance is an important consideration in the final evaluation of the selected remedy. One set of written public comments was received during the 30-day public comment period; there were no verbal comments from the June 29, 2010 public meeting. The topics of the comments included: the trigger level for ending pump and treat, effectiveness of MNA, time required to achieve cleanup levels, and the absence of perchlorate from the COC list for the intermediate zone groundwater. Comment responses were provided and incorporated into the

ROD, including clarification of the role of pump and treat in the overall remedial action, explanation of why perchlorate is only associated with the shallow zone, and reiteration of the contingency actions. The written comments received and their responses are presented in the Responsiveness Summary (**Section 3.0**).

2.11 Principal Threat Wastes

The principal threat waste at LHAAP-17 is soil contamination. The perchlorate-contaminated soil is a source material due to high concentrations of contaminants that are mobile (i.e., soil to groundwater). The perchlorate concentrations in soil are near the GWP-Ind, and perchlorate is identified as a potential soil COC because of perchlorate contaminated groundwater. Thus, perchlorate-contaminated soil is considered a principal threat waste.

2.12 The Selected Remedy

2.12.1 Summary of Rationale for the Selected Remedy

Alternative 4 (excavation and off-site disposal of soil; groundwater extraction, MNA, and LUCs) is the preferred alternative for LHAAP-17 and is consistent with the intended future use of the site as a national wildlife refuge. This alternative would satisfy the RAOs for the site through the following:

- Contaminated soil removal with off-site disposal will protect the hypothetical future maintenance worker and ecological receptors and eliminate the soil-to-groundwater pathway;
- Extraction and treatment of groundwater until the trigger level of 20,000 µg/L of perchlorate is reached will expedite MNA;
- MNA was selected as one component of the remedy based on available groundwater evidence as presented in the Addendum to the FS (Shaw, 2010). A tiered approach using three lines of evidence was used to examine the occurrence of natural attenuation. The first line of evidence evaluated reductions in COC concentrations over time and with distance, the second line of evidence evaluated geochemical indicators, while the third line of evidence entailed estimation of natural attenuation rates. In the shallow groundwater zone, historical analytical trends indicate the occurrence of perchlorate biodegradation, but perchlorate still exists in high levels at some areas, and increased at 17WW11. The perchlorate concentrations at 17WW11 are small compared to perchlorate concentrations within the rest of the plume and would be expected to attenuate quickly once perchlorate degradation restarts in this area. Natural attenuation is effectively controlling the TCE plume migration along the flow direction and the TCE plume is stable. The increasing ratio of cis- and trans-1,2-DCE isomer suggests the occurrence of reductive dechlorination of TCE; meanwhile the elevated concentrations of TCE and stabilized 1,1-DCE and 1,2-DCA suggest that chlorinated solvents cannot achieve complete dechlorination under current conditions. In the intermediate groundwater zone, the TCE plume exists at a single well

(17WW17), is stable, and has a decreasing concentration trend. Geochemical indicators in the shallow, intermediate, and deep groundwater zones present evidence that geochemical conditions are adequate for reductive dechlorination. Low DO, intermediate ORP, and low nitrate values suggest that the groundwater conditions are anaerobic and nitrate-reducing, which are favorable for perchlorate and TCE reduction. Elevated sulfate concentrations and low TOC concentrations may be limiting factors for biodegradation. Following perchlorate depletion, the subsurface conditions may become reducing enough for complete reductive dechlorination. Thus, natural attenuation was considered feasible for a portion of the site, but not as a sole remedy for the entire site. MNA, together with the groundwater extraction, will ultimately restore the groundwater to attain groundwater cleanup standards/levels; this is anticipated to be completed in approximately 117 years. This approximate timeframe to achieve cleanup levels is considered reasonable based on the anticipated future land use of the site as a national wildlife refuge and the fact that there is no current or anticipated future use of groundwater as a drinking water supply. Thus, MNA is an appropriate component of the remedy for those regions outside the influence of the active remedy because it will protect human health and the environment and will document that further reductive dechlorination is occurring within the groundwater plume and that contaminant concentrations are being reduced to attain groundwater standards/levels;

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- Groundwater monitoring system maintenance. A groundwater monitoring system will be implemented to demonstrate the active groundwater treatment and MNA remedies are protective of human health and the environment. The groundwater monitoring system will remain in place until the groundwater cleanup levels specified in Table 2-10 are achieved. If any of the elements of the groundwater monitoring system are damaged, destroyed, or become ineffective, they will be repaired or replaced;

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- A LUC for groundwater will be implemented ~~until the levels of COCs in soil and groundwater allow cleanup levelsfor unlimited use and unrestricted exposure are met~~ per 30 TAC 335.565 and 30 TAC 335.566 to ensure protection of human health by preventing ~~exposure to~~to the potable use of groundwater above cleanup levels. A LUC restricting land use to nonresidential use will be implemented until it is demonstrated that the COCs in surface ~~soil~~ and subsurface soil and groundwater are at levels that allow for unlimited use and unrestricted exposure. ~~LUC to maintain the integrity of any current or future remedial or monitoring systems to prevent the use of groundwater contaminated above cleanup levels as a potable water source will be in place until groundwater cleanup levels are met.~~

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If the 20,000 µg/L of perchlorate level is not reached after approximately 1.5 years, the contingency remedy of in situ bioremediation described in Alternative 3 will be implemented to reduce the perchlorate levels more quickly so the conditions become amenable for TCE to attenuate naturally. The monitoring and reporting associated with MNA would continue until the cleanup levels are achieved.

By extracting contaminated groundwater, Alternative 4 intends to lower the highest concentrations of perchlorate in groundwater to levels more amenable to natural attenuation. The extracted contaminated groundwater would be conveyed to the existing on-site groundwater treatment plant for treatment. The groundwater plume is contaminated with both TCE and high concentrations of perchlorate that tend to inhibit degradation of the TCE. Removal of the perchlorate down to a concentration of 20,000 µg/L by extraction is expected to accelerate the TCE degradation by MNA. Once reduced to 20,000 µg/L, the performance of natural attenuation would be evaluated by 2 years of monitoring using data acquired from the eight quarters and from the historical sampling events of the prior 10 years. The performance objectives for groundwater remediation will be included in the RD. If it is found that the performance objectives are not met, a contingency remedy of in situ bioremediation (see Alternative 3 description for basic elements) would be implemented.

Five-year reviews will be performed to document that the remedy remains protective of human health and the environment.

The selected alternative offers a high degree of long-term effectiveness, can be easily and immediately implemented, and costs less than the other most comparable alternative, Alternative 3.

The U.S. Army believes the selected alternative meets the threshold criteria and provides the best balance of tradeoffs among the other alternatives with respect to the CERCLA §121(b) criteria used to evaluate remedial alternatives. The selected alternative will: 1) be protective of human health and the environment; 2) comply with ARARs; 3) be cost-effective; 4) utilize a permanent solution; and 5) utilize an active treatment as a principal element. The selected remedy addresses the statutory preference for treatment to the maximum extent possible.

The U.S. Army will present details of the soil excavation plan, groundwater extraction plan, LUC implementation plan, groundwater monitoring plan, and MNA remedy implementation in the RD for LHAAP-17.

2.12.2 Description of the Selected Remedy

The selected remedy, Alternative 4, was outlined in **Section 2.9**; that description is expanded in the following discussion. The major components of the remedy and the contingency remedies include:

- ***Soil Excavation.*** The excavation will remove explosives, barium, and dioxin contamination for off-site disposal at a RCRA Subtitle D-permitted landfill. This action will achieve the following: 1) removal of soil that is a direct risk to the hypothetical future maintenance worker, thereby protecting human health by preventing inhalation, ingestion, and dermal contact with the COCs; 2) removal of contaminated soil that is a potential source of contaminant migration to groundwater; and 3) removal of soil posing a risk to ecological receptors. The cleanup levels are presented in **Table 2-10**. The treatability demonstration study by PEC may have reduced the contaminants to the preliminary cleanup level. To verify the remaining levels of contamination and to further delineate areas of excavation for design purposes, a limited soil sampling will be conducted during the remedial design phase. The approximate excavation locations are highlighted on **Figure 2-12**. The removal of soil contamination will be verified by collecting confirmation samples from the walls and floors of the excavation area and submitting them for laboratory analysis for the COCs of interest. Clean borrow soil will be used as needed to backfill the excavations so they can be graded for proper drainage.

- ***Groundwater extraction.*** The desired outcome is to reduce perchlorate concentrations in the groundwater to 20,000 µg/L or lower during an operational period of 1.5 years. At these levels, it is anticipated that conditions will be favorable for MNA to take over to reduce contaminants to the cleanup levels. This component is described in **Section 2.9.2**. **Figure 2-13** presents a process flow diagram for the treatment process. The groundwater treatment plant is located at LHAAP-18/24.

- ***Contingency remedy if groundwater extraction does not reduce perchlorate levels to 20,000 µg/L in the 1.5 year extraction timeframe.*** The contingency remedy would implement in situ bioremediation. The area and the elements of the contingency remedy would be selected based on the entire data set available. The elements of an in situ bioremediation remedy are described in **Section 2.9.2**. If a contingency remedy is implemented, it will be documented in an Explanation of Significant Differences (ESD).

- ***MNA to return groundwater to its potential beneficial use, wherever practicable.*** MNA begins following groundwater extraction activities. Historic data suggest that natural attenuation of COCs is occurring at the site; however, additional data collection is necessary to fully evaluate natural attenuation. Monitoring wells will be sampled for eight consecutive quarters to evaluate and confirm the occurrence of natural attenuation in conjunction with historical data. Data from the eight quarterly events will be combined with historic data to evaluate the effectiveness of various natural physical, chemical, and biological processes in reducing contaminant concentrations.

- ***Performance objectives to evaluate the MNA remedy performance after 2 years.*** Each of the general performance objectives must be met as indicated below. If the criteria are not met to illustrate that MNA is an effective remedy, the contingency action would be initiated. If MNA is effective, a baseline will be established from the data to this point in time. Specific evaluation criteria will be developed in the RD. The MNA evaluation will be based on the USEPA lines of evidence (USEPA, 1999) and the anaerobic screening (USEPA, 1998) as follows:

- MNA potential based on evaluation biodegradation screening scores using USEPA guidance.

- Plume stability (i.e., the plume concentrations are decreasing in the majority of performance wells, and the plume is not expanding in area as demonstrated with compliance wells).

- MNA Process Evaluation demonstrated based on an attenuation rate calculated with empirical performance monitoring data, and MNA Process Demonstration based on the presence of daughter products and bacterial culture counts.

- ***A contingency remedy involving in situ bioremediation to reach the RAOs if MNA is found to be ineffective.*** The contingency remedy will use elements of in situ bioremediation from Alternative 3 to address the ineffective aspects of MNA. The area and the elements of the contingency remedy would be selected based on the entire data set available. If the contingency remedy is implemented, it will be documented in an ESD.

- ***Initiate LTM.*** If MNA is determined to be effective, monitoring will be conducted to evaluate the remedy performance and determine if the plume conditions remain constant, improve or worsen after the baseline is established. LTM will be implemented at a frequency of semiannual for 3 years, then annually until the next five-year review. The performance monitoring plan will be developed in the RD and will be based on USEPA guidance (USEPA, 2004).

- Continue LTM annually thereafter until recommended otherwise by the five-year review to evaluate remedy performance and determine if plume conditions remain constant, improve, or worsen. The baseline of the plume for future five-year reviews will be established as part of the MNA evaluation program. The initial LTM plan will be developed during RD.

- ***Groundwater monitoring system maintenance.*** A groundwater monitoring system will be implemented to demonstrate the active groundwater treatment and MNA remedies are protective of human health and the environment. The groundwater monitoring system will remain in place until the groundwater cleanup levels specified in Table 2-10 are achieved. If any of the elements of the groundwater monitoring system are damaged, destroyed, or become ineffective, they will be repaired or replaced.

- ~~***Land Use Control.*** The land use controls objectives include maintaining the integrity of any current or future remedial or monitoring systems to prevent the use of groundwater contaminated above cleanup levels as a potable water source. The groundwater treatment and MNA remedial components include a groundwater monitoring system that will be used to characterize the condition of the groundwater during the period the groundwater remedy is in place until the groundwater~~

~~remediation goals are achieved, and to demonstrate achievement of the groundwater remediation goals when the groundwater remedy is complete. As a part of this groundwater remedy, the Army will maintain the remedial and monitoring systems associated with the groundwater remedies until these components of the remedy are no longer needed to achieve cleanup levels, and cleanup levels have been achieved. During the period of operation of the groundwater remedy, if any of the elements of the remedial and groundwater monitoring systems are damaged, destroyed, or become ineffective, they will be repaired or replaced with suitable components to assure that the remedial and groundwater monitoring systems are able to provide data of the quality necessary to determine the progress of and eventual completion of this component of the remedy. The actions to be taken to implement these LUC objectives and requirements will be provided through modifying the "Comprehensive Land Use Control (LUC) Management Plan, Former Longhorn Army Ammunition Plant, Karnack, Texas" and detailed in the LUC RD.~~

- The LUC for prohibition of potable groundwater use ~~(except for monitoring and testing)~~ shall be implemented ~~until the cleanup levels under the SDWA MCLs, are attained, or attainment of the MSC for GW-Ind, if no MCL is available. The LUC for the prohibition of groundwater use~~and shall remain in place at the site until the ~~hazardous substances~~COCs in ~~soil and~~ groundwater remaining at the site are reduced below the cleanup levels specified in Table 2-10 ~~that would support unlimited use and unrestricted exposure~~. A LUC RD~~emedial Design~~ will be finalized as the land use component of the Remedial Design. Within 21 days of the issuance of the Record of Decision, the Army will propose deadlines for completion of the R~~emedial~~ D~~esign~~ Work Plan, R~~emedial~~ D~~esign~~, and Remedial Action Work Plan. The documents will be prepared and submitted to EPA and TCEQ ~~for Consultation~~ pursuant to the FFA. ~~and~~ T~~t~~he LUC RD~~remedial design that~~ will contain implementation and maintenance actions, including periodic inspections. The recordation notification for the site which will be filed with Harrison County will include a description of the LUCs. The preliminary boundary for the groundwater LUC is shown on **Figure 2-5**.

- The LUC restricting land use to nonresidential shall be implemented until it is demonstrated that surface ~~soil~~ and subsurface soil and groundwater COCs are at levels that allow for unlimited use and unrestricted exposure.

- ~~The LUC to maintain the integrity of any current or future remedial or monitoring systems to prevent the use of groundwater contaminated above cleanup levels as a potable water source will be in place until groundwater cleanup levels are met.~~

The Army will implement, maintain, monitor, report on and enforce land use controls at Army-owned property. The Army shall perform those actions related to land use control activities described in this ROD and in the Remedial Design for the ROD. For portions of the Site subject to land use controls that are not owned by the Army, the Army will monitor and report on the implementation, maintenance, and enforcement of land use controls, and coordinate with federal, state, and local governments and owners and occupants of properties subject to land use controls. The Army will provide notice of the groundwater and soil contamination and any land use restrictions referenced in the ROD. The Army will send these notices to the federal, state and local governments involved at this site and the owners and occupants of the properties subject to those use restrictions and land use controls. The Army shall provide the initial notice within 90 days of ROD signature. The frequency of subsequent notifications will be described in the Remedial Design for the ROD. The Army remains responsible for ensuring that the remedy remains protective of human health and the environment. The Army will fulfill its responsibility and obligations under CERCLA and the NCP as it implements, maintains, and reviews the selected remedy.

Upon transfer of Army-owned property, the Army will provide written notice of the land use controls to the transferee of the groundwater and soil contamination and any land use restrictions referenced in the ROD. Within 15 days of transfer, the Army shall provide EPA and TCEQ with written notice of the division of implementation, maintenance, and enforcement responsibilities unless such information has already been provided in the LUC RD. The LUC RD will address the procedures to be used by the Army and the transferee to document compliance with the LUCs described in this ROD. In the event property is transferred out of Federal control, the land use controls relating to property and groundwater restrictions shall be recorded in the deed and shall be enforceable by the United States and the state of Texas.~~The U.S. Army will be responsible for implementation, maintenance, periodic inspection, reporting on, and enforcement of the LUCs. Although the U.S. Army may later pass these procedural responsibilities to the transferee by property transfer agreement, the U.S. Army shall retain ultimate responsibility for: (1) CERCLA 121(c) five year reviews; (2) notification of the appropriate regulators of any known LUC deficiencies or violations; (3) access to the property to conduct any necessary response; (4) reservation of the authority to change, modify or terminate LUCs and any related transfer or lease provisions; and (5) ensuring the protectiveness of the selected remedy. The U.S. Army shall consult with TCEQ and obtain USEPA concurrence prior to termination or significant modification of a LUC, or in the highly unlikely event of a land use change inconsistent with the industrial/recreational use assumptions of the remedy. In the event that TCEQ and/or EPA and the Army agree with respect to any significant modification of the selected remedy, including the LUC component of the selected remedy, the remedy will be changed consistent with the FFA and 40 CFR 300.435(c)(2).~~

LUC implementation and maintenance actions would be described in the RD for LHAAP-17. The LUCs would be included in the property transfer documents and a recordation of the area of groundwater prohibition would be filed in the Harrison County Courthouse. The LUC for groundwater will prevent human exposure to groundwater contaminated with chlorinated solvents and perchlorate through the prohibition of potable groundwater use. ~~The LUC for prohibition of groundwater use except for environmental monitoring and testing shall be maintained until the concentrations of contaminants and by-product (daughter) contaminants have been reduced to below their respective cleanup levels (SDWA MCLs or MSC for GW-Ind if no MCL is available).~~ In addition, within 90 days of signature of this ROD, the Army shall request the Texas Department of Licensing and Regulation to notify well drillers of groundwater use prohibitions based on a preliminary LUC boundary. Within 21 days of the issuance of the ROD, the Army will propose ~~target dates for completion of the draft secondary comments and~~ deadlines for completion of the R~~emedial~~ D~~esign~~ Work Plan, R~~emedial~~ D~~esign~~, and Remedial Action Work Plan. The documents will be prepared and submitted to EPA and TCEQ pursuant to the FFA. The LUC RD will contain implementation and maintenance actions, including periodic inspections. Consistent with the dates presented for these documents, the U.S. Army shall: 1) request the Texas Department of Licensing and Regulation to notify well drillers of groundwater use prohibitions; and 2) notify the Harrison County Courthouse of the LUC to include a map showing the areas of groundwater use prohibition at the site, in accordance with 30 TAC 335.565.

Monitoring activities associated with the LUC would be undertaken to ensure that groundwater is not being used. Long-term operational requirements under this alternative would include maintenance of the LUCs. Groundwater monitoring will demonstrate no migration of the plume and the eventual reduction of contaminants to levels below cleanup levels. The need for continued groundwater monitoring will be evaluated every 5 years during the reviews. Sampling frequency and analytical requirements will be presented as an appendix to the RD for LHAAP-17.

2.12.3 Cost Estimate for the Selected Remedy

Table 2-13 presents the present worth analysis of the cost for the selected remedy, Alternative 4. The information in the table is based on the best available information regarding the anticipated scope of the remedial alternative. The quantities used in the estimate are for estimating purposes only. Changes in the cost elements are likely to occur as a result of new information and data collected during the engineering design of the remedial alternative. Major changes may be documented in the form of a memorandum in the Administrative Record, an ESD, or a ROD amendment. This is an order-of-magnitude engineering cost estimate that is expected to be within -30 to +50 percent of the actual project cost.

The total project present worth cost of this alternative is approximately $2,090,000, using a discount rate of 2.8%. The capital cost is estimated at $1,570,000. The total O&M present value cost is estimated at approximately $520,000. The O&M cost includes evaluation of MNA, maintenance of the LUCs, and LTM through Year 30. The LTM would support the required CERCLA five-year reviews.

2.12.4 Expected Outcomes of Selected Remedy

The purpose of this response action is to attain the RAOs stated in **Section 2.8** of this document. **Table 2-10** and **2-11** present the cleanup levels for COCs and COPECs, respectively. The cleanup levels for the COCs in the groundwater are the Federal Safe Drinking Water Act MCLs, or if no MCL exists for that chemical, the cleanup level is the GW-Ind (TCEQ, 2006). The cleanup level for the COCs in the soil is the GWP-Ind. The cleanup level for the COPECs in the soil is the EcoPRGs.

The expected outcome of the selected remedy is that contaminants in soil and groundwater will be reduced to the cleanup levels. Achievement of the cleanup levels (**Tables 2-10** and **2-11**) is anticipated to be completed in less than 117 years; how much less depends on the success of the active remediation. This approximate timeframe to achieve cleanup levels is considered reasonable for the anticipated future land use as a national wildlife refuge. ~~When the groundwater cleanup levels are achieved, the LUC for the maintenance of the monitoring system will be removed.~~ When the levels of ~~groundwater remedial action goals~~COCs in soil and groundwater allow for unlimited use and unrestricted exposure~~ are achieved~~, the LUC~~s~~ ~~for~~ restricting groundwater ~~and soil~~use and restricting land use to nonresidential will be removed. In the short-term (prior to the groundwater achieving cleanup levels), the site will be made part of a national wildlife refuge operated by USFWS, and will continue as such in the long-term (after the groundwater achieves cleanup levels).

In addition, the monitoring activities associated with MNA would confirm the protection of human health and the environment by documenting the return of the groundwater to its potential beneficial use as a drinking water supply, by documenting reduction of the contaminant mass, and protection of surface water through containment of the plume. ~~Until that time, tThe LUC for groundwater will prohibit the use of the site's groundwater except for environmental monitoring and testing.~~

As part of the evaluation of MNA, attenuation rates are computed and evaluated in accordance with the USEPA guidance material (USEPA, 1998). Time-dependent attenuation rate constants and estimated in-well cleanup times are determined based on COC concentration data over time from individual wells assuming first order degradation kinetics. Attenuation rates are calculated for the monitoring wells with the highest concentrations for which the available data allow such a calculation. Attenuation rates are based on the following formula from the USEPA guidance (USEPA, 1998):

$$C = C_o e^{-kt}$$

where:
C = concentration at time t
C_o = initial concentration
k = attenuation rate constant (first order reaction)

2.13 Statutory Determinations

Under CERCLA §121 and the NCP, the U.S. Army must select remedies that are protective of human health and the environment, comply with ARARs (unless a statutory waiver is justified), are cost effective, and utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. In addition, CERCLA includes a preference for remedies that employ treatment that permanently and significantly reduce the volume, toxicity, or mobility of hazardous wastes as a principal element and a bias against off-site disposal of untreated wastes. The following sections discuss how the selected remedy meets the statutory requirements.

2.13.1 Protection of Human Health and the Environment

The selected remedy, Alternative 4, will achieve the RAOs for LHAAP-17. For the protection of human health, the remedial action would remove soil that exceeds the cleanup levels, and it would eventually achieve the destruction of the COCs present in the groundwater plumes at LHAAP-17. Continued maintenance of the LUC for groundwater would prevent human access and exposure to groundwater that poses an unacceptable risk to human health, until COCs have sufficiently degraded to ~~below the cleanup~~ levels that allow for unlimited use and unrestricted exposure. Therefore, the residual risk upon completion of the remedial actions will be within the risk range for the hypothetical future maintenance worker.~~Therefore, the residual risk upon completion of the remedial actions will be within the risk range for the hypothetical future maintenance worker.~~ At LHAAP-17, the evaluation of historical groundwater contaminant trends indicates that natural attenuation processes are occurring at the site. This remedy provides adequate confirmation that human health and the environment are protected because monitoring would be conducted to document the effectiveness of MNA. The monitoring activities associated with MNA will ensure that COCs and by-product (daughter) contaminants in groundwater do not flow to surface water bodies at such levels that ARARs are exceeded. When ~~cleanup~~ levels of COCs in soil and groundwater allow for unlimited use and unrestricted exposure ~~have been achieved in groundwater~~, the LUC for groundwater will be removed.

For the protection of ecological receptors, the remedial action would remove soil at select areas (in addition to those areas excavated for the protection of human health) to address ecological risks. The outcome of the removal is that the soil in the Waste Sub-Area, which includes LHAAP-17, will satisfy the EcoPRGs.

There are no short-term threats associated with the selected remedy that cannot be readily controlled. In addition, no adverse cross-media impacts are expected from the selected remedy.

2.13.2 Compliance with ARARs

The selected remedy complies with all ARARs. The ARARs are presented below and in **Table 2-14**.

Chemical-Specific ARARs

- **Soil**: Since there are no federally promulgated chemical-specific ARARs for soil (e.g., perchlorate), the ROD applies the State of Texas promulgated cleanup standards under 30 TAC 335, Subchapter S, which are used as the chemical-specific ARARs for this site. It is anticipated that removal of contaminated soils above the Texas standard will prevent any future contamination of the groundwater from soil at the site.

- **Surface water**: Section 121(d)(2) of CERCLA states that every remedial action shall require a level of control which at least attains surface water quality criteria established under Sections 304 or 303 of the Clean Water Act of 1972. Therefore, surface water quality criteria are ARARs if there is a remedial action that affects surface water, and measures will be implemented during construction to prevent off-site migration of contaminants to surface waters. In the event of remedy failure resulting in or potentially resulting in a release to surface water, 40 CFR §§ 122, 125, 129, and 130 – 131 and 30 TAC 307.1, 307.2, 307.3, 307.4, 307.5(a) and (b), 307.6, 307.7, 307.8 and 307.9 are considered potential future ARARs.

- **Groundwater**: Cleanup levels are presented in **Table 2-10**. LHAAP is being addressed using the Risk Reduction Standards (RRS) (30 TAC 335.551 through 335.569). The RRS were provided to ensure adequate protection of human health and the environment from potential exposure to contaminants associated with releases from solid waste management facilities or other areas. There are three sets of RRS that provide cleanup levels ranging from closure/remediation to site background (RRS 1) to closure/remediation with controls (RRS 3). A baseline risk assessment under RRS 3 was completed for LHAAP-17 which identified COCs in groundwater that potentially pose carcinogenic risk and hazard to the hypothetical future maintenance worker. These identified COCs, with the exception of perchlorate, have MCLs. Thus, the cleanup goal for groundwater will be the MCLs which meet health-based standards and criteria. MSCs provided under Texas Risk Reduction Rules (30 TAC 335.551 through 335.569) are applicable where MCLs are not available, i.e., perchlorate. This alternative will return the contaminated shallow and intermediate groundwater zones at LHAAP-17 to their potential beneficial use as drinking water, wherever practicable, which for the purposes of this ROD is considered to be attainment of the relevant and appropriate SDWA MCLs or MSC for GW-Ind if no MCL is available to the extent practicable, and consistent with 40 CFR 300.430(e)(2)(i)(B&C) and 30 TAC 335.559(d)(2). If a return to potential beneficial uses is not practicable, this alternative would still meet the NCP expectation to prevent further migration of the plume, prevent exposure to the contaminated groundwater, and evaluate further risk reduction.

Location-Specific ARARs

- **Floodplain management**: LHAAP-17 includes areas classified as part of a floodplain.

- **Wetlands**: The USACE has not made a determination that jurisdictional wetlands exist at LHAAP-17, and none are identified on the USFWS database; therefore, protection of wetlands is not considered a potential location-specific ARAR for this site.

Action-Specific ARARs

The selected remedy has potential action-specific ARARs related to the following activities: site preparation, construction, and excavation activities; waste generation, characterization, management, storage, and disposal activities; well construction; and water treatment.

- **Site preparation, construction, and excavation activities**: Certain on-site preparation, construction, and/or excavation activities will be necessary under all remediation actions to prepare the site for remediation, including the soil-moving or site-grading activities. Control of fugitive emissions and storm water runoff during implementation of these activities will be required. Airborne particulate matter resulting from construction or excavation activities is subject to the fugitive dust and opacity limits listed in 30 TAC 111, Subchapter A. No person may cause, suffer, allow, or permit visible emissions from any source to exceed an opacity of 30 percent for any 6-minute period (30 TAC 111.111[a]). Reasonable precautions must also be taken to achieve maximum control of dust to the extent practicable, including the application of water or suitable chemicals or the complete covering of materials (30 TAC 111.143 and 30 TAC 111.145). Texas has also promulgated general nuisance rules for air contaminants mandating that no person shall discharge from any source whatsoever one or more air contaminants, or combinations thereof, in such concentration and of such duration as are or may tend to be injurious to or to adversely affect human health or welfare, animal life, vegetation, or property, or as to interfere with the normal use and enjoyment of animal life, vegetation, or property (30 TAC 101.4). Storm water discharges from construction activities that disturb equal to or greater than one acre of land must comply with the substantive requirements of a USEPA National Pollutant Discharge Elimination System general permit (40 CFR 122.26; 30 TAC 205, Subchapter A; and 30 TAC 308.121), depending on the amount of acreage disturbed. Substantive requirements include implementation of good construction management techniques; phasing of large construction projects; minimal clearing; and sediment, erosion, structural, and vegetative controls to mitigate runoff and ensure that discharges meet required parameters.

- **Waste and disposal activities**: The processes of monitoring, intercepting, or treating contaminated groundwater may generate a variety of primary and secondary waste streams (e.g., soil, personal protective equipment, and dewatering and decontamination fluids). These waste streams are expected to be non-hazardous waste. All solid waste (defined as any solid, liquid, semisolid, or contained gaseous material intended for discard [40 CFR 261.2]) generated during remedial activities must be appropriately characterized to determine whether it contains RCRA hazardous waste (40 CFR 262.11; 30 TAC 335.62; 30 TAC 335.503[a][4]; 30 TAC

335.504). All wastes must be managed, stored, treated (if necessary), and disposed in accordance with the ARARs for waste management listed in **Table 2-14** for the particular type of waste stream or contaminants in the waste.

- **Well construction**: The remedial action may involve the placement, use, or eventual plugging and abandonment of some type of groundwater monitoring, injection, and/or extraction wells, either for in situ treatment or extraction of the contaminated groundwater or for LTM of the groundwater. Available standards for well construction and plugging/abandonment would provide ARARs for such actions and include 30 TAC 331, Subchapters A, C, and H. Texas has promulgated technical requirements in Chapter 76 of Title 16 of the TAC applicable to construction, operation, and plugging/abandonment of water wells. In particular, 16 TAC 76.1000 (*Locations and Standards of Completion for Wells*), 16 TAC 76.1002 (*Standards for Wells Producing Undesirable Water or Constituents*) (LHAAP-17 contaminated groundwater could be considered "undesirable water" defined pursuant to Section 76.10[36] as "water that is injurious to human health and the environment or water that can cause pollution to land or other waters"), 16 TAC 76.1004 (*Standards for Capping and Plugging of Wells and Plugging Wells that Penetrate Undesirable Water or Constituent Zones*), and 16 TAC 76.1008 (*Pump Installation*) may provide ARARs for the placement, construction, and eventual plugging/abandonment of groundwater injection or extraction wells or the placement and long-term operation of groundwater monitoring wells for proposed groundwater remedial strategies.

- **Water treatment**: Contaminated groundwater and wastewaters collected during well drilling or decontamination activities could be transported to the groundwater treatment plant at LHAAP-18/24 for processing, and would subsequently be discharged in compliance with the effluent limits for that plant. Such waters would be characterized, as required, before transport and managed accordingly in compliance with requirements for the type of waste contaminating the water. To assure compliance with the groundwater treatment plant's discharge limits, the incoming water must meet the waste acceptance criteria for the facility. On-site wastewater treatment units (as defined in 40 CFR 260.10) that are part of a wastewater treatment facility that is subject to regulation under Section 402 or Section 307(b) of the Clean Water Act of 1972 are not subject to RCRA Subtitle C hazardous waste management standards (40 CFR 270.1[c][2][v]; 40 CFR 264.1[g][6]; 30 TAC 335.42[d][1]). The USEPA has clarified that this exemption applies to all tanks, conveyance systems, and ancillary equipment, including piping and transfer trucks, associated with the wastewater treatment unit (Federal Register Title 53, 34079, September 2, 1988).

2.13.3 Cost-Effectiveness

The progression of present worth costs from the least expensive alternative to the most expensive alternative is as follows (provided that no contingencies are implemented): Alternative 1, Alternative 2, Alternative 4, and Alternative 3. No costs are associated with Alternative 1 because no remedial activities would be conducted. Alternative 2 has the lowest present worth and capital costs of the remediation alternatives (Alternatives 2 through 4). The present worth costs for Alternative 2 is lower than that of Alternatives 3 and 4, as it does not involve injections for bioremediation or construction for a groundwater extraction system. Compared to the selected alternative (Alternative 4), the total present worth cost of Alternative 2 is 9% less and Alternative 3 is 24% more. The capital present worth cost of Alternative 2 is 12% less and Alternative 3 is 25% more. **Table 2-13** is the cost estimate summary table for the selected remedy.

2.13.4 Utilization of Permanent Solutions and Alternative Treatment (or Resource Recovery) Technologies to the Maximum Extent Practicable

The U.S. Army has determined that the selected remedy represents the maximum extent to which permanent solutions and treatment technologies can be utilized in a practicable manner at the site. Soil excavation would remove impacted soils and groundwater extraction and treatment would irreversibly reduce groundwater contaminant concentrations in the treated portions of the groundwater plume. When perchlorate is reduced to 20,000 µg/L, groundwater extraction will be discontinued and MNA will reduce groundwater contaminants to cleanup levels. Natural biodegradation is an irreversible treatment process that would reduce the mass and concentration of contaminants.

Alternative 4 would significantly reduce groundwater contaminant concentrations and achieve cleanup levels although the actual potential effectiveness will be controlled by the nature of the permeable water-bearing zones and the distribution and presence of COCs remaining in the groundwater in the untreated areas. The selected remedy would provide reduction in toxicity, mobility, and volume of the groundwater contaminants via active treatment. Alternative 4 would take less time to achieve remediation goals than Alternative 2 provided subsurface conditions for groundwater extraction are favorable.

Alternative 4 would provide almost immediate protection because the LUCs would be implemented quickly. Maintenance of this control would be required until ~~natural attenuation processes reduce~~ COC ~~and by-product (daughter) contaminant~~ concentrations in soil and groundwater allow~~to below cleanup levels~~ for unlimited use and unrestricted exposure.

2.13.5 Preference for Treatment as a Principal Element

The selected remedy would reduce the toxicity, mobility, or volume of contaminants in the groundwater through an active remedial process. By utilizing groundwater extraction as a significant portion of the remedy, the statutory preference for remedies that employ treatment as a principal element is satisfied. There is principal threat material in the soil at LHAAP-17. The contaminated soil that is principal threat source material will be excavated to remove the contaminated material from the site. Based on the waste characteristics, the material will be disposed at an approved landfill.

2.13.6 Five-Year Review Requirements

Section 121(c) of CERCLA and NCP §300.430(f)(5)(iii)(C) provide the statutory and legal bases for conducting five-year reviews. Because this remedy will result in contaminants that remain on site above levels that allow unlimited use and unrestricted exposure, a review will be conducted at least every five years to confirm that the remedy continues to provide adequate protection of human health and the environment.

2.14 Significant Changes from the Proposed Plan

The Proposed Plan for LHAAP-17 was released for public comments on May 26, 2010. The Proposed Plan identified Alternative 4 as the Preferred Alternative for groundwater remediation. The U.S. Army reviewed all written comments during the public comment period (there were no verbal comments). After careful consideration of the comments, it was determined that no significant changes to the remedy, as originally identified in the Proposed Plan, were necessary or appropriate.

Table 2-1
Summary of Chemicals of Concern and Medium Specific Exposure Point Concentrations

Scenario Timeframe: Current
Medium: Groundwater
Exposure Medium: Groundwater

Exposure Point	Chemical	Concentration Detected[1] (mg/L)		Frequency of Detection	Exposure Point Concentration (mg/L)	Statistical Measure
		Minimum	Maximum			
Ingestion, inhalation, dermal contact	*Dioxin/Furan*					
	2,3,7,8-TCDD TEC	1.84E-09	3.54E-09	---	3.54E-09	maximum
	Metals					
	Aluminum	5.00E-01	8.10E+00	11/17	8.10E+00	maximum
	Antimony	5.00E-03	1.30E-02	6/28	1.30E-02	maximum
	Cadmium	9.00E-04	9.00E-04	1/28	9.00E-04	maximum
	Chromium	1.00E-02	1.80E-01	15/28	1.80E-01	maximum
	Lead	3.00E-03	1.00E-02	14/28	1.00E-02	maximum
	Manganese	4.90E-02	3.49E+00	17/17	3.49E+00	maximum
	Nickel	4.00E-02	2.10E-01	7/28	2.10E-01	maximum
	Silver	1.00E-02	1.00E-02	1/28	1.00E-02	maximum
	Strontium	1.40E-01	3.20E+00	17/17	3.20E+00	maximum
	Thallium	1.70E-03	4.30E-03	16/28	4.30E-03	maximum
	Non-Metallic Anion					
	Perchlorate	1.0E-02	3.2E+02	21/31	3.20E+02	maximum
	Semi-Volatile Organics					
	2,4-Dinitrotoluene	---	---	0/7	3.80E-03	maximum
	2,6-Dinitrotoluene	---	---	0/7	3.80E-03	maximum
	Volatile Organics					
	1,1-Dichloroethene	3.70E-03	5.10E-02	7/28	5.10E-02	maximum
	1,2-Dichloroethane	4.90E-03	6.30E-02	8/28	6.30E-02	maximum
	Methylene chloride	1.10E-03	3.20E-03	4/28	3.20E-03	maximum
	Trichloroethene	2.90E-03	5.32E+00	13/28	5.32E+00	maximum
	Dioxin/Furan					
	2,3,7,8-TCDD TEC	1.28E-06	2.14E-04	---	2.14E-04	maximum
	Explosive					
	2,4,6-Trinitrotoluene	4.30E-01	8.40E+03	9/29	8.40E+03	maximum
	2-Amino-4,6-dinitrotoluene	5.10E-01	1.60E+01	5/29	1.60E+01	maximum
	4-Amino-2,6-dinitrotoluene	4.90E-01	4.80E+00	4/20	4.80E+00	maximum

Table 2-1 (*continued*)
Summary of Chemicals of Concern and Medium Specific Exposure Point Concentrations

Scenario Timeframe: Current
Medium: Soil
Exposure Medium: Soil (0 to 2 feet below ground surface)

Exposure Point	Chemical	Concentration Detected[1] (mg/kg)		Frequency of Detection	Exposure Point Concentration (mg/kg)	Statistical Measure
		Minimum	Maximum			
Ingestion, inhalation, dermal contact	*Metals*					
	Antimony	1.36E+00	2.51E+00	9/30	2.51E+00	maximum
	Barium	4.70E+01	2.05E+04	47/47	1.16E+03	95% UCL
	Cadmium	6.80E-01	7.33E+00	11/47	7.33E+00	maximum
	Lead	4.77E+00	5.97E+02	47/47	9.34E+01	95% UCL
	Thallium	4.80E+00	4.80E+00	1/47	4.80E+00	maximum
	Non-Metallic Anion					
	Perchlorate	3.56E-02	6.16E-01	4/4	6.16E-01	maximum
	Semi-Volatile Organics					
	2,4-Dinitrotoluene	1.90E+00	7.10E+03	4/18	2.60E+03	95% UCL
	2,6-Dinitrotoluene	1.80E+00	7.60E+02	5/18	3.18E+02	95% UCL
	Hexachlorobenzene	2.80E-01	2.80E-01	1/18	2.80E-01	maximum

Notes:
[1] Minimum/maximum detected concentration above the reporting limit

For groundwater, the maximum detected concentrations were used to estimate the exposure point concentration.
For soil, the 95% UCL values were used to estimate the exposure point concentration if the concentration exceeded the average and was below the maximum detected; otherwise, the maximum detected concentration was used to estimate the exposure point concentration.

---: No information available
95% UCL: 95% upper confidence level of the mean
mg/kg: milligrams per kilogram
mg/L: milligrams per liter
TCDD: tetrachlorodibenzo-p-dioxin
TEC: toxicity equivalence concentration

References:
Jacobs Engineering Group, Inc. (Jacobs), 2002, *Baseline Human Health and Screening Ecological Risk Assessment for the Group 2 Sites (Sites 12, 17, 18/24, 29, 32, 49, Harrison Bayou, and Caddo Lake), Longhorn Army Ammunition Plant, Karnack, Texas*, Final, Oak Ridge, TN, August.

Summary of Chemicals of Potential Concern and Medium-Specific Exposure Point Concentrations

The table presents the chemicals of potential concern (COPCs) and exposure point concentration (EPC) for each (i.e. the concentration used to estimate the exposure and risk from each COPC). The table includes the range of concentrations detected for each COPC, as well as the frequency of detection (i.e., the number of times the chemical was detected in the samples collected at the site), the EPC, and the statistical measure upon which the EPC was based. The COPCs listed are the ones that were quantitatively evaluated for carcinogenic risk and non-carcinogenic hazard in the Baseline Human Health Risk Assessment (Jacobs, 2002).

Table 2-2
Carcinogenic Toxicity Data Summary

Pathway: Ingestion, Dermal Contact

Chemical of Concern	Oral Cancer Slope Factor (mg/kg-day)$^{-1}$	Dermal Cancer Slope Factor (mg/kg-day)$^{-1}$	Weight of Evidence/ Carcinogen Guideline Description	Source/Date
Dioxin/Furans				
2,3,7,8-TCDD TEC	1.50E+05	3.00E+05	not classified	USEPA-HEAST, 1997
Explosives				
2,4,6-Trinitrotoluene	3.00E-02	5.00E-02	C	USEPA-IRIS, 2001
2-Amino-4,6-dinitrotoluene	1.00E-02	2.00E-02	not classified	TCEQ, 2001
4-Amino-2,6-dinitrotoluene	1.00E-02	2.00E-02	not classified	TCEQ, 2001
Metals				
Aluminum	NTV	NTV	not classified	---
Antimony	NTV	NTV	not classified	---
Barium	NC	NC	D	TCEQ, 2001
Cadmium (Water)	NTV	NTV	B1	TCEQ, 2001
Chromium (Total)	NC	NC	not classified	---
Lead	NTV	NTV	not classified	---
Manganese (Non-diet)	NC	NC	D	TCEQ, 2001
Nickel	NTV	NTV	A	TCEQ, 2001
Silver	NC	NC	D	TCEQ, 2001
Strontium	NTV	NTV	not classified	---
Thallium	NC	NC	not classified	---
Non-Metallic Anions				
Perchlorate	NTV	NTV	not classified	---
Semivolatile Organics				
2,4-Dinitrotoluene	6.80E-01	8.00E-01	B2	USEPA-IRIS, 2001
2,6-Dinitrotoluene	6.80E-01	8.00E-01	B2	USEPA-IRIS, 2001
Hexachlorobenzene	1.60E+00	3.20E+00	B2	USEPA-IRIS, 2001
Volatile Organics				
1,1-Dichloroethene	6.00E-01	6.00E-01	C	USEPA-IRIS, 2001
1,2-Dichloroethane	9.10E-02	9.10E-02	B2	USEPA-IRIS, 2001
Methylene chloride	7.50E-03	7.89E-03	B2	USEPA-IRIS, 2001
Trichloroethene	1.10E-02	1.10E-02	B2	USEPA-NCEA, 2001

Table 2-2 (*continued*)
Carcinogenic Toxicity Data Summary

Pathway: Inhalation

Chemical of Concern	Unit Risk Factor $(mg/m^3)^{-1}$	Weight of Evidence/ Carcinogen Guideline Description	Source/Date
Dioxin/Furans			
2,3,7,8-TCDD TEC	3.30E+04	Not Classified	USEPA-HEAST, 1997
Explosives			
2,4,6-Trinitrotoluene	NTV	C	TCEQ, 2001
2-Amino-4,6-dinitrotoluene	NTV	Not Classified	---
4-Amino-2,6-dinitrotoluene	NTV	Not Classified	---
Metals			
Aluminum	NTV	Not Classified	---
Antimony	NTV	Not Classified	---
Barium	NC	D	TCEQ, 2001
Cadmium (Water)	1.80E+00	B1	USEPA-IRIS, 2001
Chromium (Total)	NC	Not Classified	---
Lead	NTV	Not Classified	---
Manganese (Non-diet)	NC	D	TCEQ, 2001
Nickel	4.80E-01	A	USEPA-IRIS, 2001
Silver	NC	D	TCEQ, 2001
Strontium	NTV	Not Classified	---
Thallium	NC	Not Classified	---
Non-Metallic Anions			
Perchlorate	NTV	Not Classified	---
Semivolatile Organics			
2,4-Dinitrotoluene	NTV	B2	TCEQ, 2001
2,6-Dinitrotoluene	NTV	B2	TCEQ, 2001
Hexachlorobenzene	4.60E-01	B2	USEPA-IRIS, 2001
Volatile Organics			
1,1-Dichloroethene	5.00E-02	C	USEPA-IRIS, 2001
1,2-Dichloroethane	2.60E-02	B2	USEPA-IRIS, 2001
Methylene chloride	4.70E-04	B2	USEPA-IRIS, 2001
Trichloroethene	1.70E-03	B2	USEPA-NCEA, 2001

Table 2-2 (*continued*)
Carcinogenic Toxicity Data Summary

Notes

--- : No information available
mg/kg-day: milligrams per kilogram per day
mg/m^3: milligrams per cubic meter
NC: Chemical not classified as a carcinogen
NTV: no toxicity value available
TCDD: tetrachlorodibenzo-p-dioxin
TEC: toxicity equivalence concentration

Weight of Evidence/Carcinogen Guideline Description:
A - Human carcinogen
B1 - Probable human carcinogen – Indicates that limited human data are available
B2 - Probable human carcinogen – Indicates sufficient evidence in animals and inadequate or no evidence in humans
C - Possible human carcinogen
D - Not classifiable as a human carcinogen

References

Jacobs Engineering Group, Inc. (Jacobs), 2002, *Baseline Human Health and Screening Ecological Risk Assessment for the Group 2 Sites (Sites 12, 17, 18/24, 29, 32, 49, Harrison Bayou, and Caddo Lake)*, Longhorn Army Ammunition Plant, Karnack, Texas, Final, Oak Ridge, TN, August.

Texas Commission on Environmental Quality (TCEQ), 2001, Update to 1998 Consistency Memorandum. Toxicity Factors Table, 15 March 2001.

U.S. Environmental Protection Agency (USEPA), 1993, *Provisional Guidance for Quantitative Risk Assessment of Polycyclic Aromatic Hydrocarbons*, Office of Research and Development, EPA/600/$-93/089, July 1993.

USEPA-HEAST, 1997, Human Health Effects Summary Tables (HEAST). FY-1995, Annual, Office of Emergency and Remedial Response, Washington, D.C. EPA/540/r-95-036.

USEPA-IRIS, 2001. Integrated Risk Information System (IRIS). United States Environmental Protection Agency Online Database for Toxicity Information on Hazardous Chemicals, 2001.

USEPA-NCEA, 2001, USEPA Region 3 Risk-Based Concentration Tables (5/8/2001). Referenced values from National Center for Environmental Assessment (NCEA).

Summary of Toxicity Assessment

The table provides carcinogenic risk information which is relevant to the contaminants of potential concern in soil and ground water. The list of chemicals of concern presented here are the ones that were quantitatively evaluated for carcinogenic risk and non-carcinogenic hazard in the Baseline Human Health Risk Assessment (Jacobs, 2002).

Table 2-3
Non-Carcinogenic Toxicity Data Summary

Pathway: Ingestion, Dermal Contact

Chemical of Concern	Chronic/ Subchronic	Oral RfD Value (mg/kg-day)	Dermal RfD (mg/kg-day)	Target Endpoint	Combined Uncertainty/ Modifying Factors	Source/Date
Dioxin/Furans						
2,3,7,8-TCDD TEC	chronic	NTV	NTV	NA	NA	---
Explosives						
2,4,6-Trinitrotoluene	chronic	5.00E-04	3.00E-04	Liver effects	1000/1	USEPA-IRIS, 2001
2-Amino-4,6-dinitrotoluene	chronic	1.67E-04	8.33E-05	NA	NA	TCEQ, 2001
4-Amino-2,6-dinitrotoluene	chronic	1.67E-04	8.33E-05	NA	NA	TCEQ, 2001
Metals						
Aluminum	chronic	1.00E+00	1.00E-01	NA	NA	USEPA-NCEA, 2001
Antimony	chronic	4.00E-04	6.00E-05	Longevity, blood glucose, and cholesterol	1000/1	USEPA-IRIS, 2001
Barium	chronic	7.00E-02	4.90E-03	Increased kidney weight	3/1	USEPA-IRIS, 2001
Cadmium (Water)	chronic	5.00E-04	1.25E-05	Proteinuria	10/1	USEPA-IRIS, 2001
Chromium (Total)	chronic	1.50E+00	1.95E-02	No effects observed	100/10	USEPA-IRIS, 2001
Lead	chronic	NTV	NTV	NA	NA	---
Manganese (Non-diet)	chronic	4.70E-02	2.82E-03	Central nervous system effects	1/1	USEPA-IRIS, 2001
Nickel	chronic	2.00E-02	8.00E-04	Decreased Body Weight	300/1	USEPA-IRIS, 2001
Silver	chronic	5.00E-03	2.00E-04	Argyria	3/1	USEPA-IRIS, 2001
Strontium	chronic	6.00E-01	1.20E-01	Rachitic bone	300/1	USEPA-IRIS, 2001
Thallium	chronic	8.00E-05	8.00E-05	Blood	3000/1	USEPA-IRIS, 2001[d]
Non-Metallic Anions						
Perchlorate	chronic	9.00E-04	9.00E-04	NA	NA	USEPA, 1998
Semivolatile Organics						
2,4-Dinitrotoluene	chronic	2.00E-03	1.70E-03	Central nervous system effects	100/1	USEPA-IRIS, 2001
2,6-Dinitrotoluene	chronic	1.00E-03	8.50E-04	Central nervous system effects	3000/1	USEPA-HEAST, 1997
Hexachlorobenzene	chronic	8.00E-04	4.00E-04	Liver effects	100/1	USEPA-IRIS, 2001
Volatile Organics						
1,1-Dichloroethene	chronic	9.00E-03	9.00E-03	Hepatic lesions	1000/1	USEPA-IRIS, 2001
1,2-Dichloroethane	chronic	3.00E-02	3.00E-02	NA	NA	USEPA-NCEA, 2001
Methylene chloride	chronic	6.00E-02	5.70E-02	Liver toxicity	100/1	USEPA-IRIS, 2001
Trichloroethene	chronic	6.00E-03	6.00E-03	NA	NA	USEPA-NCEA, 2001

Table 2-3 (*continued*)
Non-Carcinogenic Toxicity Data Summary

Pathway: Inhalation

Chemical of Concern	Chronic/ Subchronic	Inhalation RfC (mg/m^3)	Target Endpoint	Combined Uncertainty/ Modifying Factors	Source/Date
Dioxin/Furans					
2,3,7,8-TCDD TEC	chronic	NTV	---	---	---
Explosives					
2,4,6-Trinitrotoluene	chronic	0.0001	NA	NA	TCEQ, 2001
2-Amino-4,6-dinitrotoluene	chronic	0.0001	NA	NA	TCEQ, 2001
4-Amino-2,6-dinitrotoluene	chronic	0.0001	NA	NA	TCEQ, 2001
Metals					
Aluminum	chronic	0.0035	NA	NA	USEPA-NCEA, 2001
Antimony	chronic	0.0005	Pulmonary toxicity, chronic interstitial inflammation	300/1	USEPA-IRIS, 2001
Barium	chronic	0.00049	Fetus, developmental effects	1000/1	USEPA-HEAST, 1997
Cadmium (Water)	chronic	0.0002	NA	NA	USEPA-NCEA, 2001
Chromium (Total)	chronic	0.0001	NA	NA	TCEQ, 2001
Lead	chronic	NTV	---	---	---
Manganese (Non-diet)	chronic	0.00005	Impairment of neurobehavioral function	1000/1	USEPA-IRIS, 2001
Nickel	chronic	0.0002	Respiratory effects	NA	ATSDR, 1997
Silver	chronic	0.00001	NA	NA	TCEQ, 2001
Strontium	chronic	NTV	---	---	---
Thallium	chronic	0.0001	NA	NA	TCEQ, 2001
Non-Metallic Anions					
Perchlorate	chronic	NTV	---	---	---
Semivolatile Organics					
2,4-Dinitrotoluene	chronic	0.00015	NA	NA	TCEQ, 2001
2,6-Dinitrotoluene	chronic	0.00015	NA	NA	TCEQ, 2001
Hexachlorobenzene	chronic	NTV	---	---	---
Volatile Organics					
1,1-Dichloroethene	chronic	NTV	---	---	---
1,2-Dichloroethane	chronic	0.005	NA	NA	USEPA-NCEA, 2001
Methylene chloride	chronic	3	Liver toxicity	100/1	USEPA-HEAST, 1997
Trichloroethene	chronic	NTV	---	---	---

Table 2-3 (*continued*)
Non-Carcinogenic Toxicity Data Summary

Notes

---: No information for a compound with no toxicity value (NTV)
IRIS: Integrated Risk Information System, USEPA
mg/kg-day: milligrams per kilogram per day
mg/m^3: milligrams per cubic meter
NA: Information not available

NTV: No toxicity value available
RfC: Reference concentration
RfD: Reference dose
TCDD: tetrachlorodibenzo-p-diozin
TEC: toxicity equivalence concentration

References

Agency for Toxic Substances and Disease Registry (ATSDR), 1997, Minimal Risk Levels (MRLs) for Hazardous Substances.

Jacobs Engineering Group, Inc. (Jacobs), 2002, *Baseline Human Health and Screening Ecological Risk Assessment for the Group 2 Sites (Sites 12, 17, 18/24, 29, 32, 49, Harrison Bayou, and Caddo Lake)*, Longhorn Army Ammunition Plant, Karnack, Texas, Final, Oak Ridge, TN, August.

Texas Commission on Environmental Quality (TCEQ), 2001. Update to 1998 Consistency Memorandum. Toxicity Factors Table, 15 March, 2001.

U.S. Environmental Protection Agency (USEPA), 1998. *Perchlorate Environmental Contamination Toxicological Review and Risk Characterization based on Emergency Information*, Review Draft, Office of Research and Development. NCEA-1-0503, 31 December, 1998.

USEPA-HEAST, 1997. Health Effects Summary Table (HEAST). FY 1995, Annual Office of Emergency and Remedial Response. Washington, D.C. EPA/340/R-95-036.

USEPA-IRIS, 2001. Integrated Risk Information System (IRIS). United States Environmental Protection Agency Online Database for Toxicity Information on Hazardous Chemicals, 2001.

USEPA-NCEA, 2001. USEPA Region 3 Risk-Based Concentration Tables (5/8/2001). Referenced values from National Center for Environmental Assessment (NCEA).

Summary of Toxicity Assessment

This table provides non-carcinogenic risk information relevant to the contaminants of concern in both soil and ground water. The list of chemicals of potential concern presented here are the ones that were quantitatively evaluated for carcinogenic risk and non-carcinogenic hazard in the Baseline Human Health Risk Assessment (Jacobs, 2002). The uncertainty factor and modifying factor are used in the development of a references dose. The uncertainty factor adjusts results from dose-response studies in animals to make them applicable to humans. The modifying factor is used to account for uncertainties in the available toxicity data from which the reference dose is derived. In the risk assessment, the reference doses and concentrations were for the chronic case, to be conservative.

Table 2-4
Risk Characterization Summary – Carcinogens

Scenario Timeframe: Future
Receptor Population: Maintenance Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Carcinogen Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Ingestion or exposure through showering	*Dioxin/Furan*				
			2,3,7,8-TCDD TEC	1.9E-06	NE	1.5E-05	1.7E-05
			Explosive				
			2,4,6-Trinitrotoluene	ND	ND	ND	NA
			2-Amino-4,6-dinitrotoluene	ND	ND	ND	NA
			4-Amino-2,6-dinitrotoluene	ND	ND	ND	NA
			Metals				
			Aluminum	NTV	NE	NE (Kp<=0.01)	NA
			Antimony	NTV	NE	NE (Kp<=0.01)	NA
			Barium	ND	ND	ND	NA
			Cadmium	NTV	NE	NE (Kp<=0.01)	NA
			Chromium	NC	NE	NE (Kp<=0.01)	NA
			Lead	NTV	NE	NE (Kp<=0.01)	NA
			Manganese	NC	NE	NE (Kp<=0.01)	NA
			Nickel	NTV	NE	NE (Kp<=0.01)	NA
			Silver	NC	NE	NE (Kp<=0.01)	NA
			Strontium	NTV	NE	NE (Kp<=0.01)	NA
			Thallium	NC	NE	NE (Kp<=0.01)	NA
			Non-Metallic Anion				
			Perchlorate	NTV	NE	NE (Kp<=0.01)	NA
			Semi-Volatile Organics				
			2,4-Dinitrotoluene	9.0E-06	NE	NE (Kp<=0.01)	9.0E-06
			2,6-Dinitrotoluene	9.0E-06	NE	NE (Kp<=0.01)	9.0E-06
			Hexachlorobenzene	ND	ND	ND	NA
			Volatile Organics				
			1,1-Dichloroethene	1.1E-04	1.6E-04	1.4E-04	4.1E-04
			1,2-Dichloroethane	2.0E-05	1.0E-04	9.2E-06	1.3E-04
			Methylene chloride	8.4E-08	9.2E-08	NE (Kp<=0.01)	1.8E-07
			Trichloroethene	2.0E-04	5.5E-04	2.7E-04	1.0E-03
						Groundwater risk total =	1.6E-03

Table 2-4 (*continued*)
Risk Characterization Summary – Carcinogens

Scenario Timeframe: Future
Receptor Population: Maintenance Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Carcinogen Risk			
				Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil (0 to 2 feet)	Soil and particulates	Incidental Ingestion, inhalation of particulates, and dermal contact	*Dioxin/Furan*				
			2,3,7,8-TCDD TEC	1.1E-05	3.7E-10	4.3E-06	1.6E-05
			Explosive				
			2,4,6-Trinitrotoluene	8.8E-05	NTV	9.4E-05	1.8E-04
			2-Amino-4,6-dinitrotoluene	5.6E-08	NTV	7.2E-08	1.3E-07
			4-Amino-2,6-dinitrotoluene	1.7E-08	NTV	2.1E-08	3.8E-08
			Metals				
			Aluminum	ND	ND	ND	NA
			Antimony	NTV	NTV	NTV	NA
			Barium	NC	NC	NC	NA
			Cadmium	NTV	7.0E-10	NTV	7.0E-10
			Chromium	ND	ND	ND	NA
			Lead	NTV	NTV	NTV	NA
			Manganese	ND	ND	ND	NA
			Nickel	ND	ND	ND	NA
			Silver	ND	ND	ND	NA
			Strontium	ND	ND	ND	NA
			Thallium	NC	NC	NC	NA
			Non-Metallic Anion				
			Perchlorate	NTV	NTV	NTV	NA
			Semi-Volatile Organics				
			2,4-Dinitrotoluene	6.2E-04	NTV	4.7E-04	1.1E-03
			2,6-Dinitrotoluene	7.6E-05	NTV	5.7E-05	1.3E-04
			Hexachlorobenzene	1.6E-07	6.8E-12	2.0E-07	3.6E-07
			Volatile Organics				
			1,1-Dichloroethene	ND	ND	ND	NA
			1,2-Dichloroethane	ND	ND	ND	NA
			Methylene chloride	ND	ND	ND	NA
			Trichloroethene	ND	ND	ND	NA
						Soil risk total =	1.4E-03
						Total risk (soil and groundwater) =	3.0E-03

Table 2-4 (*continued*)
Risk Characterization Summary – Carcinogens

Notes

Kp	Dermal permeability coefficient
NA	Not applicable
NC	Not classified as a carcinogen
ND	Not detected in associated media or not selected as a chemical of potential concern
NE	Not evaluated through this exposure pathway. Chemical is not identified as volatile.
NE(Kp<=0.01)	Based on USEPA Region 6 guidance, chemicals of potential concern with a Kp<=0.01 were not evaluated for dermal contact while showering (USEPA, 1995)
NTV	No toxicity value available
TCDD	Tetrachlorodibenzo-p-dioxin
TEC	Toxicity equivalence concentration

References

U.S. Environmental Protection Agency (USEPA), 1989, *Risk Assessment Guidance for Superfund, Vol. I: Human Health Evaluation Manual, (Part A)*, EPA/540/1-89/002, December.

USEPA, *Supplemental Region VI Risk Assessment Guidance, May 5, 1995*.

Summary of Risk Characterization

The table provides risk estimates for the significant routes of exposure at LHAAP-17. These risk estimates are based on a reasonable maximum exposure and were developed by taking into account various conservative assumptions about the frequency and duration of a hypothetical future maintenance worker's exposure to soil and groundwater, as well as the toxicity of the chemicals of concern. The total risk from exposure to contaminated soil and groundwater at this site is estimated to be 3.0×10^{-3}. A risk below 1×10^{-4} is generally considered to be acceptable (USEPA, 1989). The soil risk and the groundwater risk are unacceptable.

Table 2-5
Risk Characterization Summary – Non-Carcinogens

Scenario Timeframe: Future
Receptor Population: Maintenance Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Target Endpoint	Non-Carcinogenic Hazard Quotient			
					Ingestion	Inhalation	Dermal	Exposure Routes Total
Groundwater	Groundwater	Ingestion or exposure through showering	*Dioxin/Furan*					
			2,3,7,8-TCDD TEC	NA	NTV	NE	NTV	NA
			Explosive					
			2,4,6-Trinitrotoluene	Liver effects	ND	ND	ND	NA
			2-Amino-4,6-dinitrotoluene	NA	ND	ND	ND	NA
			4-Amino-2,6-dinitrotoluene	NA	ND	ND	ND	NA
			Metals					
			Aluminum	NA	7.9E-02	NE	NE (Kp<=0.01)	7.9E-02
			Antimony	Longevity, blood glucose, and cholesterol	3.2E-01	NE	NE (Kp<=0.01)	3.2E-01
			Barium	Increased kidney weight	ND	ND	ND	NA
			Cadmium	Proteinuria	1.8E-02	NE	NE (Kp<=0.01)	1.8E-02
			Chromium	No effects observed	1.2E-03	NE	NE (Kp<=0.01)	1.2E-03
			Lead	NA	NTV	NE	NE (Kp<=0.01)	NA
			Manganese	Central nervous system effects	7.3E-01	NE	NE (Kp<=0.01)	7.3E-01
			Nickel	Decreased Body Weight	1.0E-01	NE	NE (Kp<=0.01)	1.0E-01
			Silver	Argyria	2.0E-02	NE	NE (Kp<=0.01)	2.0E-02
			Strontium	Rachitic bone	5.2E-02	NE	NE (Kp<=0.01)	5.2E-02
			Thallium	Blood	5.3E-01	NE	NE (Kp<=0.01)	5.3E-01
			Non-Metallic Anion					
			Perchlorate	NA	3.5E+03	NE	NE (Kp<=0.01)	3.5E+03
			Semi-Volatile Organics					
			2,4-Dinitrotoluene	Central nervous system effects	1.9E-02	NE	NE (Kp<=0.01)	1.9E-02
			2,6-Dinitrotoluene	Central nervous system effects	3.7E-02	NE	NE (Kp<=0.01)	3.7E-02
			Hexachlorobenzene	Liver effects	ND	ND	ND	NA
			Volatile Organics					
			1,1-Dichloroethene	Hepatic lesions	5.5E-02	NTV	7.4E-02	1.3E-01
			1,2-Dichloroethane	NA	2.1E-02	2.2E+00	9.5E-03	2.2E+00
			Methylene chloride	Liver toxicity	5.2E-04	1.8E-04	NE (Kp<=0.01)	7.0E-04
			Trichloroethene	NA	8.7E+00	NTV	1.2E+01	2.0E+01
Groundwater Hazard Index Total =								3.5E+03

Table 2-5 (*continued*)
Risk Characterization Summary – Non-Carcinogens

Scenario Timeframe: Future
Receptor Population: Maintenance Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Concern	Target Endpoint	Non-Carcinogenic Hazard Quotient			
					Ingestion	Inhalation	Dermal	Exposure Routes Total
Soil (0 to 2 feet)	Soil and particulates	Incidental ingestion, inhalation of particulates, dermal contact	*Dioxin/Furan*					
			2,3,7,8-TCDD TEC	NA	NTV	NTV	NTV	NA
			Explosive					
			2,4,6-Trinitrotoluene	Liver effects	1.6E+01	1.2E-02	1.8E+01	3.4E+01
			2-Amino-4,6-dinitrotoluene	NA	9.4E-02	2.4E-05	1.2E-01	2.1E-01
			4-Amino-2,6-dinitrotoluene	NA	2.8E-02	7.1E-06	3.6E-02	6.4E-02
			Metals					
			Aluminum	NA	ND	ND	ND	NA
			Antimony	Longevity, blood glucose, and cholesterol	6.1E-03	7.4E-07	2.6E-03	8.8E-03
			Barium	Increased kidney weight	1.6E-02	3.5E-04	1.5E-02	3.1E-02
			Cadmium	Proteinuria	7.2E-03	5.4E-06	1.8E-03	9.0E-03
			Chromium	Proteinuria	ND	ND	ND	NA
			Lead	Gastrointestinal	NTV	NTV	NTV	NA
			Manganese	NA	ND	ND	ND	NA
			Nickel	Decreased Body Weight	ND	ND	ND	NA
			Silver	Argyria	ND	ND	ND	NA
			Strontium	Rachitic bone	ND	ND	ND	NA
			Thallium	Blood	5.9E-02	7.1E-06	3.8E-03	6.2E-02
			Non-Metallic Anion					
			Perchlorate	NA	6.7E-04	NTV	4.3E-05	7.1E-04
			Semi-Volatile Organics					
			2,4-Dinitrotoluene	Central nervous system effects	1.3E+00	2.6E-03	9.6E-01	2.2E+00
			2,6-Dinitrotoluene	Central nervous system effects	3.1E-01	3.1E-04	2.3E-01	5.5E-01
			Hexachlorobenzene	Liver effects	3.4E-04	NTV	4.4E-04	7.8E-04
			Volatile Organics					
			1,1-Dichloroethene	Hepatic lesions	ND	ND	ND	NA
			1,2-Dichloroethane	NA	ND	ND	ND	NA
			Methylene chloride	Decreased hematocrit and hemoglobin in the blood	ND	ND	ND	NA
			Trichloroethene	Liver and kidney effects	ND	ND	ND	NA
Soil Hazard Index Total =								3.7E+01
Hazard Index Total (soil and groundwater) =								3.5E+03

Table 2-5 (*continued*)
Risk Characterization Summary – Non-Carcinogens

Notes

Kp	Dermal permeability coefficient
NA	Not applicable
ND	Not detected in associated media or not selected as a chemical of potential concern
NE	Not evaluated through this exposure pathway. Chemical is not identified as a volatile.
NE (Kp<=0.01)	Based on USEPA Region 6 guidance, chemicals of potential concern with a Kp<=0.01 were not evaluated for dermal contact while showering (USEPA, 1995)
NTV	No toxicity value
TCDD	Tetrachlorodibenzo-p-dioxin
TEC	Toxicity equivalence concentration

References

U.S. Environmental Protection Agency (USEPA), 1989, *Risk Assessment Guidance for Superfund, Vol. I: Human Health Evaluation Manual, (Part A)*, EPA/540/1-89/002, December.

USEPA, *Supplemental Region 6 Risk Assessment Guidance*, May 5, 1995.

Summary of Risk Characterization

The table provides hazard quotients (HQs) for each route of exposure and the hazard index (sum of hazard quotients) for all routes of exposure for LHAAP-17. The Risk Assessment Guidance for Superfund (USEPA, 1989) states that, generally, a hazard index (HI) greater than 1 indicates the potential for adverse non-carcinogenic effects. The estimated HI for groundwater is 3,500 and for soil is 37. Both values are unacceptable and indicate that the potential for adverse non-carcinogenic effects could occur from exposure to contaminants in those mediums.

Table 2-6
Chemicals with Carcinogenic Risk Greater than 1×10^{-6} in Soil

Chemical	Baseline Risk Assessment			Retained as COC ?
	Carcinogenic Risk in Soil [a]	EPC (mg/kg)	Soil Sample Location (Depth)	
2,4-Dinitrotuluene	1.1×10^{-3}	2602[b]	*	Yes, 1
2,4,6-Trinitrotoluene	1.8×10^{-4}	8400	17SS22 [c] (0-2 feet)	Yes, 1
2,6-Dinitrotoluene	1.3×10^{-4}	318 [b]	*	Yes, 1
2,3,7,8-TCDD TEC	1.6×10^{-5}	2.14×10^{-4}[d]	17SD12[e] (0.00 feet)	No, 2

Notes and Abbreviations:

1. *Identified as chemical of concern (COC) since carcinogenic risk is above the acceptable range*
2 *Excluded since risk is within the acceptable range and the chemical is not a COC for groundwater*

[a] *Carcinogenic risk from Baseline Risk Assessment Table C-29 (Jacobs, 2002)*
[b] *95 percent upper confidence limit (UCL) used as EPC.*
[c] *From Baseline Risk Assessment Table 3-64.*
[d] *Toxic equivalents used in developing the EPC.*
[e] *From Baseline Risk Assessment Table 3-19.*
* *No specific location, EPC calculated as 95 percent UCL as noted in the Baseline Risk Assessment Report Table 3-64*

COC	*chemical of concern*
EPC	*Exposure Point Concentration from Baseline Risk Assessment (Jacobs, 2002)*
mg/kg	*milligrams per kilogram*
TCDD	*tetrachlorodibenzo-p-dioxin*
TEC	*toxicity equivalence concentration*

Table 2-7
Chemicals with Hazard Quotient Greater than 0.1 in Soil

Chemical	Baseline Risk Assessment			Retained as COC ?
	Soil Hazard Quotient [a]	EPC (mg/kg)	Soil Sample Location (Depth)	
2,4,6-Trinitrotoluene	34	8400	17SS22 [b] (0-0.5 ft)	Yes, 1
2,4-Dinitrotoluene	2.2	2602[c]	*	Yes, 1
2,6-Dinitrotoluene	0.55	318 [c]	*	No, 2
2-Amino-4,6-dinitrotoluene	0.21	16	17SB03 (0-2 feet)	No, 2

Notes and Abbreviations:

1. *Identified as COC since Hazard Quotient is greater than 1.0.*
2. *Not identified as COC since HQ is less than 1.0*

[a] *HQ from Baseline Risk Assessment Table C-26 (Jacobs, 2002)*

[b] *From Baseline Risk Assessment Table 3-64*

[c] *95 percent upper confidence limit (UCL) used as the EPC*

* *No specific location, EPC calculated as 95 percent UCL as noted in the Baseline Risk Assessment Report Table 3-64 (Jacobs, 2002)*

COC	*chemical of concern*
EPC	*Exposure Point Concentration from Baseline Risk Assessment (Jacobs, 2002)*
HQ	*hazard quotient*
mg/kg	*milligrams per kilogram.*

Table 2-8
Chemicals with Carcinogenic Risk Greater than 1×10^{-6} in Groundwater

Chemical	Baseline Risk Assessment			Data Since Risk Assessment		
	Carcinogenic Risk in Ground-water [a]	EPC (µg/L)	Well	Maximum [b] (µg/L)	Well	Adjusted Risk
Trichloroethene	1×10^{-3}	5,320	17WW01	6090	17WW01	1.1×10^{-3}
1,1-Dichloroethene	4.1×10^{-4}	51	17WW01	70	17WW01	5.6×10^{-4}
1,2-Dichloroethane	1.3×10^{-4}	63	17WW01	35.8 J	17WW01	7.4×10^{-5}
2,3,7,8-TCDD TEC	1.7×10^{-5}	3.5×10^{-6} [c]	17WW13	–	–	–
2,4-Dinitrotuluene	9×10^{-6}	3.8	17WW02	ND	17WW02	–
2,6-Dinitrotoluene	9×10^{-6}	3.8	17WW02	ND	17WW02	–

Chemical	Comparison Levels		Retained as COC?
	MCL (µg/L)	TCEQ GW-Ind (µg/L)	
Trichloroethene	5	5	Yes, 1
1,1-Dichloroethene	7	7	Yes, 1
1,2-Dichloroethane	5	5	Yes, 1
2,3,7,8-TCDD TEC	3×10^{-5}	–	No, 2
2,4-Dinitrotuluene	–	0.42	No, 3
2,6-Dinitrotoluene	–	0.42	No, 3

Notes and Abbreviations:

No adjusted risk was calculated for 2,3,7,8-TCDD TEC, 2,4-dinitrotoluene, and 2,6-dinitrotoluene because no data was collected since the risk assessment for 2,3,7,8-TCDD TEC, and concentrations since the risk assessment have been ND for 2,4-dinitrotoluene and 2,6-dinitrotoluene.
No MCL available for 2,4-dinitrotoluene and 2,6-dinitrotoluene, and no TCEQ GW-Ind available for 2,3,7,8-TCDD.

1. *Identified as COC because most recent maximum concentration is above the MCL*
2. *Excluded because the EPC and more recent results are below the MCL*
3. *Excluded because more recent results are below the TCEQ GW-Ind*

[a] *From Baseline Risk Assessment Table C-29 (Jacobs, 2002)*
[b] *Maximum data from the latest sampling event*
[c] *Toxic equivalents were used in developing the EPC*

–	*not applicable*
µg/L	*micrograms per liter*
COC	*chemical of concern*
EPC	*exposure point concentration*
MCL	*Safe Drinking Water Act maximum contaminant level*
MSC	*medium specific concentration from Updated Examples of Risk Reduction Standard No. 2, Appendix II*
ND	*nondetect*
TCEQ GW-Ind	*Texas Commission of Environmental Quality Groundwater MSC for Industrial Use*
TCDD	*tetrachlorodibenzo-p-dioxin*
TEC	*toxicity equivalence concentration*

Table 2-9
Chemicals with Hazard Quotient Greater than 0.1 in Groundwater

Chemical	Baseline Risk Assessment			Data Since Risk Assessment		
	Hazard Quotient Groundwater [a]	EPC (µg/L)	Well	Maximum [b] (µg/L)	Well	Adjusted Hazard Quotient
Perchlorate	3500	320,000	17WW06	74,000 160,000	17WW06 17WW02	809 1750
Trichloroethene	20	5,320	17WW01	5,970	17WW01	22.9
1,2-Dichloroethane	2.2	63	17WW01	44.9	17WW01	1.3
Manganese	0.73	3490	17WW01	–	–	–
Thallium	0.59	4.3	17WW13	ND (0.05)	17WW13	–
Antimony	0.32	13	17WW02	ND (0.25)	17WW02	–
1,1-Dichloroethene	0.13	51	17WW01	70	17WW01	0.2

Chemical	Comparison Levels		Retained as COC ?
	MCL (µg/L)	TCEQ GW-Ind (µg/L)	
Perchlorate	—	72	Yes, 1
Trichloroethene	5	5	Yes, 2
1,2-Dichloroethane	5	5	Yes, 2
Manganese	—	14,000	No, 3
Thallium	—	2	No, 4
Antimony	—	6	No, 4
1,1-Dichloroethene	7	7	Yes, 2

Notes and Abbreviations:

1. *Identified as a COC because HQ >1*
2. *Identified as COC because EPC is above the MCL.*
3. *Excluded because EPC is below the TCEQ GW-Ind MSC and HQ is <1.0*
4. *Excluded because more recent data results are below the TCEQ GW-Ind*

[a] *From Baseline Risk Assessment Table C-29 (Jacobs, 2002)*

[b] *Maximum data from the latest sampling event*

—	*not applicable*
COC	*chemical of concern*
EPC	*exposure point concentration*
HQ	*hazard quotient*
MSC	*medium specific concentration from Updated Examples of Risk Reduction Standard No. 2, Appendix II*
TCEQ GW-Ind	*Texas Commission of Environmental Quality Groundwater MSC for Industrial Use*
MCL	*Safe Drinking Water Act maximum contaminant level*
µg/L	*micrograms per liter*

Table 2-10
Cleanup Levels for Human Health Risk

Medium	Chemical of Concern	Cleanup Level
Shallow zone groundwater		MCL (µg/L)
	1,1-Dichloroethene	7
	1,2-Dichloroethane	5
	cis-1,2-Dichloroethene	70
	Trichloroethene	5
	Vinyl chloride	2
		GW-Ind (µg/L)
	Perchlorate	72
		MCL (µg/L)
Intermediate zone groundwater	cis-1,2-Dichloroethene	70
	Trichloroethene	5
	Vinyl chloride	2
Soil		GWP-Ind (mg/kg)
	2,4,6-Trinitrotoluene	5.1
	2,4-Dinitrotoluene	0.042
	2,6-Dinitrotoluene	0.042
	Perchlorate	7.2

Notes and Abbreviations:

GW-Ind	*Texas Commission on Environmental Quality groundwater medium specific concentration for industrial use*
GWP-Ind	*Texas Commission on Environmental Quality soil medium specific concentration for industrial use based on groundwater protection*
MCL	*Safe Drinking Water Act maximum contaminant level*
mg/kg	*milligrams per kilogram*
µg/L	*micrograms per liter*

Table 2-11
Cleanup Levels for Ecological Risk in Soil (EcoPRGs)

Chemical	SS EcoPRG [a] (mg/kg)	TS EcoPRG [a] (mg/kg)	Depth [b]	Sample Location
Barium	222	—	0 - 0.5'	17SS22, 17SD04, 17SD07, 17SD08, 17SD11
	—	520	0 - 3'	17SD07
2,4-Dinitrotoluene	—	12	0 - 3'	17SB02
2,6-Dinitrotoluene	2.7	6.8	0 - 3'	17SB02
2,4,6-Trinitrotoluene	—	4.7	0 - 3'	17SS22, 17SS23, 17SB06
2,3,7,8-TCDD TEC	4×10^{-6}	4×10^{-6}	0 - 3'	17SD12

Notes and Abbreviations:

[a] *From Baseline Ecological Risk Assessment Table 16-1 (Shaw, 2007b)*

[b] *Depth and locations of remedial action for Waste Sub-Area*

EcoPRG	*ecological preliminary remediation goal*
mg/kg	*milligrams per kilogram*
SS	*surface soil from 0-0.5 feet (applicable to deer mouse)*
TCDD	*tetrachlorodibenzo-p-dioxin*
TEC	*toxicity equivalence concentration*
TS	*total soil from 0-3 feet (applicable to short-tailed shrew)*

Table 2-12
Comparative Analysis of Alternatives

Comparative Analysis of Alternatives Criteria	Alternative 1 No Action	Alternative 2 Excavation and Off-site Disposal of Soil; MNA and LUC for Groundwater	Alternative 3 Excavation and Off-site Disposal of Soil; In Situ Bioremediation; MNA and LUC for Groundwater	Alternative 4 Excavation and Off-site Disposal of Soil; Groundwater Extraction; MNA and LUC for Groundwater
Overall protection of human health and the environment	No protection. Does not achieve RAOs.	Achieves RAOs. Protection of human health and environment provided by excavation and maintenance of LUC. Excavation would remove soil above cleanup levels. Monitored natural attenuation activities would demonstrate that degradation of plume is occurring in groundwater.	Achieves RAOs. Protection of human health and environment provided by excavation of soil, bioremediation of shallow zone groundwater, and MNA of intermediate zone groundwater. Groundwater monitoring will continue until remainder of plumes degrade to cleanup levels and LUC will remain in place until the levels of COCs allow for ~~remainder of plumes degrade to cleanup levels~~unlimited use and unrestricted exposure.	Achieves RAOs. Protection of human health and environment provided by excavation of soil, extraction of shallow zone groundwater, and MNA of intermediate zone groundwater. Groundwater monitoring will continue until remainder of plumes degrade to cleanup levels and LUC will remain in place until the levels of COCs allow for ~~remainder of plumes degrade to cleanup levels~~unlimited use and unrestricted exposure.
Compliance with ARARs	No compliance with chemical-specific ARARs.	Complies with ARARs.	Complies with ARARs.	Complies with ARARs.
Long-term effectiveness and permanence	Not effective for soil. Natural attenuation would occur, but its progress would be unverified by monitoring. No evaluation of natural attenuation's long-term effectiveness and permanence.	Excavation would have a permanent effect of removing contaminants from the soil. MNA would verify permanent reduction of contaminant levels in the groundwater over time. LUC would be effective and reliable so long as it is maintained until the~~cleanup~~ levels of COCs allow for unlimited use and unrestricted exposure ~~are achieved~~.	Excavation would have a permanent effect of removing contaminants from the soil. Bioremediation would permanently convert contaminants to harmless compounds (chlorinated solvents also generate temporary daughter products). A treatability study may be required. Long-term monitoring would verify permanent reduction of contaminant levels in the groundwater over time. LUC would be effective and reliable so long as it is maintained until the ~~cleanup~~ levels of COCs allow for unlimited use and unrestricted	Excavation would have a permanent effect of removing contaminants from the soil. Groundwater extraction would permanently remove contaminants from groundwater which is treated at the groundwater treatment plant. Long-term monitoring would verify permanent reduction of contaminant levels in the groundwater over time. LUC would be effective and reliable so long as it is maintained until the ~~cleanup~~ levels of COCs allow for unlimited use and unrestricted exposure~~are achieved~~.

Table 2-12 *(continued)*
Comparative Analysis of Alternatives

Comparative Analysis of Alternatives Criteria	Alternative 1 No Action	Alternative 2 Excavation and Off-site Disposal of Soil; MNA and LUC for Groundwater	Alternative 3 Excavation and Off-site Disposal of Soil; In Situ Bioremediation; MNA and LUC for Groundwater	Alternative 4 Excavation and Off-site Disposal of Soil; Groundwater Extraction; MNA and LUC for Groundwater
			exposure~~are achieved~~.	
Reduction of toxicity, mobility, or volume through treatment	No active reduction.	Soil contaminants removed and disposed of without treatment. No active reduction in groundwater.	Soil contaminants removed and disposed of without treatment. Shallow zone groundwater contaminants would be treated through in situ bioremediation in the areas of highest contamination. No active reduction in intermediate zone groundwater.	Soil contaminants removed and disposed of without treatment. Shallow zone groundwater contaminants would be extracted and treated at the groundwater treatment plant. No active reduction in intermediate zone groundwater.
Short-term effectiveness	No short-term impacts.	Minimal impacts to the community, workers, or the environment from short-term activities. Provides almost immediate protection.	Minimal impacts to the community, workers, or the environment from short-term activities. Provides almost immediate protection.	Minimal impacts to the community, workers, or the environment from short-term activities. Provides almost immediate protection.
Implementability	Inherently implementable.	Readily implemented.	Implementable, but uncertainty exists in the effectiveness and time required to reduce contaminants to cleanup levels. Specialized knowledge required for implementation.	Implementable, but uncertainty exists in the effectiveness and time required to reduce contaminants to cleanup levels. Specialized knowledge required for implementation.
Cost • Capital present worth • O&M present worth • Total present worth	 $0 $0 $0	 $1,400,000 $500,000 $1,900,000	 $2,000,000 $600,000 $2,600,000	 $1,600,000 $500,000 $2,100,000
State acceptance	Not acceptable	Not acceptable	Acceptable	Acceptable

Table 2-12 *(continued)*
Comparative Analysis of Alternatives

Comparative Analysis of Alternatives Criteria	Alternative 1 No Action	Alternative 2 Excavation and Off-site Disposal of Soil; MNA and LUC for Groundwater	Alternative 3 Excavation and Off-site Disposal of Soil; In Situ Bioremediation; MNA and LUC for Groundwater	Alternative 4 Excavation and Off-site Disposal of Soil; Groundwater Extraction; MNA and LUC for Groundwater
Community acceptance	Responded to comments			

Notes and Abbreviations:

ARAR	applicable or relevant and appropriate requirement
COC	chemical of concern
LUC	land use control
MCL	maximum contaminant level
MNA	monitored natural attenuation
O&M	operation and maintenance
RAO	remedial action objective

Table 2-13
Remediation Cost Table
Selected Remedy (Alternative 4)
Present Worth Analysis

Year	FY	Capital Costs		Operation & Maintenance Costs			Present Value (NPV)		
				Long-Term Monitoring	Groundwater Extraction	Total	Discount Rate	Capital	O&M
							2.8%		
1	2011	$1,572,880		$24,244	$200,472	$224,716	NPV	$1,572,880	$540,907
2	2012			78,259	100,236	178,495			
3	2013	0		41,696		41,696		Total NPV	$2,113,787
4	2014	0		35,206		35,206			
5	2015			71,229		71,229			
6	2016	0		24,451		24,451			
7	2017	0		13,769		13,769			
8	2018	0		13,769		13,769			
9	2019	0		13,769		13,769			
10	2020			56,294		56,294			
11	2021					0			
12	2022					0			
13	2023					0			
14	2024					0			
15	2025			59,215		59,215			
16	2026					0			
17	2027					0			
18	2028					0			
19	2029					0			
20	2030			59,215		59,215			
21	2031					0			
22	2032					0			
23	2033					0			
24	2034					0			
25	2035			59,215		59,215			
26	2036					0			
27	2037					0			
28	2038					0			
29	2039					0			
30	2040			59,215		59,215			
		$1,572,880		$609,544	$300,708	$910,252			

Table 2-13 *(continued)*
Remediation Cost Table
Selected Remedy (Alternative 4)

Notes:

MNA	monitored natural attenuation
NPV	net present value
O&M	operation & maintenance
VOC	volatile organic compounds

Major assumptions are as described below. Quantities and assumptions are for cost estimating purposes only.

Capital costs include: excavation evaluation, excavation and disposal activities, flow tests, engineering support, and construction management. The soil is assumed to be classified as nonhazardous for disposal purposes.

O&M costs for groundwater extraction are based on having 3 extraction wells.

Monitoring costs are based on the assumption that sampling is conducted at 5 shallow zone wells and 3 intermediate zone wells, with one quality control sample in each zone. In the shallow zone, monitoring begins 6 months into Year 2 when groundwater extraction ends and MNA begins. The sampling frequency is quarterly for 2 years, then semiannual for 3 years, then annual for Years 7 through 10, and finally every five years (Years 15, 20, 25, and 30). Analysis of the shallow zone groundwater is for VOCs and perchlorate. In the intermediate zone, monitoring begins at the start of Year 1 when MNA begins. The sampling frequency is quarterly for 2 years (Years 1 and 2), then semiannual for 3 years (Years 3 through 5), then annual for Years 6 through 10, and finally every five years (Years 15, 20, 25, and 30). Analysis of the intermediate zone groundwater is for VOCs.

The discount rate of 2.8% is based on the Office of Management and Budget Circular No. A-94, January 2008.

Table 2-14
Description of ARARs for Selected Remedy

Citation	Activity or Prerequisite/Status	Requirement
Soil		
TCEQ Texas Risk Reduction Rules 30 TAC 335.558 and 335.559(d)(2)	Ensures adequate protection of human health and the environment from potential exposure to contaminants associated with releases – **relevant and appropriate** for remediation of contaminated soil for cross-media contamination pathways such as soil to groundwater and for hypothetical future maintenance workers.	Near surface (i.e., 0-2 feet bgs) non-residential (industrial) soils shall conform to the non-residential soil MSCs (SAI-Ind) based upon worker ingestion of soil, inhalation of particulates and volatiles and the non-residential soil-to-groundwater cross media protection concentration. The concentration of contamination in soil shall not exceed the non-residential soil-to-groundwater protection MSC (GWP-Ind). See Table 2-10 for specific numeric criteria.
Groundwater		
Federal Safe Drinking Water Act MCLs/Non-Zero MCLGs 40 CFR 141	Applicable to drinking water for a public water system—**relevant and appropriate** for water that could potentially be used for human consumption.	Must not exceed MCLs/non-zero MCLGs for water designated as a current or potential source of drinking water. See Table 2-10 for specific numeric criteria.
TCEQ Texas Risk Reduction Rules 30 TAC 335	Applicable to industrial groundwater—**relevant and appropriate** for hypothetical future maintenance worker exposure to groundwater.	If no maximum contaminant level has been promulgated, groundwater must not exceed the industrial medium-specific concentration. See Table 2-10 for specific numeric criteria.
Floodplain		
Requirements for Hazardous Waste Facilities in Floodplains Resource Conservation and Recovery Act (RCRA) 40 CFR 264.18(b)	If excavated soil is found to constitute RCRA hazardous waste, these requirements are **relevant and appropriate** since LHAAP-17 is located within a 100-year floodplain. However, it is not anticipated that the excavated soil will be classified as hazardous.	A hazardous waste treatment, storage, or disposal facility used for remediation waste and located in the 100-year floodplain must be designed, constructed operated, and maintained to prevent washout of such waste by a 100-year flood unless owner/operator show that procedures are in effect to remove waste safely before flood water can reach the facility.

Table 2-14 *(continued)*
Description of ARARs for Selected Remedy

Citation	Activity or Prerequisite/Status	Requirement
General Site Preparation, Construction, and Excavation Activities		
Opacity Standard 30 TAC 111.111(a)(8)(A)	Fugitive emissions from land-disturbing activities (e.g., excavation, construction)—applicable.	Visible emissions shall not be permitted to exceed opacity of 30% for any 6-minute period from any source.
Fugitive Particulate Matter Standard 30 TAC 111.145	Fugitive emissions from land-disturbing activities (e.g., excavation, construction)—applicable.	No person may cause, suffer, allow, or permit a structure, road, street, alley or parking area to be constructed, altered, repaired, or demolished, or land to be cleared without taking at least the following precautions to achieve control of dust emissions: • Use of water or of suitable oil or chemicals for control of dust in the demolition of structures, in construction operations, in work performed on a road, street, alley, or parking area, or in the clearing of land; and • Use of adequate methods to prevent airborne particulate matter during sandblasting of structures or similar operations
Storm water Runoff Controls 40 CFR 122.26; 30 TAC 205, Subchapter A; 30 TAC 308.121	Storm water discharges associated with construction activities—applicable to disturbances of equal to or greater than 1 acre of land.	Specific to areas of excavation of contaminated soil. Good construction management techniques, phasing of construction projects, minimal clearing, and sediment, erosion, structural, and vegetative controls shall be implemented to mitigate storm water run-on/runoff.
Waste Generation, Management, and Storage		
Characterization of Solid Waste 40 CFR 262.11 30 TAC 335.62 30 TAC 335.504 30 TAC 335.503(a)(4)	Generation of solid waste, as defined in 30 TAC 335.1—applicable.	Must determine whether the generated solid waste is RCRA hazardous waste by using prescribed testing methods or applying generator knowledge based on information regarding material or process used. If the waste is determined to be hazardous, it must be managed in accordance with 40 CFR 262–268. After making the hazardous waste determination as required, if the waste is determined to be nonhazardous, the generator shall then classify the waste as Class 1, Class 2, or Class 3 (as defined in Section 335.505 through Section 335.507) using one or more of the methods listed in Section 335.503(a)(4) and Section 335.508 and manage the waste in accordance with the requirements of Chapter 335 of the TAC for industrial solid waste.
Characterization of Hazardous Waste 40 CFR 264.13(a)(1); 40 CFR 268.7 30 TAC 335.504(3) 30 TAC 335.509 30 TAC 335.511	Generation of a RCRA hazardous waste for treatment, storage, or disposal—applicable if hazardous waste is generated (e.g., PPE).	Must obtain a detailed chemical and physical analysis of a representative sample of the waste(s) that at a minimum contains all the information that must be known to treat, store, or dispose of the waste in accordance with 40 CFR 264 and 268. Must also determine whether the waste is restricted from land disposal under 40 CFR 268 et seq. by testing in accordance with prescribed methods or use of generator knowledge of waste.

Table 2-14 *(continued)*
Description of ARARs for Selected Remedy

Citation	Activity or Prerequisite/Status	Requirement
Requirements for Temporary Storage of Hazardous Waste in Accumulation Areas 40 CFR 262.34(a) and (c)(1) 30 TAC 335.69(a) and (d)	On-site accumulation of 55 gallons or less of RCRA hazardous waste for 90 days or less at or near the point of generation—applicable if hazardous waste is generated (e.g., PPE) and stored in an accumulation area.	Applicable to IDW and other waste. A generator may accumulate hazardous waste at the facility provided that • Waste is placed in containers that comply with 40 CFR 264.171 to 264.173 (Subpart I); and • Container is marked with the words "hazardous waste"; or • Container may be marked with other words that identify the contents.
Requirements for the Use and Management of Containers 40 CFR 264.171–264.173 30 TAC 335.69(e) 30 TAC 335.152(a)(7)	On-site storage/treatment of RCRA hazardous waste in containers for greater than 90 days—applicable if hazardous waste is generated (e.g., PPE) and is stored in containers.	Design and operating standards of 40 CFR 264.175(c) and 40 CFR 264.171, 264.172, and 264.173(a) and (b) must be met for the use and management of hazardous waste in containers.
Wells		
Well Construction Standards—Monitoring or Injection Wells 16 TAC 76.1000	Construction of water wells—applicable to construction of new monitoring or injection wells, if needed.	Adhere to substantive requirements. Wells shall be completed in accordance with the technical requirements of Section 76.1000, as appropriate.
Class V Injection Wells 30 TAC 331 Subchapters A, C, and H	Installation, operation, and closure of injection wells for in situ chemical oxidation fall in the category of Class V Injection Wells— relevant and appropriate.	Injection wells shall be constructed to the required specifications for isolation casing, surface completion, prevention of commingling, and confinement of undesirable groundwater to its zone of origin. Closure shall be accomplished by removing all of the removable casing and the entire well shall be pressure filled via a tremie pipe with cement from bottom to the land surface, or closure shall be performed by the alternative method for Class V Wells completed in zones of undesirable groundwater. Groundwater concentrations at time of well closure will determine the appropriate method of abandonment.

Table 2-14 *(continued)*
Description of ARARs for Selected Remedy

Citation	Activity or Prerequisite/Status	Requirement
Well Construction Standards—Extraction Wells 16 TAC 76.1000(a) and (c) through (h) 16 TAC 76.1002(a) through (c) 16 TAC 76.1008(a) through (c)	Construction of water wells—**applicable** to construction of extraction (recovery) wells.	Wells shall be completed in accordance with the technical requirements of Section 76.1000, as appropriate. Water wells completed to produce undesirable water shall be cased to prevent the mixing of water or constituent zones. The annular space between the casing and the wall of the borehole shall be pressure grouted with cement or bentonite grout to the land surface. Bentonite grout may not be used if a water zone contains chloride water above 1500 parts per million (ppm) or if hydrocarbons are present. Wells producing undesirable water or constituents shall be completed in such a manner that will not allow undesirable fluids to flow onto the land surface. During installation of a water well pump, installer shall make a reasonable effort to maintain integrity of groundwater and to prevent contamination by elevating the pump column and fittings, or by other means suitable under the circumstances. Pump shall be constructed so that no unprotected openings into the interior of the pump or well casing exist.
Treatment/Disposal		
Disposal of Wastewater (e.g., contaminated groundwater, dewatering fluids, decontamination liquids) 40 CFR 268.1(c)(4)(i) 30 TAC 335.431(c)	RCRA-restricted characteristically hazardous waste intended for disposal—**applicable** if extracted groundwater is determined to be RCRA characteristically hazardous.	Appropriate and relevant in the event of a spill. Disposal is not prohibited if such wastes are managed in a treatment system subject to regulation under Section 402 of the CWA that subsequently discharges to waters of the United States.
Closure		
Standards for Plugging Wells that Penetrate Undesirable Water or Constituent Zones 16 TAC 76.1004(a) through (c)	Plugging and abandonment of wells—**applicable** to plugging and closure of monitoring and/or extraction wells.	If a well is abandoned, all removable casing shall be removed and the entire well pressure filled via a tremie pipe with cement from bottom up to the land surface. In lieu of this procedure, the well shall be pressure-filled via a tremie tube with bentonite grout of a minimum 9.1 lb/gal weight followed by a cement plug extending from land surface to a depth of not less than 2 feet. Undesirable water or constituents or the freshwater zone(s) shall be isolated with cement plugs.

Abbreviations:

ARAR	*applicable or relevant and appropriate requirement*	*MCLG*	*maximum contaminant level goal*
bgs	*below ground surface*	*MSC*	*medium-specific concentration*
CFR	*Code of Federal Regulations*	*%*	*percent*
CWA	*Clean Water Act of 1972*	*PPE*	*personal protective equipment*
USEPA	*U.S. Environmental Protection Agency*	*ppm*	*part per million*
FR	*Federal Register*	*RCRA*	*Resource Conservation and Recovery Act of 1976*
lb/gal	*pound per gallon*	*TAC*	*Texas Administrative Code*
LHAAP	*Longhorn Army Ammunition Plant*	*TCEQ*	*Texas Commission on Environmental Quality*
MCL	*maximum contaminant level*		

Figure 2-1
LHAAP Location Map

Figure 2-2
Site Vicinity Map

Figure 2-3
Soil Sample Location Map

Figure 2-4
Surface Water and Sediment Sample Location Map

Figure 2-5
Groundwater Elevation Map (Shallow Zone)

Figure 2-6
Groundwater Elevation Map (Intermediate Zone)

Figure 2-7
Human Health Conceptual Site Model

Figure 2-8
Ecological Conceptual Exposure Model

Figure 2-9
VOCs and Perchlorate in Shallow Zone Groundwater

Figure 2-10
VOCs and Perchlorate in Intermediate Zone Groundwater

Figure 2-11
Soil Contamination

Figure 2-12
Areas of Soil Remediation

Figure 2-13
Existing Groundwater Treatment Plant Process

3.0 Responsiveness Summary

The Responsiveness Summary serves three purposes. First, it provides the U .S. Army, USEPA, and TCEQ with information about community concerns with the preferred alternative at LHAAP-17 as presented in the Proposed Plan. Second, it shows how the public's comments were considered in the decision-making process for selection of the remedy. Third, it provides a formal mechanism for the U.S. Army to respond to public comments.

The U.S. Army, USEPA, and TCEQ provide information regarding LHAAP-17 through public meetings, the Administrative Record for the facility, and announcements published in the Shreveport Times and Marshall News Messenger newspapers. **Section 2.3** discusses community participation on LHAAP-17, including the dates for the public comment period, the date, location, and time of the public meetings, and the location of the Administrative Record. The following documents related to community involvement were added to the Administrative Record:

- Transcript of the public meeting on June 29, 2010
- Presentation slides from the June 29, 2010 public meeting
- Written questions and comments from the public during the public comment period, and the U.S. Army response to those comments dated December 9, 2010.

3.1 Stakeholder Issues and Lead Agency Responses

This section responds to significant issues raised by stakeholders including the public and community groups that were received in written or verbal form. The figures that the commenter makes reference to were provided by the commenter.

Question/comment: The Army intends to stop pumping and treating groundwater once average perchlorate concentrations are reduced to 20,000 µg/L. According to the Army, high concentrations of perchlorate inhibit the natural attenuation of TCE. However, the Army has not presented any evidence to show that there are significant differences in the attenuation of TCE when the perchlorate concentration is below 20,000 µg/L. In fact, TCE concentrations are increasing at monitor wells 130 and 17WW03, even though perchlorate concentrations at these wells are well below 20,000 µg/L (see figures 1a, 1b, 2a, and 2b on the next page). On the other hand, perchlorate concentrations in monitor well 17WW06 are much higher than 20,000 µg/L, but TCE concentrations are decreasing (see figures 3a and 3b). Thus, there does not appear to be a strong relationship between perchlorate concentrations and the attenuation of TCE. The Army should not rely on a reduction in perchlorate concentrations to result in the attenuation of TCE.

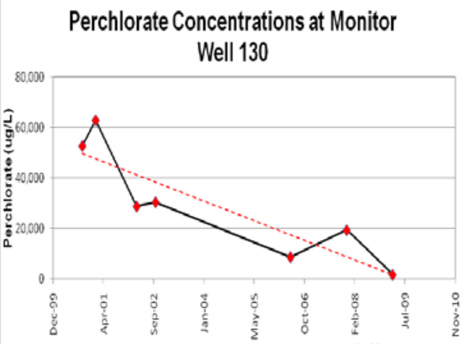

Figure 1a

Data source: United States Army, 2010a, appendix A, table A-1.

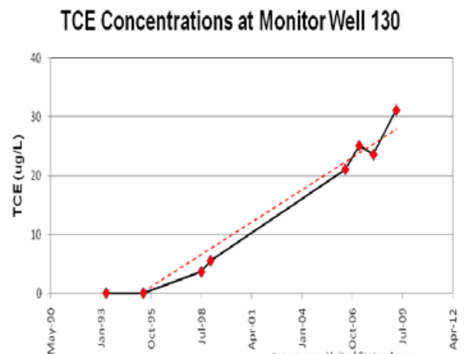

Figure 1b

Data source: United States Army, 2010a, appendix A, table A-1.

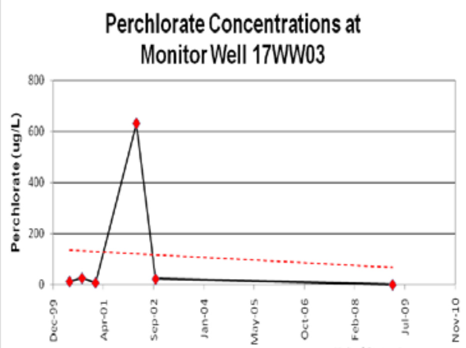

Figure 2a

Data source: United States Army, 2010a, appendix A, table A-1.

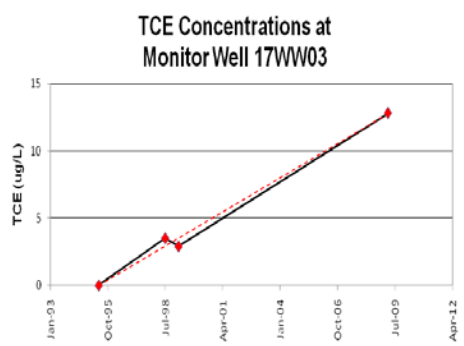

Figure 2b

Data source: United States Army, 2010a, appendix A, table A-1.

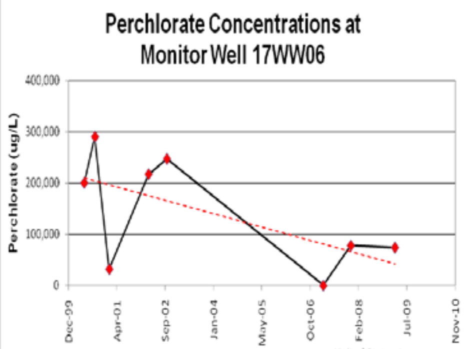

Figure 3a

Data source: United States Army, 2010a, appendix A, table A-1.

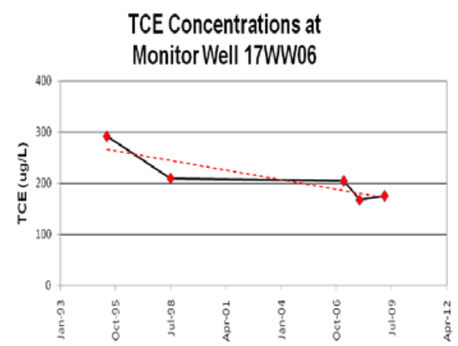

Figure 3b

Data source: United States Army, 2010a, appendix A, table A-1.

Response: Studies of natural attenuation and guidance for implementing MNA presume that biologically assisted attenuation proceeds from the most easily reduced compounds to the ones that are most difficult. Perchlorate is more easily reduced than TCE. The microbes that metabolize perchlorate are ubiquitous in the natural environment, and there appears to be no potential "stalling" at daughter products (which can happen with TCE). The perchlorate concentration of 20,000 µg/L was selected based on data from LHAAP-17 and another site at Longhorn. At LHAAP-17, observation of the subsurface conditions is complicated by the perchlorate contaminated soil which may add perchlorate to the groundwater via percolation. The performance of natural attenuation to meet remedial action objectives will be evaluated after soil removal, groundwater pumping, and eight quarterly sampling events. If it is found that the performance objectives are not being met with natural attenuation, a contingent remedy such as in situ bioremediation would be implemented.

Question/comment: It appears that the Army intends to stop pump and treat once the trigger is reached, regardless of the effect that pump and treat is having on contaminant concentrations. This is not a reasonable approach to contaminant clean-up. The Army should evaluate the effectiveness of pump and treat when the trigger is reached. Then, if it is still having a substantial effect on contaminant concentrations, pump and treat should be continued. The pump and treat system should be operated as long as it is causing significant reductions in contaminant concentrations.

Response: The U.S. Army has chosen to implement pump and treat to reduce the highest contaminant concentrations at LHAAP-17 to make conditions more favorable for MNA. Contaminant removal by pump and treat methods operates with diminishing returns – as concentrations decrease, the mass removal rate also falls. Inevitably, a point is reached at which remediation by pump and treat is no longer cost effective. The pump and treat system in conjunction with the site hydrogeological conditions may also be considered ineffective if the system is incapable of reducing perchlorate concentrations at a rate that would be considered productive. As the wording in the comment implies, "substantial effect" and "significant reductions", there is some amount of interpretation involved in deciding when to turn off the pumps. However, pump and treat is not the primary remedy selected or evaluated for LHAAP-17. It is used to assist the primary remedy of MNA by reducing the highest contaminant concentrations. If the pump and treat does not effectively reduce the highest contaminant concentrations in the reasonable time allowed, a contingency remedy such as in situ bioremediation will be implemented.

Question/comment: TCE samples have been collected from 11 monitor wells in the shallow zone. TCE concentrations have exceeded the 5 µg/L MCL in six of these wells. Of these six wells TCE concentrations are rising in four, and dropping in two (see figures 1b, 2b, 3b, 4, 5, and 6). The table below shows the most recent TCE concentrations found in the six wells.

Clearly, natural attenuation is not acting to reduce TCE concentrations throughout the site. Although the Army claims that high concentrations of perchlorate are inhibiting the attenuation of TCE, this assertion is not supported by the data (see first comment). The Army should reevaluate its reliance on natural attenuation to reduce TCE concentrations at Site 17.

Most Recent TCE Concentrations in Shallow Zone Monitor Wells

Wells with increasing concentrations of TCE		**Wells with decreasing concentrations of TCE**	
Well ID	TCE (µg/L)	Well ID	TCE (µg/L)
130	31.1	17WW04	0.9
17WW01	6090	17WW06	176
17WW02	867		
17WW03	12.8		

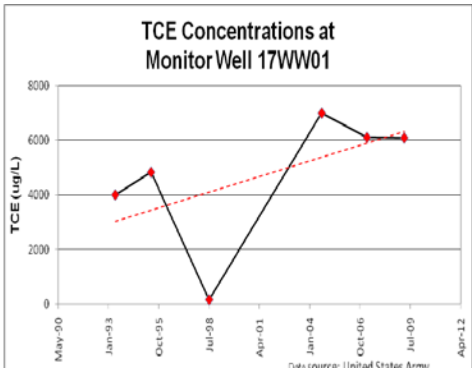

Figure 4 Data source: United States Army, 2010a, appendix A, table A-1.

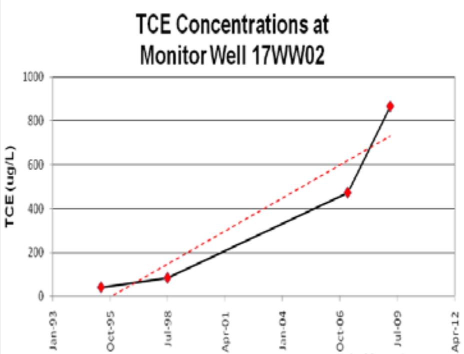

Figure 5 Data source: United States Army, 2010a, appendix A, table A-1.

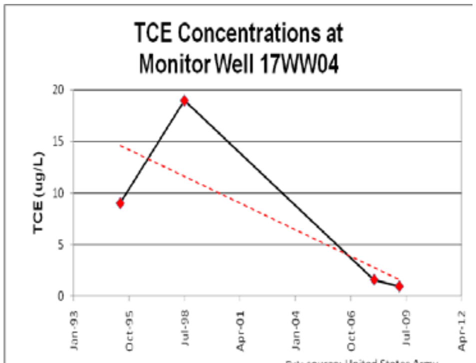

Figure 6 Data source: United States Army, 2010a, appendix A, table A-1.

Response: The most significant increase in TCE concentrations is seen at well 17WW01 between 1998 and 2004. TCE concentrations have declined in this well since 2004. Increases in TCE concentrations at wells 130, 17WW02, and 17WW03 are not as significant and may reflect seasonal variations instead of an overall increase in mass. The groundwater gradient at LHAAP-17 is fairly flat and the diffusion of TCE away from 17WW01 may cause a rise in concentrations in the surrounding wells (i.e., 17WW02 and 17WW03). Even though there are fluctuations in the wells at LHAAP-17, the plume is bounded and there does not appear to be a significant migration of the plume. Additionally, pump and treat will contain the plume and will reduce TCE concentrations (prior to MNA evaluation) as well as the perchlorate.

Under current conditions at LHAAP-17, with the addition of perchlorate from contaminated soil by percolation, natural attenuation cannot be effectively evaluated since the high perchlorate concentrations are inhibiting TCE attenuation. After contaminated soil is removed, groundwater pumping will still disturb natural conditions. It is only after soil is removed and pumping is stopped that an effective MNA evaluation may be made. When that evaluation is complete, and if it is favorable, MNA will continue as the remedy. However, if the evaluation is not favorable, another remedy (e.g., in situ bioremediation) will be implemented to reduce the TCE concentrations.

Question/comment: The Army estimates that natural attenuation will reduce TCE concentrations in the shallow groundwater zone to the clean-up level (5 µg/L) in less than 120 years. It is not reasonable to propose a plan that could require the maintenance of LUCs for a century.

Response: The reasonably anticipated future use of the site is as a wildlife refuge (i.e., Caddo Lake National Wildlife Refuge). Once the property is transferred into the refuge system, the property must be kept as a National Wildlife Refuge unless there is an act of Congress which removes the parcel or the land is exchanged in accordance with the National Wildlife Refuge System Administration Act of 1966 and the National Wildlife Refuge System Act Amendments of 1974. This proposed transfer as a national wildlife refuge, which by its very nature includes physical access and use restrictions, is subject to control and continual inspection by Refuge personnel. Also, the property is intended to remain under ownership and management of a federal government agency. The LUC for groundwater will prohibit access to the groundwater except for environmental testing until cleanup levels are met. Maintenance of the LUC for groundwater use prohibition would require minimal effort and would be reasonable for extended lengths of time. Effectiveness of the LUC will be evaluated as part of the statutory five-year reviews and does not pose additional burden. Additionally, access of groundwater through well installations requires a permit from the Texas Department of Licensing and Regulation or Texas Water District authority. The department will be provided a copy of the county recordation that indicates the location of contaminated groundwater at the site and associated prohibitions.

Question/comment: The clean-up time estimate is based on data from monitor well 17WW06, where TCE concentrations are declining (see figure 3b). However, this estimate does not apply to those portions of Site 17 where TCE concentrations are increasing (see third comment). The Army should provide an estimate of clean-up time for the entire site.

Response: Although there is some uncertainty associated with the cleanup time for the entire site because of the inhibitive effects of perchlorate, the data collected during the two year period of natural attenuation monitoring (post pump and treat) will be used to remove some of the uncertainties associated with the estimate of time to achieve MCLs. The statutory five-year reviews will evaluate the effectiveness of the remedy and estimated durations to reach MCLs and would recommend implementation of other measures if needed.

Question/comment: The Army estimates that natural attenuation will reduce perchlorate concentrations to the clean-up level (72 µg/L) within 15 years. This estimate is based on perchlorate degradation rates (half-lives) calculated for eight monitor wells. However, the Army did not calculate degradation rates for two monitor wells that currently contain high perchlorate concentrations: well 17WW01 (56,000 µg/L) and well 17WW02 (160,000 µg/L). Over the entire period of record, perchlorate concentrations in these two wells have increased, although concentrations in both wells are currently decreasing (see figures 7 and 8). Wells 17WW01 and 17WW02 are important data points that the Army has not accounted for in its estimate. The Army should explain why it did not use data from these wells to estimate the clean-up time for perchlorate at Site 17.

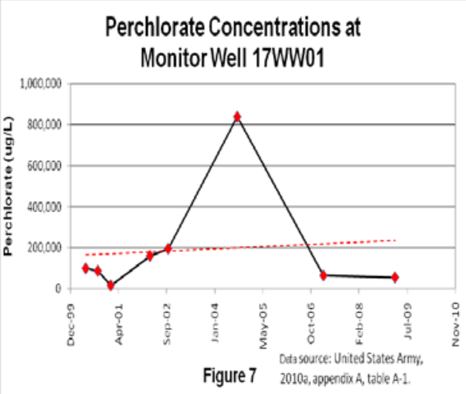

Figure 7

Data source: United States Army, 2010a, appendix A, table A-1.

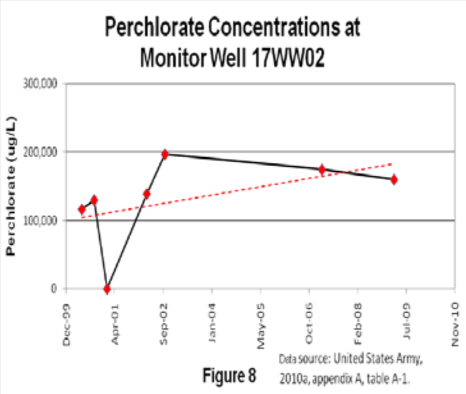

Figure 8

Data source: United States Army, 2010a, appendix A, table A-1.

Response: Data from wells 17WW01 and 17WW02 were not used because those two wells appear to be receiving additional perchlorate as it leaches into groundwater from the overlying contaminated soil. The removal of contaminated soil will end this influx, and the pump and treat activity will reduce perchlorate concentrations in the groundwater at those two wells (to

20,000 µg/L). As the perchlorate concentration at 17WW06 (74,000 µg/L) is significantly higher, the U.S. Army feels that the cleanup time estimated for perchlorate at 17WW06 by MNA provides a reasonable estimate.

Question/comment: The Army does not consider perchlorate to be a COC in the intermediate groundwater zone. However, high concentrations of perchlorate have been detected in intermediate zone monitor well 17WW11. Therefore, perchlorate should be a COC in the intermediate zone.

Response: Well 17WW11 is considered a shallow-intermediate well. There was no distinct clay layer to separate the shallow and intermediate zones. Boring logs for it and surrounding wells were inspected along with groundwater elevations, and it appears to be more reasonably connected with nearby shallow zone monitoring wells than with nearby intermediate zone monitoring wells. As a result, the well 17WW11 has been included with the shallow wells, and within the defined perchlorate plume. Also, perchlorate concentrations were below the detection limit in the intermediate groundwater zone wells (17WW07, 17WW09, 17WW15, and 17WW17).

Question/comment: The Army will present details of the soil excavation plan, the pump and treat system, the groundwater remediation performance objectives, the plan for implementing and evaluating MNA, and the LUC implementation plan, in the RD. However, the RD has not yet been produced. Given its importance, the Army should make the RD available for public review and comment as soon as practicable.

Response: The public will be provided with updates on remedial design and remedial action status through the RAB meeting and any concerns can be addressed through this forum. The RD will include performance objectives, schedule and other design criteria and will follow established regulatory guidance for MNA.

3.2 Technical and Legal Issues

This section is used to expand on technical and legal issues. However, there are no issues of that nature beyond the technical issues already discussed in **Section 3.1**.

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Shaw, 2007b, *Data Gaps Investigation Report, Longhorn Army Ammunition Plant, Karnack, Texas,* Final, Houston, Texas, April.

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U.S. Army Toxic and Hazardous Materials Agency (USATHAMA), 1980, *Installation Assessment of Longhorn Army Ammunition Plant, Report No. 150,* February.

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USEPA, 1999, *Use of Monitored Natural Attenuation at Superfund, RCRA Corrective Action, and Underground Storage Tank Sites*, OSWER Directive 9200.4.-17P, April.

USEPA, 2004, *Performance Monitoring of MNA Remedies for VOCs in Ground Water*, EPA/600/R-04/027, April.

Glossary of Terms

Glossary of Terms

Administrative Record – The body of reports, official correspondence, and other documents that establishes the official record of the analysis, clean up, and final closure of a site.

ARARs – Applicable or relevant and appropriate requirements. Refers to the federal and state requirements that a selected remedy will attain.

Attenuation – The process by which a compound is reduced in concentration over time, through absorption, adsorption, degradation, dilution, and/or transformation.

Characterization – The compilation of available data about the waste site to determine the rate and extent of contaminant migration resulting from the site, and the concentration of any contaminants that may be present.

Chemicals of Concern (COCs) – Those chemicals that significantly contribute to a pathway in an exposure model of a hypothetical receptor (e.g., a child that resides on a site). They exceed either the calculated numerical limit for cumulative site carcinogenic risk (1 in 10,000 exposed individuals) or the calculated numerical limit of 1 for non-carcinogenic effects, a value proposed by the USEPA.

Chemical of Potential Concern (COPCs) – Those chemicals that are identified as a potential threat to human health or the environment and are evaluated further in the baseline risk assessment. COCs are a subset of the COPCs that are identified in the Remedial Investigation/Feasibility Study as needing to be addressed by the response action proposed in the Record of Decision.

Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) – CERCLA was enacted by Congress in 1980 and was amended by the Superfund Amendments and Reauthorization Act in 1986. CERCLA provides federal authority to respond directly to releases or threatened releases of hazardous substances that may endanger public health or the environment. CERCLA established prohibitions and requirements concerning closed and abandoned hazardous waste sites and established the Superfund Trust Fund.

Contaminant Plume – A column of contamination with measurable horizontal and vertical dimensions that is suspended and moves with groundwater.

Exposure – Contact of an organism with a chemical or physical agent. Exposure is quantified as the amount of the agent available at the exchange boundaries of the organism (e.g., skin, lungs, gut) and available for absorption.

Glossary of Terms (continued)

Federal Facility Agreement – A binding legal agreement among USEPA, TCEQ, and U.S. Army that sets the standards and schedules for the comprehensive remediation of Longhorn Army Ammunition Plant.

Groundwater – Underground water that fills pores in soil or openings in rocks to the point of saturation.

Human Health Risk Assessment – A study conducted as part of a remedial investigation to determine the risk posed to human health by site-related chemicals.

Maximum Contaminant Level (MCL) – The maximum contaminant level is the maximum permissible level of a contaminant in a public water system. MCLs are defined in the Code of Federal Regulation (40 CFR 141, National Primary Drinking Water Regulations, which implement portions of the Safe Drinking Water Act). The TCEQ has adopted MCLs as the regulatory cleanup levels for both industrial and residential uses. Any detected compound in the groundwater samples with a MCL was evaluated by comparing it to its associated MCL.

National Priorities List (NPL) – The USEPA's list of the most serious uncontrolled or abandoned hazardous waste sites identified for possible long-term remedial action under Superfund. USEPA is required to update the NPL at least once a year. A site must be on the NPL to receive money from the Trust Fund for remedial action.

Organic Compounds – Carbon compounds such as solvents, oils, and pesticides. Most are not readily dissolved in water.

Record of Decision – A legal document presenting the remedial action selected for a site or operable unit. It is based on information and technical analyses generated during the remedial investigation/feasibility study process and consideration of public comments on the proposed plan and community concerns.

Remedial Investigation – A study designed to gather data needed to determine the nature and extent of contamination at a Superfund site.

Resource Conservation and Recovery Act (RCRA) – Gives USEPA the authority to control the generation, transport, treatment, storage, and disposal of hazardous waste. RCRA focuses only on active and future facilities and does not address abandoned or historical sites.

Glossary of Terms (continued)

Responsiveness Summary – A summary of oral and/or written comments received during the proposed plan comment period, including responses to these comments. The responsiveness summary is a key part of a ROD highlighting community concerns.

Proposed Plan – A plan for a site cleanup that proposes a recommended or preferred remedial alternative. The Proposed Plan is available to the public for review and comment. The preferred alternative may change based on public and other stakeholder input.

Superfund Amendments and Reauthorization Act (SARA) – Amended CERCLA in 1986. SARA resulted in more emphasis on permanent remedies for cleaning up hazardous waste sites, increased the focus on human health problems posed by hazardous waste sites, and encouraged greater citizen participation in making decisions on how sites should be cleaned up.

Surface Media – The soil (surface or subsurface), surface water, and sediment present at a site as applicable.

Superfund – The common name used for CERCLA; also referred to as the Trust Fund. The Superfund Program was established to help fund cleanup of hazardous waste sites. It also allows legal action to force those responsible for sites to clean them up.

Appendix A

Public Meeting Newspaper and Media Notices

PUBLIC NOTICE
THE UNITED STATES ARMY INVITES PUBLIC COMMENT ON THE PROPOSED PLAN FOR ENVIRONMENTAL SITE LHAAP-17
LONGHORN ARMY AMMUNITION PLANT, TEXAS
PUBLIC MEETING AT KARNACK COMMUNITY CENTER JUNE 29, 2010

The U.S. Army is the lead agency for environmental response actions at Longhorn Army Ammunition Plant (LHAAP). In partnership with Texas Commission on Environmental Quality and the U.S. Environmental Protection Agency Region 6, the U.S. Army has developed the Proposed Plan for NPL site LHAAP-17. Although the Proposed Plan for LHAAP-17 identifies the preferred remedy for the site, the U.S. Army welcomes the public's review and comments. The public comment period is June 10, 2010 through July 10, 2010. The public meeting will be held on June 29, 2010 at the Karnack Community Center, Highway 134 and Spur 449, Karnack, Texas. Questions, comments, and responses on the Proposed Plan will be recorded by a court reporter during the public meeting. Copies of the Proposed Plan and supporting documentation are available for public review at the Marshall Public Library, 300 S. Alamo, Marshall, Texas, 75670. A summary of the site, including a discussion of various alternatives that were evaluated, are provided below.

Longhorn Army Ammunition Plant (LHAAP) is an inactive, government-owned, formerly contractor-operated and -maintained industrial facility located in central-east Texas in the northeastern corner of Harrison County. The installation occupies nearly 8,416 acres between State Highway 43 at Karnack, Texas, and the western shore of Caddo Lake. LHAAP was established in December 1941 near the beginning of World War II for the manufacture of trinitrotoluene. Other past industrial operations at the installation included the use of secondary explosives, rocket motor propellants, and various pyrotechnics, such as illuminating and signal flares and ammunition.

LHAAP-17, Burning Ground No. 2/Flashing Area, is located in the west-central portion of LHAAP and covers an area of approximately 3.9 acres. The site was used as a burning ground from 1959 through 1980 and as a flashing area to decontaminate recoverable metal byproducts. Four alternatives were evaluated for addressing the contaminated soil and groundwater at the site: 1) no action; 2) excavation and off-site disposal for soil; monitored natural attenuation (MNA) and land use controls (LUCs) for groundwater; 3) excavation and off-site disposal for soil; in situ bioremediation; MNA and LUCs for groundwater; and 4) excavation and off-site disposal for soil; groundwater extraction, MNA and LUCs for groundwater. Based on available information, the preferred remedy is alternative 4 which would remove contaminated soil from LHAAP-17 with off-site disposal; reduce groundwater contamination throughout the shallow zone groundwater contaminant plume via groundwater extraction; MNA to assure protection of human health and the environment by documenting that the contaminated groundwater remains localized and that contaminant concentrations are being reduced to MCLs; and LUCs to protect human health by preventing human exposure to contaminated groundwater.

For further information or to submit written comments, contact: Dr. Rose M. Zeiler, Longhorn Army Ammunition Plant, P.O. Box 220, Ratcliff, Arkansas, 72951; phone number 479-635-0110 or e-mail rose.zeiler@us.army.mil.

MEDIA RELEASE

The United States Army has prepared a Proposed Plan for the environmental site LHAAP-17, Burning Ground No. 2/Flashing Area, at the Longhorn Army Ammunition Plant. The Proposed Plan is the document that describes LHAAP-17 and its proposed remedies. The Proposed Plan was developed to facilitate public involvement in the remedy selection process.

Copies of the Proposed Plan and other supporting documentation for LHAAP-17 are available for public review at the Marshall Public Library, 300 S. Alamo, Marshall, Texas, 75670. The public comment period is June 10, 2010 through July 10, 2010.

A public meeting will be held on June 29, 2010, from 6:00 to 8:00 p.m. at the Karnack Community Center, Highway 134 and Spur 449, Karnack, Texas, 75661.

All written public comments on the Proposed Plan must be postmarked on or before July 10, 2010. Written comments may be provided to Dr. Rose M. Zeiler, Longhorn Army Ammunition Plant, P.O. Box 220, Ratcliff, Arkansas, 72951, or e-mailed to rose.zeiler@us.army.mil. E-mailed comments must be submitted by close of business on July 10, 2010.

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DRAFT FINAL
RECORD OF DECISION
LHAAP-001-R (SOUTH TEST AREA/BOMB TEST AREA) AND LHAAP-003-R (GROUND SIGNAL TEST AREA)
LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS

Prepared for

U.S. Army Corps of Engineers
Tulsa District
1645 South 101st East Avenue
Tulsa, Oklahoma 74128

Prepared by

Shaw Environmental, Inc.
1401 Enclave Parkway, Suite 250
Houston, Texas 77077

MARC No. W912BV-07-D-2004, Task Order No. 0007
Shaw Project No. 133363

~~August~~October 2012

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Glossary of Terms

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Acronyms and Abbreviations

µg/kg	microgram per kilogram
µg/L	microgram per liter
AM	action memorandum
BERA	baseline ecological risk assessment
bgs	below ground surface
BIP	blow-in-place
CD	cultural debris
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CTT	closed, transferring, and transferred
DNT	Dinitrotoluene
DoD	Department of Defense
EE/CA	Engineering Evaluation/Cost Analysis
EPS	Environmental Protection Systems, Inc.
FFA	Federal Facility Agreement
ft	foot/feet
GW-Ind	groundwater MSC for industrial use
GWP-Ind	soil MSC for industrial use based on groundwater protection
HMX	high-molecular-weight RDX or high melt explosive
HRR	historical records review
IRP	Installation Restoration Program
LHAAP	Longhorn Army Ammunition Plant
LUC	land use control
MC	munitions constituents
MCL	maximum contaminant level
MD	munitions debris
MEC	munitions and explosives of concern
mm	Millimeter
MMRP	Military Munitions Response Program
MOA	memorandum of agreement
MPPEH	material potentially presenting an explosive hazard
MRS	munitions response site
MSC	medium-specific concentration
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NFA	no further action
NPL	national priorities list
OB/OD	open burn/open detonation
RAB	Restoration Advisory Board
RDX	research department explosive (hexahydro-1,3,5-trinitro-1,3,5-triazine)

***Acronyms and Abbreviations** (continued)*

ROD	Record of Decision
SARA	Superfund Amendments and Reauthorization Act
Shaw	Shaw Environmental, Inc.
SI	site inspection
STEP	Solutions to Environmental Problems
TAC	Texas Administrative Code
TCEQ	Texas Commission on Environmental Quality
TNT	Trinitrotoluene
USACE	U.S. Army Corps of Engineers
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
UXO	unexploded ordnance
WP	white phosphorus

1.0 Declaration

1.1 Site Name and Location

Military Munitions Response Program (MMRP) Sites LHAAP-001-R, South Test Area/Bomb Test Area, and LHAAP-003-R, Ground Signal Test Area.

Longhorn Army Ammunition Plant (LHAAP)
Karnack, Texas

Comprehensive Environmental Response, Compensation, and Liability Information System, U.S. Environmental Protection Agency (USEPA) Identification Number: TX6213820529.

1.2 Statement of Basis and Purpose

This decision document presents the selected remedy for LHAAP-001-R and LHAAP-003-R, located at the Longhorn Army Ammunition Plant in Karnack, Texas. The remedy was selected in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980, as amended by the Superfund Amendments and Reauthorization Act (SARA) of 1986, and to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), 40 Code of Federal Regulations (CFR) Part 300.

The remedy selection was based on the Administrative Record file for these sites, including the Site Inspection (SI) Report (e^{2}M, 2005), the Engineering Evaluation/Cost Analysis (EE/CA) (Cape, 2007) and Action Memorandum (AM) (U.S. Army, 2007), the Munitions Constituents (MC) Data Summary Report (Shaw Environmental, Inc. [Shaw], 2011), the Munitions and Explosives of Concern (MEC) Removal Action Report (EODT Technology, Inc. [EODT], 2009), the Installation-wide Baseline Ecological Risk Assessment (BERA) Report (Shaw, 2007), the Proposed Plan (U.S. Army, 2011), and other related documents contained in the Administrative Record for the Munitions Response Sites (MRS) LHAAP-001-R and LHAAP-003-R.

This document is issued by the U.S. Army, the lead agency for this installation. The U.S. Army, USEPA, and the Texas Water Commission (currently known as the TCEQ) entered into the FFA for remedial activities at LHAAP which became effective on December 30, 1991. The USEPA Region 6 and the Texas Commission on Environmental Quality (TCEQ) are the regulatory agencies providing technical support, project review and comment, and oversight of the U.S. Army cleanup program at the former LHAAP. The USEPA and the Army jointly select the remedy and TCEQ concurs with LUCs and limited groundwater monitoring in this Record of Decision (ROD).

1.3 Assessment of the Site

The response action selected in this ROD is necessary to protect the public health and safety from explosive hazards that may have remained at the sites after the 2008 removal action and to confirm that the levels of perchlorate in groundwater are protective of human health.

1.4 Description of the Selected Remedy

The selected remedy for LHAAP-001-R and LHAAP-003-R is implementation of LUCs and limited groundwater monitoring for perchlorate, in addition to the completed removal action. The lead agency has determined that LUCs are necessary to protect public health and safety related to MC or MEC at LHAAP-001-R, South Test Area/Bomb Test Area, and LHAAP-003-R, Ground Signal Test Area, and that limited groundwater monitoring for perchlorate will be conducted to confirm that the levels in groundwater are below 72 μg/L, the State of Texas groundwater medium-specific concentration (MSC) for industrial use (GW-Ind).

Throughout the ROD document for these two MRS, the term MC refers to the data gap constituent of white phosphorous (WP) and the emerging contaminant perchlorate. U.S. Army, regulators, and project stakeholders met in 2005 for technical planning meetings and agreed that metals and explosives, typically included as MCs, were addressed with the Installation Restoration Program (IRP) RODs signed in 1998 for Sites LHAAP-27 and LHAAP-54. These sites are co-located with MRS LHAAP-001-R and LHAAP-003-R, respectively.

MEC items were found at both sites during the EE/CA investigations. Subsequently, MEC items were located and removed during surface removals over the entire areas of LHAAP-001-R and LHAAP-003-R, and a subsurface removal to depth in the open burn/open detonation (OB/OD) area within LHAAP-001-R. Although these removal actions provide an effective solution for reducing risk of exposure by reducing the potential for any direct contact with MEC or material potentially presenting explosive hazard (MPPEH), there is the potential that some MEC remains. Therefore, the sites are not suitable for unrestricted use. LUCs for both LHAAP-001-R and LHAAP-003-R promote ongoing protection of human safety against potential explosive hazards that may have remained at the sites. The LUC objectives are: 1) to prohibit the development and use of the property for residential housing, elementary and secondary schools, and child care facilities and playgrounds, and 2) prohibit intrusive activities such as digging or any other activity which could result in explosive safety risks. The LUC restricting land use to nonresidential will remain in place until it is demonstrated that the MEC no longer presents a threat to public safety. ~~groundwater, surface soil and subsurface soil COCs (i.e., the MEC items and the perchlorate as described in Section 2.7 of the ROD) are at levels that allow for unlimited use and unrestricted exposure and it is demonstrated that there is no substantial threat of an explosive hazard.~~ A LUC to prohibit intrusive subsurface activities, including digging, will remain in place until the current land holding agency or any subsequent transferee takes the actions necessary to protect workers and the public from explosives hazards associated with the proposed intrusive activities. For example, intrusive activities may be conducted provided the current land holding agency or any subsequent transferee retains support from UXO-qualified personnel as necessary.

~~The LUC to prohibit intrusive activities will remain in place until it is demonstrated that the MEC~~ and ~~there is no substantial threat of an explosive hazard.~~

Environmental sampling results at LHAAP-001-R and LHAAP-003-R indicate that there is no risk to human health and safety from perchlorate or WP. Limited groundwater monitoring is intended to confirm perchlorate levels in groundwater are below the GW-Ind to verify protection of human health and the environment. If, after three rounds of groundwater sampling at LHAAP-001-R and one round of groundwater sampling at LHAAP-003-R, the results that are evaluated on or before the first five year review indicate detections at levels below the GW-Ind value of 72 micrograms per liter (µg/L) for perchlorate, groundwater monitoring will cease and the wells will be plugged and abandoned.

Five-Year Reviews will be conducted to ensure that the LUCs are specified, implemented, monitored, reported on, and enforced in an efficient, cost effective manner that ensures long-term protectiveness. Texas Administrative Code (TAC) §335.566, requires that the LUCs be filed in Harrison County. With the exception of the nonresidential LUC, the specific LUCs and implementation details are provided in the Final Work Plan for the MEC Removal Action at the Former Longhorn Army Ammunition Plant, LHAAP-001-R (Site 27) and LHAAP-003-R (Site 54) (EODT, 2008). A LUC Remedial Design (RD) will be finalized as the land use component of the Remedial Design. Within 21 days of the issuance of the ROD, the Army will propose deadlines for completion of the RD Work Plan, RD, and Remedial Action Work Plan. The documents will be prepared and submitted to EPA and TCEQ pursuant to the FFA. The LUC RD will contain implementation and maintenance actions, including periodic inspections. LUC boundaries and sign locations are depicted on **Figures 2-7** and **2-8**.

The Army will implement, maintain, monitor, report on and enforce land use controls at Army-owned property. The Army shall perform those actions related to land use control activities described in this ROD and in the Remedial Design for the ROD. For portions of the Site subject to land use controls that are not owned by the Army, the Army will monitor and report on the implementation, maintenance, and enforcement of land use controls, and coordinate with federal, state, and local governments and owners and occupants of properties subject to land use controls. The Army will provide notice of the groundwater and soil contamination and any land use restrictions referenced in the ROD. The Army will send these notices to the federal, state and local governments involved at this site and the owners and occupants of the properties subject to those use restrictions and land use controls. The Army shall provide the initial notice within 90 days of ROD signature. The frequency of subsequent notifications will be described in the Remedial Design for the ROD. The Army remains responsible for ensuring that the remedy remains protective of human health and the environment. The Army will fulfill its responsibility and obligations under CERCLA and the NCP as it implements, maintains, and reviews the selected remedy.

Upon transfer of Army-owned property, the Army will provide written notice that given past use of the two sites addressed by this ROD for military munitions related purposes, there is a possibility that MEC may exist on the property. The written notification will also include ~~of the land use controls to the transferee of the groundwater and soil contamination and~~ any land use restrictions referenced in the ROD. Within 15 days of transfer, the Army shall provide EPA and TCEQ with written notice of the division of implementation, maintenance, and enforcement responsibilities unless such information has already been provided in the LUC RD. The LUC RD will address the procedures to be used by the Army and the transferee to document compliance with the LUCs described in this ROD. In the event property is transferred out of Federal control, the land use controls relating to property and groundwater restrictions shall be recorded in the deed and shall be enforceable by the United States and the state of Texas.

The U.S. Army and regulators will consult to determine appropriate enforcement actions should there be a failure of a LUC objective at these sites after they have been transferred.

1.5 Statutory Determinations

The statutory preference for treatment was addressed with the MEC removal action which removed source material from the site and destroyed MEC. The selected remedy, implementation of LUCs and limited groundwater monitoring for perchlorate are protective of human health and safety, complies with Federal and State requirements that are applicable or relevant and appropriate, and is cost effective. In addition, the remedy offers long-term effectiveness through the maintenance and implementation of LUCs that over the long term will reduce risk associated with potential MEC hazards that may have remained at the sites. The limited groundwater monitoring for perchlorate will confirm perchlorate level in groundwater is below GW-Ind.

Comment [E1]: Reduce struck in 7-20 version. Assume it was a typo.

Because explosive hazards may remain at the sites that do not allow for unlimited use and unrestricted exposure, five-year reviews will be conducted for MRS LHAAP-001-R and LHAAP-003-R to ensure protection of human health and safety under CERCLA §121(c), U.S. Code (USC) Title 42 §9621(c). In accordance with Texas Administrative Code (TAC) Title 30 §335.566, a notification will be recorded in the Harrison County records stating that the site is only suitable for nonresidential use until ~~the levels of COCs (i.e., the MEC items and the perchlorate as described in Section 2.7 of the ROD) in groundwater, surface and subsurface soil allow for unlimited use and unrestricted exposure and until~~ it is demonstrated that the MEC no longer presents a ~~there is no substantial~~ threat to public safety~~of an explosive hazard~~. ~~The restriction against~~ A LUC to prohibit intrusive subsurface activities, including digging, will remain in place until the current land holding agency or any subsequent transferee takes the actions necessary to protect workers and the public from explosives hazards associated with the proposed intrusive activities. For example, intrusive activities may be conducted provided the current land holding agency or any subsequent transferee retains support from UXO-qualified personnel as necessary.

~~is in place until it is demonstrated that the MEC and other contaminants of concern no longer present a potential threat to public health. there is no substantial threat of an explosive hazard.~~ Although the U.S. Army may later pass these procedural responsibilities to the transferee by property transfer agreement, the U.S. Army shall retain ultimate responsibility for remedy integrity, per the FFA and CERCLA §121.

Comment [E2]: New language.

1.6 ROD Data Certification Checklist

The following information is included in the Decision Summary section of this ROD. Additional information can be found in the Administrative Record for this site.

- Current and reasonably anticipated future land use assumptions and current and potential future beneficial uses of groundwater as identified in the streamlined risk assessment and ROD (**Section 2.6**).
- Potential land and groundwater use that will be available at the sites as a result of the selected remedy (**Section 2.6**).
- COCs and their concentrations (**2.7**).
- Baseline risk represented by the COCs (**2.7**).
- Cleanup levels established for COCs and the basis for these levels (**Not Applicable**).
- How source materials constituting principal threats are addressed at this site (**Section 2.11**).
- Key factor(s) that led to selecting the remedy (**Section 2.12**).
- Estimated capital, annual operation and maintenance (O&M), and total present worth costs, discount rate, and the number of years over which the remedy cost estimates are projected (**Section 2.12**).

1.7 Authorizing Signatures

As the lead agency, the U.S. Army issues this ROD for LHAAP-001-R and LHAAP-003-R which documents the selected remedy. The undersigned is the appropriate approval authority for this decision.

Thomas E. Lederle *(Date)*
Deputy
BRAC Division, ACSIM
U.S. Army

The U.S. Environmental Protection Agency approves the selected remedy as provided in the ROD for LHAAP-001-R and LHAAP-003-R.

Pamela Phillips *(Date)*
Acting Director
Superfund Division
U.S. Environmental Protection Agency
Region 6

2.0 Decision Summary

2.1 Site Name, Location, and Description

LHAAP-001-R, South Test Area/Bomb Test Area, and LHAAP-003-R, Ground Signal Test Area

Longhorn Army Ammunition Plant, Karnack, Texas

Comprehensive Environmental Response, Compensation, and Liability Information System USEPA Identification Number: TX6213820529

Lead Agency: U.S. Army, Department of Defense (DoD)

Source of Cleanup Money: U.S. Army, DoD and MMRP

The former LHAAP is an inactive government-owned, formerly contractor-operated and maintained Department of Defense facility located in central east Texas in the northeast corner of Harrison County. As shown on **Figure 2-1,** LHAAP is approximately 14 miles northeast of Marshall, Texas. The facility is approximately 40 miles west of Shreveport, Louisiana. The former U.S. Army installation occupied nearly 8,416 acres between State Highway 43 at Karnack, Texas, and the southwestern shore of Caddo Lake and is accessed by State Highways 43 and 134.

LHAAP was placed on the National Priorities List (NPL) on August 9, 1990. Activities to remediate contamination began in 1990. After its listing on the NPL, the U.S. Army, the USEPA, and the Texas Water Commission (currently known as the TCEQ) entered into a CERCLA Section 120 FFA for remedial activities at LHAAP. The FFA became effective December 30, 1991. LHAAP operated until 1997 when it was placed on inactive status and classified by the U.S. Army Armament, Munitions, and Chemical Command as excess property.

The sites addressed in this ROD are LHAAP-001-R and LHAAP-003-R, which are shown on **Figure 2-2** and discussed below.

LHAAP-001-R, the South Test Area/Bomb Test Area, is located in the southern portion of LHAAP and covers an area of approximately 79 acres. LHAAP-001-R was constructed in 1954 and used for testing photoflash bombs produced at the facility until about 1956. During the late 1950s, illuminating signal devices were also demilitarized within pits excavated in the vicinity of the test pad. During the early 1960s, leaking production items may have been demilitarized by detonation. Leaking WP munitions were supposedly disposed of although no primary source documentation concerning this effort was located. A 1984 LHAAP Contamination Survey stated the area had been relatively inactive since the early 1960s and no disposal or testing activities were carried out in this area. LHAAP-001-R is co-located with IRP site LHAAP-27.

LHAAP-003-R, the Ground Signal Test Area, is located in the southeastern portion of LHAAP and covers an area of approximately 80 acres. LHAAP-003-R was used intermittently starting in April 1963 for aerial and on-ground testing and destruction of a variety of devices, including pyrotechnic signal devices, red phosphorus smoke wedges, infrared flares, illuminating mortar shells and cartridges, button bombs, and various types of explosive simulators. The site was also used intermittently over a 20-year period for testing and burn-out of rocket motors. From late 1988 through 1991, the site was also used for burn-out of Pershing missile rocket motors. Occasionally, leaking WP munitions were burned at the site as a demilitarization activity. LHAAP-003-R is co-located with IRP site LHAAP-54.

These sites are surrounded by an area (approximately 7,000 acres) that was transferred by the U.S. Army to the U.S. Fish and Wildlife Service (USFWS) for management as the Caddo Lake National Wildlife Refuge. The U.S. Army, the lead agency for environmental response actions at LHAAP, is acting in partnership with USEPA Region 6 and TCEQ in planning and implementing remedial actions at MRS LHAAP-001-R and LHAAP-003-R.

2.2 Site History and Enforcement Activities

2.2.1 Site History

LHAAP was established in December 1941 with the primary mission of manufacturing trinitrotoluene (TNT). Production of TNT began at Plant 1 in October 1942 and continued through World War II until August 1945, when the facility was placed on standby status until February 1952. In 1952, the facility was reactivated and production of pyrotechnic ammunition, such as photoflash bombs, simulators, hand signals, and tracers for 40 millimeter (mm) ammunition continued at Plant 2 through 1956.

In December 1954, a third facility, Plant 3, began production of solid-fuel rocket motors for tactical missiles. Rocket motor production at Plant 3 continued as the primary operation at LHAAP until 1965 when Plant 2 was reactivated for the production of pyrotechnic and illuminating ammunition. In the years following the Vietnam conflict, LHAAP continued to produce flares and other basic pyrotechnic or illuminating items for the DoD inventory. From September 1988 to May 1991, LHAAP was also used for the static firing and elimination of Pershing I and II rocket motors in compliance with the Intermediate-Range Nuclear Forces Treaty in effect between the United States and the former Union of Soviet Socialist Republics (USSR).

LHAAP-001-R: The site was identified in the U.S. Army Closed, Transferring, and Transferred (CTT) Range/Site Inventory as 6.75 acres in size; however, a 1981 aerial photograph, historical records, a site visit, and a teleconference on 17 May and 18 May 2005 between U.S. Army Corps of Engineers (USACE) and U.S. Army Environmental Center indicated the site should be 79 acres including Demolition Sub Areas 1, 2 and 3.

The LHAAP-001-R site was constructed in 1954 and used by Universal Match Corporation for testing M120A1 photoflash bombs produced at the facility until about 1956. The bombs were tested by exploding them in the air over an elevated, semi-elliptical earthen test pad. Bombs awaiting testing were stored in three earth-covered concrete bunkers. The bombs tested were 150-pound M120/M120A photoflash bombs filled with photoflash powder and containing a black powder booster charge for bursting the bomb and a timed nose fuze.

During the late 1950s, illuminating signal devices were also demilitarized within pits excavated in the vicinity of the test pad at the site. During the early 1960s, leaking production items such as XM40E5 "button bombs" may have been demilitarized by detonation in the South Test Area/Bomb Test Area (LHAAP-001-R) or the Ground Signal Test Area (LHAAP-003-R). The XM40E5 is a small (approximately 1- by 1.25-inch) anti-intrusion mine also referred to as a "Gravel" Mine, which explodes on impact. It is believed that leaking WP munitions were disposed of in this area although no primary source documentation concerning this effort was located. Occasional leaking WP munitions were burned at the site as a demilitarization activity. Other sources indicate that possibly 3- to 4-pound canisters of WP were demilitarized in the vicinity of the test pad. The 1984 LHAAP Contamination Survey (Environmental Protection Systems, Inc. [EPS], 1984) stated the area has been relatively inactive since the early 1960s and no disposal or testing activities were carried out in this area.

LHAAP-003-R: The site was used intermittently starting in April 1963 for aerial and on-ground testing and destruction of a variety of devices, including pyrotechnic signal devices, red phosphorus smoke wedges, infrared flares, illuminating 60 and 81 mm mortar shells, illuminating 40 to 155 mm cartridges, button bombs, and various types of explosive simulators. The site was also used intermittently over a 20-year period for testing and burn-out of rocket motors from Nike-Hercules, Pershing, and Sergeant missiles systems. Around 1970, a Sergeant rocket motor reportedly exploded in an excavated pit near the center of the site. Debris was reportedly placed in the resulting crater and backfilled. However, later MEC clearance to depth in the area found no rocket motor. From late 1988 through 1991, the site was also used for burn-out of rocket motors in Pershing missiles destroyed in accordance with the Intermediate-Range Nuclear Forces Treaty between the United States and the former USSR. Occasionally, leaking WP munitions were burned at the site as a demilitarization activity.

2.2.2 Enforcement Activities

Due to the release of hazardous substances, pollutants, and contaminants from operation and maintenance activities at the facility, the USEPA placed LHAAP on the NPL on August 9, 1990.

Activities to remediate contamination associated with the listing of LHAAP as an NPL site began in 1990. After the listing on the NPL, the U.S. Army, the USEPA, and the Texas Water Commission (currently known as the TCEQ) entered into a CERCLA Section 120 FFA for remedial activities at LHAAP. The FFA became effective December 30, 1991.

2.3 Community Participation

The U.S. Army, USEPA, TCEQ and the Restoration Advisory Board (RAB) have provided public outreach to the surrounding community concerning LHAAP-001-R and LHAAP-003-R, and other environmental sites at LHAAP. The outreach program has included fact sheets, media interviews, site visits, invitations to attend quarterly RAB meetings, and public meetings consistent with its public participation responsibilities under Sections 113 (k)(2)(B), 117(a), and 121(f)(1)(G) of CERCLA.

The Proposed Plan (U.S. Army, 2011) for the LUCs and limited groundwater monitoring for perchlorate for both LHAAP-001-R and LHAAP-003-R was released to the Administrative Record file and made available to the public for review and comment on July 13, 2011. A notice of availability of the Proposed Plan and other related documents in the Administrative Record file was published in the *Marshall News Messenger* on June 29, 2011. A 30-day public comment period for the Proposed Plan began on July 13, 2011. The public meeting was held on July 21, 2011. Written comments were received from the general public.

The Administrative Record may be found at the information repositories maintained at the following locations:

Public Library

Location: Marshall Public Library
300 S. Alamo
Marshall, Texas 75670

Business Hours: Monday – Thursday 10:00 a.m. – 8:00 p.m.
Friday – Saturday 10:00 a.m. – 5:00 p.m.

Longhorn Army Ammunition Plant

Location: U.S. Army Office Trailer
Longhorn Army Ammunition Plant
Karnack, Texas 75670

2.4 Scope and Role of Operable Unit or Response Action

The land on which these sites are located is excess to the U.S. Army's needs and is intended for transfer to the USFWS for incorporation into the Caddo Lake National Wildlife Refuge. Future anticipated use is consistent with an industrial/recreational level of exposure. These two sites can be addressed independent of response actions at other environmental sites at LHAAP.

2.5 Site Characteristics

This section of the ROD presents an overview of LHAAP-001-R and LHAAP-003-R site characteristics with respect to physical site features, known or suspected sources of contamination, types of contamination, and affected media. Known or potential routes of contaminant migration are also discussed.

2.5.1 Physical Characteristics

2.5.1.1 LHAAP-001-R

LHAAP-001-R is located near the southern boundary of LHAAP (**Figure 2-2**). The surface features at LHAAP-001-R include a deteriorated asphalt and gravel road running from the entrance to the test pad. Concrete bunkers and the site of the demolished former observation building are located alongside the road about halfway between the entrance and the test pad. A circular, 50-foot (ft) wide fire lane with a 2,000-ft diameter is centered at the test pad. Since the observation building has been demolished, the site is currently overgrown with brush and small trees. Formerly cleared areas in the vicinity of the test pad and alongside the access road are also overgrown with vegetation.

Soil at the site consists of interbedded silty and clayey sands, sandy silts, and clays of the Wilcox Group. The topography slopes gently to the east and surface water runoff from the hillside flows generally to the southeast and into Harrison Bayou. Groundwater at the site was encountered between 7 and 9 ft below ground surface (bgs). Groundwater is topographically controlled with a general flow direction to the east toward the floodplain of Harrison Bayou.

2.5.1.2 LHAAP-003-R

LHAAP-003-R is located in the southeastern portion of LHAAP (**Figure 2-2**). Surface features at LHAAP-003-R include an asphalt road (Haystack Road) that intersects Long Point Road just east of its intersection with Avenue Q. The site is currently undeveloped and has become overgrown with woody vegetation.

The site is located within the watersheds of Saunders Branch and Harrison Bayou. Both Saunders Branch and Harrison Bayou flow into Caddo Lake. Surface water runoff from the site is towards drainage ditches located alongside the circular dirt road forming the outer margin of the site. The ditches converge to the northeast and the southwest directing surface water to Saunders Branch and Harrison Bayou, respectively.

Soil at the site consists of interbedded silty and clayey sands, sandy silts, and clays of the Wilcox Group. The depth to groundwater at the site averages about 15 feet bgs with some seasonal fluctuations. The regional groundwater flow direction is to the north-northeast toward Caddo Lake; however, during periods of high precipitation the groundwater flow direction in the southwestern portion of the site diverts to the northwest towards Harrison Bayou.

2.5.2 Nature and Extent of Contamination

MMRP sites LHAAP-001-R and LHAAP-003-R are co-located with the IRP sites LHAAP-27 and LHAAP-54, respectively. Between 1982 and 1996, several investigations were conducted in a phased approach to determine the nature and extent of contamination at LHAAP-27 and LHAAP-54. Media investigated included soil, groundwater, surface water, and sediment. Based on the results of the investigations and the risk assessment conducted for the sites, an IRP no further action (NFA) ROD under CERCLA for Hazardous, Toxic, and Radioactive Waste was signed with regulatory concurrence in January of 1998 for LHAAP-27 and LHAAP-54 (USACE, 1998).

From 2002 to 2007, investigations related to the MMRP were conducted at LHAAP. As a result of the records review for the U.S. Army CTT Range/Site Inventory in 2002, the South Test Area/Bomb Test Area and Ground Signal Area were designated LHAAP-001-R and LHAAP-003-R, respectively (e^{2}M, 2002). For these two MRS, investigations were conducted to determine the presence or absence of MEC, and to address the identified data gaps including WP and perchlorate.

2.5.2.1 LHAAP-001-R

Perchlorate was identified as an emerging contaminant and perchlorate data for environmental media was collected after the 1998 NFA ROD was signed. In May and October 2000, a total of 26 soil samples were collected from 13 soil borings (27SB01 through 27SB13) and analyzed for perchlorate (Solutions to Environmental Problems [STEP], 2005). Two samples were collected from each boring from two depth intervals; 0 to 0.5 ft and 1 to 2 ft bgs. Perchlorate was detected in only one (27SB01 at depth of 0 to 0.5 ft) of the 26 soil samples at a concentration of 28.9 micrograms per kilogram (µg/kg), a level lower than the MSC for industrial use based on groundwater protection (GWP-Ind) value of 7,200 µg/kg.

During three consecutive quarterly sampling events, groundwater samples were collected from six existing shallow monitoring wells to determine whether perchlorate was present in the underlying groundwater as a result of past historical activities. The six monitoring wells are located in areas with the highest potential for impact from site activities and in the direction of flow across the site from west to east toward Harrison Bayou. During the first quarter (April to May 2000), four groundwater samples were collected from four existing monitoring wells (MW-131, MW-132, 27WW01, 27WW04). Perchlorate was detected in two of the wells, 27WW01 and 27WW04, at concentrations of 52.6 and 16.4 µg/L, respectively. Both levels were below the groundwater MSC for industrial use (GW-Ind) value of 72 µg/L. No maximum contaminant level (MCL) exists for perchlorate. Perchlorate concentrations were below detection limits in all the six monitoring wells (MW-131, MW-132, 27WW01 through 27WW04) sampled during the second quarter (August through October 2000). During the third quarter, January through February 2001, perchlorate was not detected in the groundwater samples collected from three sampled wells, MW-131, 27WW01, and 27WW04. Two of the six wells at LHAAP-001-R were not sampled during two of the three sampling events.

In October 2009, USEPA collected additional groundwater samples from the existing six monitoring wells to confirm groundwater conditions at the site. Perchlorate was detected in three wells with only one of the three above the GW-Ind value of 72 μg/L at a concentration of 76 μg/L. The USEPA's perchlorate detection of 76 μg/L was an estimate from a diluted sample. The U.S. Army collected split samples at the same time that the USEPA collected samples from the six monitoring wells. Perchlorate was detected in two wells for the U.S. Army split samples, with a maximum concentration below the GW-Ind value of 72 μg/L (Shaw, 2011).

In March 2003, USFWS conducted an investigation at the former LHAAP facility to determine contaminant levels in soil and sediment (USFWS, 2003). Soil samples were collected from five locations (FWS-055, -056, -058, -063, and -201) within LHAAP-001-R. Soil analytical results indicated that metals and semivolatile organic compounds were detected at low concentrations, but not above screening levels, and the site was not included as one of the areas requiring further evaluation. Perchlorate was not detected above the reporting limit.

Between 2002 and 2004, a MMRP SI was conducted for LHAAP-001-R to determine the presence or absence of MEC and/or MC at the site which may have remained from activities conducted by the DoD during operations of the MRS, and may pose a threat to human health and/or the environment (e^2M, 2005).

Results of the historical records review (HRR) and a visual site inspection verified MEC presence at the site. Possible sources areas for MEC and MC identified during the SI included the following:

- Testing areas associated with the various suspected ordnance types.
- A Demolition Area located within the footprint of LHAAP-001-R. This area was reportedly designed for detonation of dangerous/unserviceable ammunition.
- Spent flares, a 155 mm WP projectile, shrapnel from photoflash bombs, and ordnance related scrap found on the site.

The SI identified a data gap in earlier soil sampling, in that, although demilitarization activities including open pit burning and explosive detonation were conducted at the site, no analysis for the munitions constituent WP was performed at the site. The SI recommended that further investigation be conducted to address the identified data gap.

In 2007, an EE/CA was conducted to facilitate completion of a non-time-critical removal action of MEC at the site (CAPE, 2007). Field activities conducted during the EE/CA characterized MEC and addressed the WP data gap at the site. Twenty-one (21) MEC and MPPEH items along with 700 pounds of munitions debris (MD) were recovered at the surface or within the top 6 inches of the soil. The items were clustered within an area suspected of the use of OB/OD activities, although never permitted as an OB/OD unit. The suspected OB/OD area is approximately 14 acres in size.

Based on the heaviest MPPEH concentrations or historical detonations, soil samples were collected within LHAAP-001-R to determine if evidence of WP existed in areas where MC was most likely to exist. One soil sample (BTA-27-LHAAP-001-RS-01A) was collected near the center of the suspected OB/OD area. A second soil sample (BTA-27-LHAAP-001-RS-01B) was collected in a scarred area identified as the photo flash cartridge disposal area in the historical review. Both areas are near locations where MPPEH items were recovered during the field investigations. In addition, pre- and post-detonation samples were collected in association with explosive demolition of MPPEH recovered during the field activities. Soil samples were collected from 0 to 6-inches bgs. Analytical results indicated that neither WP nor explosives (1,3,5-trinitrobenzene, 1,3-dinitrobenzene, 2,4,6-TNT, 2,4-dinitrotoluene (DNT), 2,6-DNT, 2-amino-4,6-DNT, 2-nitrotoluene, 3-nitrotoluene, 4-amino-2,6-DNT, 4-nitrotoluene, HMX, nitrobenzene, RDX, and tetryl) were identified at concentrations above detection limits in any soil samples at the site. In addition, there was no indication of the presence of explosives in any of the pre- or post-detonation samples. The removal action objective of protection of human health from WP and explosives at unacceptable concentrations had been achieved as demonstrated by the soil analytical results. All site sample locations are shown on **Figure 2-3**.

The EE/CA recommended surface and subsurface removal of MEC items with LUCs to reduce the risk within LHAAP-001-R. Between August and November 2008, a MEC non-time-critical removal action was conducted and LUCs were developed for the site (EODT, 2009). Surface clearance of the entire site and subsurface clearance to the depth of detection was performed at LHAAP-001-R. Magnetometer-assisted surface clearance was performed for the entire site of approximately 79 acres. Site preparations included brush removal. The clearance team worked in grids and established 5-ft sweep lanes within each grid, removing and disposing of all surface MEC and MPPEH, MD, cultural debris (CD), and range-related debris. A total of 90 MEC/MPPEH items were located and destroyed, and a total of 6,742 pounds of MD and 154 pounds of CD were removed during the course of surface clearance.

Subsurface MEC removal was conducted for the suspected OB/OD area of approximately 14 acres within LHAAP-001-R. Magnetometers were utilized to detect surface and subsurface anomalies. Each detected anomaly was excavated until the item was located, identified, and a magnetic signature was no longer detected at the location. All MEC/MPPEH encountered were explosively destroyed to verify that no residual explosive hazard existed. A total of 294 MEC/MPPEH items and 14 inert items were located, excavated, and removed and a total of 15,397 pounds of MD and 1,722 pounds of CD were removed during the course of subsurface clearance. All MEC items were destroyed using the "blow-in-place" (BIP) method following approved demolition procedures. All debris was consolidated and relocated to the site lay down area. The debris was stored in approved containers, inspected, verified and certified as free of explosives, and shipped off site for final disposition. Locations for the surface and subsurface clearance are shown on **Figure 2-4**.

LUCs were designed and constructed for the site consistent with recommendations of the EE/CA and AM that included:

Restriction against intrusive activities. TAC § 335.569, Appendix III requires that the restriction be recorded in the Harrison County Clerk's Office, with the survey, map, and LUC language.

Signage at the perimeter of LHAAP-001-R. Signs were installed at the perimeter of the site, serving as the physical demarcation of the controlled areas. The signs have visibility from one sign to the next with a maximum spacing of 100 ft. The signs include warning of the potential presence of MEC and state the restriction against intrusive activities.

Education program for future refuge visitors, staff, and volunteers. The program includes informational pamphlets and safety video warning of the potential presence of MEC and presenting examples of MEC that were or may be found at the site.

2.5.2.2 LHAAP-003-R

Perchlorate was identified as an emerging contaminant, and perchlorate data for environmental media was collected after the 1998 NFA ROD was signed. Between May 2000 and February 2001, during three consecutive quarterly sampling events, groundwater samples were collected from three existing shallow monitoring wells to determine whether perchlorate contamination had occurred in the underlying groundwater as a result of past historical activities (STEP, 2005). The wells are located adjacent to the three surface water features that drain the entire LHAAP-003-R site. Because the shallow groundwater flow pattern is heavily influenced by surface flow in this area, the wells represent groundwater from the entire site. During the first quarter (April and May 2000), perchlorate was detected at concentrations of 26.8, 20.4, and 22.7 µg/L, in groundwater samples collected from monitoring wells MW-127, MW-128, and 18WW16, respectively. The detections were below the GW-Ind value of 72 µg/L. No MCL exists for perchlorate. Perchlorate concentrations were below detection limits in the three monitoring wells during the second quarter (August through October 2000). During the third quarter, January through February 2001, perchlorate was detected in only one groundwater sample collected from well 18WW16 at a concentration of 8 µg/L, well below the GW-Ind of 72 µg/L. No perchlorate was detected in the water samples from wells MW-127 and MW-128. Three of the seven wells at LHAAP-003-R were not sampled during two of the three sampling events. Groundwater samples were also collected from Geoprobe points (GPSAS54-01, -02, and -03) installed in June 2001. Perchlorate was below detection limits in all three grab samples.

In October 2009, USEPA collected additional groundwater samples from the existing four monitoring wells to confirm groundwater conditions at the site. Perchlorate was detected in only one well at a concentration that was well below the GW-Ind value of 72 µg/L. The U.S. Army collected split samples at the same time that the USEPA collected samples from the four monitoring wells. Perchlorate was detected in one well for the U.S. Army split samples at a concentration well below the GW-Ind value of 72 µg/L.

In March 2003, USFWS conducted an investigation at the former LHAAP facility to determine contaminant levels in soil and sediment (USFWS, 2003). Soil samples were collected from two locations (FWS-095 and FWS-223) within LHAAP-003-R. These two locations are along the surface drainage that flows toward Saunders Branch on the east side of the site. Soil analytical results indicated that metals were detected at low concentrations confirming previous findings. Perchlorate was not detected.

Between 2002 and 2004, a MMRP SI was conducted for LHAAP-003-R to determine the presence or absence of MEC and/or MC at the site which may have remained from activities conducted by the DoD during operations of the MRS. The SI verified MEC presence at the site (e^2M, 2005).

Results of the HRR and a visual site inspection verified MEC presence at the site. Possible source areas for MEC and MC identified during the SI included: testing areas associated with the various suspected ordnance types; a confirmed mortar impact area on site with numerous unidentified ordnance item shapes on the surface and outside the mortar berm; a site reportedly used for the testing and burnout of Pershing and Sergeant rocket motors; and areas associated with past demilitarization activities. In addition, a Sergeant rocket motor reportedly exploded at the site around 1970 and debris was reportedly placed in the resulting crater and backfilled. It was also reported that occasionally WP munitions were burned at the site. It appears that most of the items tested at this location were statically fired and observed for adequate illumination and burn time and not launched by a weapons system.

The SI identified a data gap in earlier soil sampling, in that, although demilitarization activities were conducted at the site and occasionally demolition and burning of WP munitions were performed, no analysis for the munitions constituent WP was performed at the site. The SI recommended that further investigation be conducted to address the identified data gap.

In 2007, an EE/CA was conducted to facilitate completion of a non-time-critical removal action of MEC at the site (CAPE, 2007). Field activities conducted during the EE/CA characterized

MEC and addressed the WP data gap at the site. Fourteen (14) MEC and MPPEH items along with 513 pounds of MD were recovered at the surface or within the top 6 inches of the soil. The items were clustered within the former Mortar Test Area. Based on the heaviest MPPEH concentrations or historical detonations, soil samples were collected within LHAAP-003-R to determine if evidence of WP existed in areas where MC was most likely to exist. One soil sample (BTA-54-LHAAP-001-RS-01A) was collected within the area identified as the mortar firing range. A second soil sample (BTA-54-LHAAP-001-RS-01B) was collected in a scarred area identified as the Rocket Motor Area in the historical review. In addition, pre- and post-detonation samples were collected in association with explosive demolition of MPPEH recovered during the field activities. Soil samples were collected from 0 to 6-inches bgs. Analytical results indicated that no WP or explosives (1,3,5-trinitrobenzene, 1,3-dinitrobenzene, 2,4,6-TNT, 2,4-DNT, 2,6-DNT, 2-amino-4,6-DNT, 2-nitrotoluene, 3-nitrotoluene, 4-amino-2,6-DNT, 4-nitrotoluene, HMX, nitrobenzene, RDX, and tetryl) were identified at concentrations above detection limits in any soil samples at the site. In addition, there was no indication of the presence of explosives in any of the pre- or post-detonation samples. The removal action objective of protection of human health from WP or explosives at unacceptable concentrations had been achieved as demonstrated by the soil analytical results. All site sample locations are shown on **Figure 2-5**.

The EE/CA recommended surface clearance of MEC items with LUCs to reduce the risk within LHAAP-003-R. Between August and November 2008, a MEC removal action was conducted and LUCs were developed for the site (EODT, 2009). Magnetometer-assisted surface clearance was performed at LHAAP-003-R for the entire site of approximately 80 acres. Site preparations included brush removal. The clearance team worked in grids and established 5-ft sweep lanes within each grid, removing and disposing of all surface MEC and MPPEH, MD, CD, and range-related debris. Twelve MEC/MPPEH items and one inert item were located and destroyed and 6,880 pounds of MD and 5,981 pounds of CD were removed during the course of surface clearance. All MEC items were destroyed using the BIP method following approved demolition procedures. All debris was consolidated and relocated to the site lay down area. The debris was stored in approved containers, inspected, verified and certified as free of explosives, and shipped off site for final disposition. Locations for the surface clearance are shown on **Figure 2-6**.

LUCs were designed and constructed for the site consistent with recommendations of the EE/CA and AM that included:

Restriction against intrusive activities. TAC § 335.569, Appendix III requires that the restriction be recorded in the Harrison County Clerk's Office, with the survey, map, and LUC language.

Signage at the perimeter of LHAAP-003-R. Signs were installed at the perimeter of the site, serving as the physical demarcation of the controlled areas. The signs have visibility from one sign to the next with a maximum spacing of 100 ft. The signs include warning of the potential presence of MEC and state the restriction against intrusive activities.

Education program for future refuge visitors, staff, and volunteers. The program includes informational pamphlets and safety video warning of the potential presence of MEC and presenting examples of MEC that were or may be found at the site.

2.6 Current and Potential Future Site and Resource Uses

2.6.1 Current and Future Land Uses

LHAAP is located near the unincorporated community of Karnack, Texas. Karnack is a rural community with a population of 775 people. The incorporated community of Uncertain, Texas, population 205, is located to the northeast of LHAAP on the edge of Caddo Lake and is a resort area and an access point to Caddo Lake. The industries in the surrounding area consist of agriculture, timber, oil and natural gas production, and recreation.

LHAAP has been an industrial facility since 1942. Production activities and associated waste management activities continued until the facility was determined to be in excess of the U.S. Army's needs in 1997. The plant area has been relatively dormant since that time. LHAAP is surrounded by a fence (except on the border with Caddo Lake), and current security measures at the LHAAP preclude unlimited public access to areas within the fence. The fence now represents the Refuge boundary.

The reasonably anticipated future use of LHAAP-001-R and LHAAP-003-R is as a national wildlife refuge. This anticipated future use is based on a Memorandum of Agreement (MOA) (U.S. Army, 2004) between the USFWS and the U.S. Army. That MOA documents the transfer process of the LHAAP acreage to USFWS to become the Caddo Lake National Wildlife Refuge and will be used to facilitate transfer of LHAAP-001-R and LHAAP-003-R. Presently the Caddo Lake National Wildlife Refuge occupies approximately 7,000 acres of the 8,416-acre former installation. A change in use from wildlife refuge requires an act of Congress or the land is part of an exchange authorized by the Secretary of the Interior.

2.6.2 Current and Future Surface Water Uses

Streams on LHAAP currently support wildlife and aquatic life. While humans may have limited access to some streams during annual hunts, there is no routine human use of streams on LHAAP. The streams do not carry adequate numbers and size of fish to support either sport or subsistence fishing. During the summer months, the streams cease flowing and/or dry up. The streams flow into Caddo Lake. Caddo Lake is a large recreational area that covers 51 square miles and has a mean depth of 6 ft. The watershed of the lake encompasses approximately 2,700 square miles. It is used extensively for fishing and boating. Caddo Lake is a drinking water supply for multiple cities in Louisiana, including Vivian, Oil City, Mooringsport, South Shore, Blanchard, Shreveport, and Bossier City.

The anticipated future uses of the streams and lake are the same as the current uses.

2.6.3 Current and Future Groundwater Uses

Groundwater in the deep aquifer (250-430 ft bgs) near LHAAP is currently used as a drinking water source. The drinking water aquifer should not be confused with the deep zone groundwater, which extends only to a depth of approximately 151 feet bgs. The deep zone groundwater and the drinking water aquifer are distinct from each other and there is no connectivity between the deep zone groundwater and the drinking water aquifer. There are currently five active water supply wells near LHAAP that are completed in the drinking water aquifer. One well is located in and owned by Caddo Lake State Park. The well is completed to a depth of 315 ft bgs and has been in use since 1935. A second well owned by the Karnack Water Supply Corporation services the town of Karnack and is located approximately 2 miles southeast of town. This well is completed to approximately 430 ft bgs and has been in use since 1942. The Caddo Lake Water Supply Corporation has three wells located both north and northwest of LHAAP. These wells are identified as Caddo Lake Water Supply Corporation Wells 1, 2, and 3 and are all hydraulically upgradient of LHAAP. Because of the large distance between these wells and LHAAP, water removal from these wells is not expected to affect groundwater flow at the site. In addition, there are several livestock and domestic wells located in the vicinity of LHAAP with depths averaging approximately 250 ft bgs.

Three water supply wells are located within the boundary of LHAAP itself. One well is located at the Fire Station/Security Office approximately 2.3 miles north-northwest of LHAAP-001-R and 2.39 miles northwest of LHAAP-003-R. The second well is located approximately 0.35 miles southwest of the Fire Station/Security Office and 2.19 miles north-northwest of LHAAP-001-R and 2.39 miles northwest of LHAAP-003-R. The third well is located north of the administration building, near the entrance to LHAAP approximately 2.16 miles west-northwest of LHAAP-001 and 2.73 miles west-northwest of LHAAP-003-R. Two additional wells previously supplied water to the installation, but these have been plugged and abandoned. Although all three provide water at the tap, none are used for drinking water. None of the water supply wells is associated with the two sites addressed by this ROD Document.

Based on the anticipated future use of the facility (i.e., a wildlife refuge), the groundwater at the two sites will not be used in the future as a drinking water source. However, to be conservative, it is assumed that future use is industrial. The future industrial scenario for LHAAP conservatively assumes limited use of groundwater as a drinking water source. No WP or explosives were identified at detectable concentrations in any soil samples collected from LHAAP-001-R and LHAAP-003-R. Perchlorate was detected in only one soil sample at a concentration that was well below the GWP-Ind value at LHAAP-001-R. The soils at the two sites are not potential sources of contribution of perchlorate, WP, or explosives into the underlying groundwater. All perchlorate detections in groundwater at LHAAP-001-R were below the GW-Ind value except for one detection by USEPA in 2009 at a concentration of 76 µg/L, slightly above the risk-based GW-Ind of 72 µg/L in one well. The result was an estimate from a diluted sample. The U.S. Army's split sample for the same well indicated that perchlorate was detected at a concentration of 50 µg/L, below the GW-Ind. The U.S. Army result is consistent with previous detected levels for the site. Therefore, no evaluation of groundwater against the criterion set forth for human ingestion in an industrial land use scenario was performed.

2.7 Summary of Site Risks

This section contains the results of the risk evaluation for LHAAP-001-R and LHAAP-003-R addressing WP and explosives and MEC risk to human health and safety.

2.7.1 Summary of Site Risk for LHAAP-001-R

2.7.1.1 MEC Risk to Human Safety

The risk evaluation for LHAAP-001-R addressed risks to human safety related to the potential presence of MEC.

The risk factors associated with MEC items were categorized in three classes: MEC factors, site characteristics factors, and human factors. MEC factors are related to the type of MEC, the sensitivity, the quantity (density), and the depth. Site characteristic factors include the accessibility and stability of areas where MEC items are located. Human factors are related to the population density and population activities.

During the EE/CA field activities, twenty one (21) MPPEH items along with 700 pounds of MD were recovered at LHAAP-001-R, with most of the items clustered in the suspected OB/OD area. The types of ordnance items found were pyrotechnic or illumination in nature; no high explosives or fuzed items were identified. All items were at the surface or within the top 6 inches of soil. Accordingly, the MEC density, ordnance-type hazard, and sensitivity factors were all assigned a value of 1. The site stability was rated stable, with the rating for contact level risk associated with future human activities as significant. Because the reasonably anticipated future land use is incorporation into the existing wildlife refuge and the significant refuge activities, the probable future population density at the site is low. Taking all risk factors into consideration, the risk assessment indicated moderate MEC risk to human safety for LHAAP-001-R.

Through the surface removal action MEC items were located and removed over the entire surface area, thereby reducing the risk to the future land user. The subsurface removal action located, excavated, and removed MEC or MPPEH items to a depth consistent with the expected future land use and the significant refuge activities, all of which are non-intrusive. The subsurface removal provided an effective solution for reducing risk of exposure by reducing the potential for any direct contact with MEC or MPPEH.

However, because there is a reasonable potential that some MEC remained after the removal action there is a potential risk to the public. Consistent with the recommendations of the EE/CA and the AM (U.S. Army, 2007), LUCs were identified to promote ongoing protection of human safety against potential explosive hazards that may have remained at the site.

2.7.1.2 MC Risk to Human Health

The MC risk to human health at LHAAP-001-R refers to the risk to human health from exposure to WP and explosives in soil and groundwater. The risk evaluation is based on the reasonably anticipated future use as a national wildlife refuge and does not address unrestricted use.

During the EE/CA investigation activities, no WP or explosives were identified at detectable concentrations in any soil samples collected and there was no indication of the presence of explosives in any pre- or post-detonation samples. There is not a complete pathway for WP or explosives. Therefore, there is no risk associated with WP or explosives.

Additional sampling conducted by the USEPA in 2009 resulted in a detection of perchlorate at a concentration of 76 µg/L, slightly above the risk-based GW-Ind of 72 µg/L in one well. The result was an estimate from a diluted sample. The U.S. Army's split sample for the same well indicated that perchlorate was detected at a concentration of 50 µg/L, below the GW-Ind. The U.S. Army result is consistent with previous detected levels for the site and, therefore, there was no need to evaluate risk associated with perchlorate because there was no exceedance of the GW-Ind.

2.7.1.3 Ecological Risk

The ecological risk for LHAAP-001-R was addressed in the installation-wide BERA (Shaw, 2007). For the BERA, the entire installation was divided into three large sub-areas (i.e., the Industrial Sub-Area, Waste Sub-Area, and Low Impact Sub-Area) for the terrestrial evaluation. The individual sites at LHAAP were grouped into one of these sub-areas, which were delineated based on commonalities of historic use, habitat type, and spatial proximity to each other. Conclusions for individual sites and the potential for detected chemicals to adversely affect the environment were made in the context of the overall conclusions of the sub-area in which the site falls. Site LHAAP-001-R lies within the Low Impact Sub-Area, and the BERA concluded that no unacceptable risk was present in the Low Impact Sub-Area (Shaw, 2007).

Summary results from the BERA indicated that perchlorate was not selected as a final constituent of potential ecological concern because all estimated receptor ecological effects quotient were less than 1 and there was no evidence of a perchlorate source area. In addition, during the EE/CA, no WP or explosives were identified in any soil samples and there was no indication of the presence of explosives in any pre- or post-detonation samples confirming the determination of no risk to the environment for LHAAP-001-R.

2.7.2 Summary of Site Risk for LHAAP-003-R

2.7.2.1 MEC Risk to Human Safety

The risk factors associated with MEC items were categorized into three classes: MEC factors, site characteristics factors, and human factors. MEC factors are related to the type of MEC, the sensitivity, the quantity (density), and the depth. Site characteristic factors include the accessibility and stability of areas where MEC items are located. Human factors are related to the population density and population activities.

During the EE/CA field activities, fourteen (14) MPPEH items along with 513 pounds of MD were recovered at LHAAP-003-R with most items clustered in the former Mortar Test Area. The types of ordnance items found were pyrotechnic or illumination in nature except the miscellaneous fuzes. All fuzes were inspected and were determined to have functioned as designed. All items were at the surface or within the top 6 inches of soil. Accordingly, the MEC density, ordnance-type hazard, and sensitivity factors were all assigned a value of 1. The site stability was rated stable, with the rating for contact level risk associated with future human activities as significant. Because the reasonably anticipated future land use is incorporation into the existing wildlife refuge and the significant refuge activities (all of which are non-intrusive), the probable future population density at the site is low. Taking all risk factors into consideration, the risk assessment indicated low MEC risk to human safety for LHAAP-003-R.

Through the surface removal action MEC items were located and removed over the entire site thereby reducing the risk to the future land user.

However, because there is a reasonable potential that some MEC remained after the removal action there is a potential risk to the public. Consistent with the recommendations of the EE/CA and the AM (U.S. Army, 2007), LUCs were identified for the site to promote ongoing protection of human safety against potential explosive hazards that may have remained at the site.

2.7.2.2 MC Risk to Human Health

The MC risk to human health at LHAAP-003-R refers to the risk to human health from exposure to WP and explosives in soil and groundwater. The risk evaluation is based on the reasonably anticipated future use as a national wildlife refuge and does not address unrestricted use.

During the EE/CA investigation activities, no WP or explosives were identified at detectable concentrations in any soil samples collected and there was no indication of the presence of explosives in any pre- or post-detonation samples. There is not a complete pathway for WP or explosives. Therefore, there is no risk associated with WP or explosives.

The additional groundwater sampling conducted by the USEPA and U.S. Army in 2009 indicated that perchlorate was detected in one well at a concentration well below the GW-Ind, and therefore there was no need to evaluate risk associated with perchlorate.

2.7.2.3 Ecological Risk

The ecological risk for LHAAP-003-R was addressed in the installation-wide BERA (Shaw, 2007). For the BERA, the entire installation was divided into three large sub-areas (i.e., the Industrial Sub-Area, Waste Sub-Area, and Low Impact Sub-Area) for the terrestrial evaluation. The individual sites at LHAAP were grouped into one of these sub-areas, which were delineated based on commonalities of historic use, habitat type, and spatial proximity to each other. Conclusions for individual sites and the potential for detected chemicals to adversely affect the environment were made in the context of the overall conclusions of the sub-area in which the site falls. Site LHAAP-003-R lies within the Low Impact Sub-Area, and the BERA concluded that no unacceptable risk was present in the Low Impact Sub-Area (Shaw, 2007).

In addition, during the EE/CA, no WP or explosives were identified in any soil samples and there was no indication of the presence of explosives in any pre- or post-detonation samples confirming the determination of no risk to the environment for LHAAP-003-R.

2.8 Remedial Action Objectives

The remedial action objective for LHAAP-001-R and LHAAP-003-R is protection of human health and safety from explosive hazards that may have remained at the sites after the MEC removal action and confirmation that perchlorate is present in groundwater at levels below the chemical specific criterion.

2.9 Description of Alternatives

Two alternatives (including No Action) have been evaluated. This section introduces the remedy components, identifies the common elements and distinguishing features of each alternative, and describes the expected outcomes of each.

2.9.1 Description of Remedy Components

Alternative 1 – No Action

The no action alternative provides a comparative baseline against which the other risk-reduction alternatives can be evaluated. No alternative technology is associated with this alternative and no risk-reduction measures resulting in the treatment, containment, removal of, or limited exposure to MEC would take place. No actions would be implemented to reduce existing or potential future exposure to human receptors. Limited sampling of groundwater would not be conducted.

The no action alternative is appropriate for sites where no MEC has been found; where there is no documented evidence of MEC firing, burial, or impact areas; or where the nature and extent of exposure (e.g., small arms ammunition) poses minimal threat to those who may encounter MEC.

LHAAP-001-R and LHAAP-003

Estimated Capital Present Worth Cost: $0
Estimated O&M Present Worth Cost: $0
Cost Estimate Duration: $0
Estimated Present Worth Cost: $0

Alternative 2 – Land Use Controls and Limited Groundwater Monitoring

LUCs are MEC response actions intended to mitigate or reduce potential residual risk remaining after completion of munitions response actions. Selected LUCs may also be used to supplement removal actions. As a stand-alone response action, LUCs do not result in the removal of additional MEC. To the extent the controls are effective and are maintained, the threat to human safety is reduced. The level of protection is greater than that provided by Alternative 1 (No Action) because informing the public of dangers related to ordnance reduces the likelihood of accidental exposure to MEC that may remain after the 2008 removal action.

This alternative includes LUC objectives to prohibit the development and use of the property for residential housing, elementary and secondary schools, and child care facilities and playgrounds, and to prohibit intrusive activities such as digging or any other activity which could result in explosive safety risks. The LUC to prohibit residential land use will remain in place until it is demonstrated that the MEC no longer presents a threat to public safety. ~~the level of COCs (i.e., the MEC items and the perchlorate as described in Section 2.7 of the ROD) in groundwater, surface soil and subsurface soil are at levels that allow for unlimited use and unrestricted exposure and it is demonstrated that there is no substantial threat of an explosive hazard.~~ A LUC to prohibit intrusive subsurface activities, including digging, will remain in place until the current land holding agency or any subsequent transferee takes the actions necessary to protect workers and the public from explosives hazards associated with the proposed intrusive activities. For example, intrusive activities may be conducted provided the current land holding agency or any subsequent transferee retains support from UXO-qualified personnel as necessary.~~The LUC to prohibit intrusive activities will remain in place until it is demonstrated that the MEC andr other contaminants of concern no longer present a potential threat to public health.~~ ~~there is no substantial threat of an explosive hazard.~~

Comment [E3]: New language.

The details of the LUCs will be included in the Remedial Design.

To confirm that perchlorate in groundwater at LHAAP-001-R and LHAAP-003-R is present at levels that are below chemical-specific criterion applicable to the intended future use of the site, limited groundwater monitoring would be conducted. Three rounds of groundwater sampling at LHAAP-001-R and one round of groundwater sampling at LHAAP-003-R will be conducted and the results compared to the TCEQ GW-Ind value of 72 micrograms per liter (µg/L) for perchlorate.

LHAAP-001-R
Estimated Capital Present Worth Cost: $16,600
Estimated O&M Present Worth Cost: $97,300
Cost Estimate Duration: 30 years
Estimated Present Worth Cost: $113,900

LHAAP-003-R
Estimated Capital Present Worth Cost: $11,100
Estimated O&M Present Worth Cost: $71,100
Cost Estimate Duration: 30 years
Estimated Present Worth Cost: $82,200

2.9.2 Common Elements and Distinguishing Features of Each Alternative

Only Alternative 2, LUCs and Limited Groundwater Monitoring meets the RAO. LUCs would serve to prohibit the development and use of the property for residential housing, elementary and secondary schools, and child care facilities and playgrounds, and to prohibit intrusive activities such as digging or any other activity which could result in explosive safety risks. The LUC restricting land use to nonresidential will remain in place until it is demonstrated that the MEC no longer presents a threat to public safety.~~groundwater, surface soil and subsurface soil COCs (i.e., the MEC items and the perchlorate as described in Section 2.7 of the ROD) are at levels that allow for unlimited use and unrestricted exposure and it is demonstrated that there is no substantial threat of an explosive hazard.~~ A LUC to prohibit intrusive subsurface activities, including digging, will remain in place until the current land holding agency or any subsequent transferee takes the actions necessary to protect workers and the public from explosives hazards associated with the proposed intrusive activities.~~The LUC to prohibit intrusive activities will remain in place until it is demonstrated that the MEC and other contaminants of concern no longer present a potential threat to public health.~~ For example, intrusive activities may be conducted provided the current land holding agency or any subsequent transferee retains support from UXO-qualified personnel as necessary.

Comment [E4]: New language.

~~[illegible] of an explosive hazard.~~ - The details of the LUCs will be included in the Remedial Design. LUCs that were designed and constructed for the site consistent with recommendations of the EE/CA and AM include MEC warning signs spaced every 100 feet, information pamphlets and a MEC safety video to present MEC hazards and safety to the public and site workers.

The Army will implement, maintain, monitor, report on and enforce land use controls at Army-owned property. The Army shall perform those actions related to land use control activities described in this ROD and in the Remedial Design for the ROD. For portions of the Site subject to land use controls that are not owned by the Army, the Army will monitor and report on the implementation, maintenance, and enforcement of land use controls, and coordinate with federal, state, and local governments and owners and occupants of properties subject to land use controls. The Army will provide notice of the groundwater and soil contamination and any land use restrictions referenced in the ROD. The Army will send these notices to the federal, state and local governments involved at this site and the owners and occupants of the properties subject to those use restrictions and land use controls. The Army shall provide the initial notice within 90 days of ROD signature. The frequency of subsequent notifications will be described in the Remedial Design for the ROD. The Army remains responsible for ensuring that the remedy remains protective of human health and the environment. The Army will fulfill its responsibility and obligations under CERCLA and the NCP as it implements, maintains, and reviews the selected remedy.

Upon transfer of Army-owned property, the Army will provide written notice of the land use controls to the transferee of the groundwater and soil contamination and any land use restrictions referenced in the ROD. Within 15 days of transfer, the Army shall provide EPA and TCEQ with written notice of the division of implementation, maintenance, and enforcement responsibilities unless such information has already been provided in the LUC RD. The LUC RD will address the procedures to be used by the Army and the transferee to document compliance with the LUCs described in this ROD. In the event property is transferred out of Federal control, the land use controls relating to property and groundwater restrictions shall be recorded in the deed and shall be enforceable by the United States and the state of Texas.

Only Alternative 2 includes a provision for limited groundwater monitoring for perchlorate to confirm the levels are protective of human health.

2.10 Summary of Comparative Analysis of Response Alternatives

Nine criteria identified in the NCP §300.430(e)(9)(iii) are used to evaluate the different remediation alternatives individually and against each other in order to select a remedy for each MRS. This section profiles the relative performance of each alternative against the nine criteria, noting how it compares to the other options under consideration. The nine evaluation criteria are discussed below. **Table 2-1** summarizes the comparative analysis of the alternatives for LHAAP-001-R and LHAAP-003-R.

2.10.1 Overall Protection of Human Health and Safety

Overall protection of human health and the environment addresses whether each alternative provides adequate protection of human health and the environment and describes how risks posed through each exposure pathway are eliminated, reduced, or controlled through treatment, engineering controls, and/or institutional controls.

Overall protection of human safety measures how well each alternative reduces public exposure and interaction with MEC, the reduction in terms of possible injury or death to humans, and protection of the environment. The following factors are evaluated for this criterion:

- Net reduction in MEC
- Estimated quantity of residual MEC
- Expected depth of residual MEC
- Potential exposure pathway between humans and MEC for projected future land use
- Potential for an individual to interact with MEC if an exposure occurs.

Although a MEC removal action was conducted at LHAAP-001-R and LHAAP-003-R, some MEC may have remained. The No action alternative does not reduce MEC risk to potential onsite receptors. The LUCs of Alternative 2 are protective of human safety because they cut off the exposure pathway.

The limited groundwater monitoring for perchlorate that is part of Alternative 2 provides overall protection of human health by confirming that perchlorate in groundwater does not exceed the TCEQ GW-Ind, which is protective of the future intended user. The No Action alternative has no provision for limited groundwater monitoring. Alternative 2 meets the RAOs.

2.10.2 Compliance with ARARs

Section 121(d) of CERCLA and NCP §300.430(f)(1)(ii)(B) requires that remedial actions at CERCLA sites attain legally applicable or relevant and appropriate Federal and State requirements, standards, criteria, and limitations, which are collectively referred to as "ARARs", unless such ARARs are waived under CERCLA Section 121(d)(4).

Compliance with the ARARs criterion measures how well an alternative meets chemical-, action-, and location-specific ARARs (federal, state, and local). Chemical-specific ARARs exist for MEC sites and are related to the presence of MC and the protection of human health. The screening of MC and WP sampling data at LHAAP-001-R indicated they were not constituents of concern. However, because the level of perchlorate in groundwater requires confirmation that it is protective of human health, the TCEQ GW-Ind for perchlorate is appropriate and relevant.

Only Alternative 2 provides a means to confirm compliance with the chemical specific ARAR for perchlorate in groundwater.

An action specific ARAR, 30 TAC 335, is applicable to well abandonment. Only Alternative 2 would address this requirement.

No location-specific ARARs are identified for these two sites.

2.10.3 Long-Term Effectiveness and Permanence

Long-term effectiveness and permanence refers to expected residual risk and the ability of a remedy to maintain reliable protection of human health and the environment over time, once cleanup levels have been met. This criterion includes the consideration of residual risk that will remain onsite following remediation, and the adequacy and reliability of controls.

No action is the lowest ranked alternative for long-term effectiveness because it does not reduce the potential for exposure to any remaining MEC over the long term nor does it confirm that perchlorate in groundwater is not present at levels that may present a risk to human health. The LUCs of Alternative 2 can provide risk reduction over the long term by cutting off the exposure pathway. LUCs reduce risk associated with MEC hazards as long as they are effectively maintained.

2.10.4 Reduction of Toxicity, Mobility, or Volume through Treatment

Reduction of toxicity, mobility, or volume through treatment refers to the anticipated performance of the treatment technologies that may be included as part of a remedy.

Because the screening of MC and WP sampling data at LHAAP-001-R and LHAAP-003-R indicated they were not constituents of concern, treatment technology was not necessary. This includes perchlorate in groundwater, which only requires confirmation that it meets the TCEQ GW-Ind.

Alternatives 1 and 2 do not include treatment and would not result in reduction of toxicity, mobility, or volume reduction of MEC. The completed MEC removal action removed source material from the sites.

2.10.5 Short-Term Effectiveness

Short-term effectiveness criteria measures how well an alternative meets the exposure and interaction reduction objectives during its implementation and is characterized by:

- The ability of the alternative to reduce risk during implementation
- The potential for adverse effects on the environment during the implementation
- The time required to implement the alternative

- The potential for adverse effects on humans, including the community and personnel involved in implementation of the alternative.

Neither Alternative 1 nor Alternative 2 involve active remedial measures. No activities are associated with Alternative 1 and the activities associated with Alternative 2 are protective to the surrounding community from short-term risks.

Alternative 2 contains the LUCs as the remedy and would provide almost immediate protection through implementation of the LUC that prohibits intrusive activities. The LUCs and limited groundwater monitoring of Alternative 2 would provide short-term risk reduction by informing workers of hazards associated with MEC potentially at the site during groundwater monitoring activities and with the potential presence of perchlorate in groundwater at levels exceeding the TCEQ GW-Ind. There would be no exposure for workers repairing/maintaining signs which are located just outside the perimeters of LHAAP-001-R and LHAAP-003-R.

2.10.6 Implementability

Implementability is a measure of whether a MEC response action alternative can be physically and administratively implemented, maintained, and enforced. It is also a measure of the availability of the services and materials needed to implement the alternative. Another consideration for implementability is regulatory agency and community acceptance of a given alternative. For implementability, the response alternatives are ranked by technical and administrative feasibility, the availability of services and materials and the regulatory agency and community acceptance of the alternative.

The no action alternative is the easiest alternative to implement in terms of both technical and administrative feasibility. Under the no action alternative no services or materials are required.

The technology associated with implementing the LUCs alternative (i.e., sign maintenance) is reliable, readily accessible, and easily implemented. There should be no implementation safety concerns related to the MEC warning sign repair/maintenance at both sites, as this will occur outside the perimeter of the sites. Groundwater monitoring of the existing wells is easily implemented as no additional services or materials are required beyond sampling requirements and it is known to meet regulatory and community acceptance.

2.10.7 Cost

Cost estimates are used in the CERCLA process to eliminate those remedial alternatives that are significantly more expensive than competing alternatives without offering commensurate increases in performance or overall protection of human health or the environment. The cost estimates developed are preliminary estimates with an intended accuracy range of –30 to +50 percent.

The benefit of the investment in risk reduction is considered when ranking the alternatives. This involves evaluating the reduction in risk to the public versus the cost of implementing the alternative. There is no investment cost associated with no action, however, the no action alternative does not provide any MEC risk reduction at LHAAP-001-R and LHAAP-003-R or confirmation groundwater sampling. LUCs costs include maintenance costs for LUCs (e.g., replacing weathered signs), groundwater sampling and monitoring well abandonment, and five-year reviews. The LUCs provide the greatest reduction of risk.

2.10.8 State/Support Agency Acceptance

The USEPA and TCEQ have reviewed the Proposed Plan, which presented LUCs with limited groundwater monitoring as the preferred alternative. Comments received from the USEPA and TCEQ during the Proposed Plan development have been incorporated. Both agencies concur with the selected remedial action.

2.10.9 Community Acceptance

Community acceptance is an important consideration in the final evaluation of the selected remedy. One set of written public comments was received during the 30-day public comment period; there were no verbal comments from the July 21, 2011 public meeting. The topics of the comments included: monitoring metals in groundwater, detection limits for metals in soil and sediment, groundwater flow, adequacy of monitoring well coverage, and perchlorate standard in groundwater. The written comments received and their responses are presented in the Responsiveness Summary (**Section 3.0**).

2.11 Principal Threat Wastes

Between August and November 2008, a MEC removal action was conducted for LHAAP-001-R and LHAAP-003-R to remove potential explosive hazards and a potential source of munitions constituents. For LHAAP-001-R, surface removal was conducted for the entire site and subsurface removal for the suspected OB/OD area. For LHAAP-003-R, surface clearance was conducted for the entire site. In addition, screening of MC and WP sampling data indicated they were not constituents of concern at LHAAP-001-R and LHAAP-003-R, although a requirement to confirm that perchlorate in groundwater does not exceed the chemical specific ARAR was identified. There are currently no known principal threat wastes at these two MRS sites (LHAAP-001-R-01 MMRP and LHAAP-003-R-01 MMRP).

2.12 The Selected Remedy

2.12.1 Summary of Rationale for the Selected Remedy

Implementation of LUCs and limited groundwater monitoring for perchlorate in addition to the completed removal action is the selected remedy for LHAAP-001-R and LHAAP-003-R and is consistent with the intended future use of the site as a national wildlife refuge. The presence of

MEC items at LHAAP-001-R and LHAAP-003-R was confirmed during the EE/CA investigation, therefore, a MEC removal was implemented for the MRS sites. MEC items were located and removed during surface removals over the entire areas of LHAAP-001-R and LHAAP-003-R, and a subsurface removal to depth in the OB/OD area within LHAAP-001-R. Although the removal action provided an effective solution for reducing risk of exposure by reducing the potential for any direct contact with MEC, there is the potential that some MEC remains. Therefore, the sites are not suitable for unrestricted use. LUCs for both LHAAP-001-R and LHAAP-003-R promote ongoing protection of human safety against potential explosive hazards that may have remained at the sites and satisfy the RAO for the sites.

Environmental sampling results at LHAAP-001-R and LHAAP-003-R indicate that there is no risk to human health and safety from perchlorate or WP. Limited groundwater monitoring is intended to confirm perchlorate levels in groundwater are below the GW-Ind to verify protection of human health and the environment.

The selected alternative offers a high degree of long-term effectiveness, can be readily implemented, and is cost-effective.

The U.S. Army believes the selected alternative meets the threshold criteria and provides the best balance of tradeoffs among the other alternatives with respect to the CERCLA §121(b) criteria used to evaluate remedial alternatives. The selected alternative will: 1) be protective of human health and safety; 2) comply with ARARs; 3) be cost-effective; and 4) utilize a permanent solution; by 5) reducing the volume of the potential source for MEC contaminants and pollutants.

A LUC Remedial Design will be finalized as the land use component of the Remedial Design. The LUCs will be recorded in Harrison County and will be added to the 2007 Longhorn Army Ammunition Plant Comprehensive LUC Management Plan. The LUC to prohibit residential land use will remain in place until it is demonstrated that the MEC no longer presents a threat to public safety. ~~groundwater, surface soil and subsurface soil COCs (i.e., the MEC items and the perchlorate as described in Section 2.7 of the ROD) are at levels that allow for unlimited use and unrestricted exposure and it is demonstrated that there is no substantial threat of an explosive hazard.~~ A LUC to prohibit intrusive subsurface activities, including digging, will remain in place until the current land holding agency or any subsequent transferee takes the actions necessary to protect workers and the public from explosives hazards associated with the proposed intrusive activities. For example, intrusive activities may be conducted provided the current land holding agency or any subsequent transferee retains support from UXO-qualified personnel as necessary.~~The LUC to prohibit intrusive activities will remain in place until it is demonstrated that the MEC and other contaminants of concern no longer present a potential threat to public health.~~ [illegible]

Comment [E5]: New language.

Five-year reviews will be performed to document that the remedy remains protective of human health and safety.

2.12.2 *Description of the Selected Remedy*

The selected remedy for LHAAP-001-R and LHAAP-003-R is implementation of LUCs and limited groundwater monitoring in addition to the completed removal action.

Between August and November 2008, a MEC non-time critical removal action was conducted for the LHAAP-001-R and LHAAP-003-R. Surface clearance was performed at LHAAP-001-R and LHAAP-003-R for the entire sites and subsurface clearance to depth of detection was performed at LHAAP-001-R in the OB/OD area. The MEC removal action located and removed MEC items thereby reducing the risk to the future land user. Although these removal actions provide an effective solution for reducing risk of exposure by reducing the potential for any direct contact with MEC or MPPEH, there is the potential that some MEC remains. Therefore, LUCs will be implemented for the sites.

The major components of the selected remedy include:

Land Use Control. LUCs were designed and constructed to promote ongoing protection of human safety against potential explosive hazards that may have remained at the sites. The LUCs' performance objectives are to prohibit the development and use of the property for residential housing, elementary and secondary schools, and child care facilities and playgrounds, and to prohibit intrusive activities such as digging or any other activity which could result in explosive safety risks. The recordation notification for the sites which will be filed with Harrison County will include a description of the LUCs. The boundary of the LUCs encloses the site boundaries shown on **Figures 2-7** and **2-8**. The locations of the signs are also shown on **Figures 2-7** and **2-8**. The details for the LUCs will be included in the Remedial Design. The LUC to prohibit residential land use will remain in place until it is demonstrated that the MEC no longer presents a threat to public safety. ~~groundwater, surface soil and subsurface soil COCs (i.e., the MEC items and the perchlorate as described in Section 2.7 of the ROD) are at levels that allow for unlimited use and unrestricted exposure and it is demonstrated that there is no substantial threat of an explosive hazard.~~ A LUC to prohibit intrusive subsurface activities, including digging, will remain in place until the current land holding agency or any subsequent transferee takes the actions necessary to protect workers and the public from explosives hazards associated with the proposed intrusive activities.~~The LUC to prohibit intrusive activities will remain in place until it is demonstrated that the MEC and other contaminants of concern no longer present a potential threat to public health.~~~~there is no substantial threat of an explosive hazard.~~ For example, intrusive activities may be conducted provided the current land holding agency or any subsequent transferee retains support from UXO-qualified personnel as necessary.

Comment [E6]: New language.

_LUCs that were prepared and constructed during the 2008 removal action include the following:

  - The survey including legal description and plat of the LUC boundaries and locations of signs prepared in accordance with TAC § 335.569, Appendix III in preparation for recordation in the Harrison County Clerk's Office.
  - Signage at the perimeter of LHAAP-001-R and LHAAP-003-R. Signs are in place at the perimeter of the sites, serving as the physical demarcation of the controlled areas. The signs have visibility from one sign to the next with a maximum spacing of 100 ft. The signs include warning of the potential presence of MEC, state the restriction against intrusive activities, and provide a contact number.
  - Education program for future refuge visitors, staff, and volunteers. The program includes informational pamphlets and safety video warning of the potential presence of MEC and presenting examples of MEC that were or may be found at the site.
- ***Limited Groundwater Monitoring.*** Environmental sampling results at LHAAP-001-R and **LHAAP-003-R** indicate that there is no risk to human health and safety from perchlorate or WP. However, limited groundwater monitoring is intended to confirm perchlorate levels in groundwater are below the GW-Ind to verify protection of human health and the environment. If, after three rounds of groundwater sampling at LHAAP-001-R and one round of groundwater sampling at LHAAP-003-R, the results that are evaluated on or before the first five year review indicate detections at levels below the GW-Ind value of 72 micrograms per liter (µg/L) for perchlorate, groundwater monitoring will cease and the wells will be plugged and abandoned.

The Army will implement, maintain, monitor, report on and enforce land use controls at Army-owned property. The Army shall perform those actions related to land use control activities described in this ROD and in the Remedial Design for the ROD. For portions of the Site subject to land use controls that are not owned by the Army, the Army will monitor and report on the implementation, maintenance, and enforcement of land use controls, and coordinate with federal, state, and local governments and owners and occupants of properties subject to land use controls. The Army will provide notice of the groundwater and soil contamination and any land use restrictions referenced in the ROD. The Army will send these notices to the federal, state and local governments involved at this site and the owners and occupants of the properties subject to those use restrictions and land use controls. The Army shall provide the initial notice within 90 days of ROD signature. The frequency of subsequent notifications will be described in the Remedial Design for the ROD. The Army remains responsible for ensuring that the remedy remains protective of human health and the environment. The Army will fulfill its responsibility and obligations under CERCLA and the NCP as it implements, maintains, and reviews the selected remedy.

Upon transfer of Army-owned property, the Army will provide written notice of the possibility that MEC may exist on the two sites due to historical use of the property for military munitions related purposes. The notice will also include ~~land use controls to the transferee of the~~

~~groundwater and soil contamination and~~ any land use restrictions referenced in the ROD. Within 15 days of transfer, the Army shall provide EPA and TCEQ with written notice of the division of implementation, maintenance, and enforcement responsibilities unless such information has already been provided in the LUC RD. The LUC RD will address the procedures to be used by the Army and the transferee to document compliance with the LUCs described in this ROD. In the event property is transferred out of Federal control, the land use controls relating to property and groundwater restrictions shall be recorded in the deed and shall be enforceable by the United States and the state of Texas. The internal control mechanism for this closed installation is the "Comprehensive Land Use Control (LUC) Management Plan, Former Longhorn Army Ammunition Plant, Karnack, Texas," to which the final approved LUC RD will be added.

The details and description of the LUCs implementation and maintenance actions were presented in the LUC Plan (EODT, 2008) associated with the 2008 removal action. A LUC Remedial Design (RD) will be finalized as the land use component of the Remedial Design. Within 21 days of the issuance of the ROD, the Army will propose deadlines for completion of the RD Work Plan, RD, and Remedial Action Work Plan. The documents will be prepared and submitted to EPA and TCEQ pursuant to the FFA. The LUC RD will contain implementation and maintenance actions, including periodic inspections. The LUC RD will be the 2008 LUC Plan revised and finalized as the LUC RD. A recordation of the area with the prohibition of intrusive activity and residential land use will be filed in the Harrison County Courthouse in accordance with TAC § 335.569, Appendix III. The recordation will include the locations of the signs and a description of the educational material available. To transfer this property (LHAAP-001-R-01 & LHAAP-003-R-01), an Environmental Condition of Property (ECP) document would be prepared and the Environmental Protection Provisions from the ECP would be attached to the letter of transfer. The ECP would include the LUCs as part of the Environmental Protection Provisions. The property would be transferred subject to the LUCs identified in the ECP.

Five-Year Reviews will be conducted to ensure that the LUCs are specified, implemented, monitored, reported on, and enforced in an efficient, cost effective manner that ensures long-term protectiveness. Texas Administrative Code (TAC) §335.566, requires that the LUCs be filed in Harrison County.

2.12.3 Cost Estimate for the Selected Remedy

Tables 2-2 and **2-3** are the cost estimate summary tables for LHAAP-001-R and LHAAP-003-R, respectively. The information in the tables is based on the best available information regarding the anticipated scope of the selected remedy. The quantities used in the estimate are for estimating purposes only. Changes in the cost elements may occur as a result of new information and data collected during the O&M of the remedial alternative. Major changes may be documented in the form of a memorandum in the Administrative Record, an ESD, or a ROD amendment. This is an order-of-magnitude engineering cost estimate that is expected to be within -30 to +50 percent of the actual project cost.

The total project present worth cost of the selected remedy is approximately $113,900 and $82,200 for LHAAP-001-R and LHAAP-003-R, respectively, using a discount rate of 2.3%. The capital cost is estimated at $16,600 and $11,100, for LHAAP-001-R and LHAAP-003-R, respectively. The total O&M present value cost is estimated at approximately $97,300 and $71,100 for LHAAP-001-R and LHAAP-003-R, respectively. The O&M costs includes three quarters of perchlorate sampling for LHAAP-001-R and one quarter of sampling for LHAAP-003-R, semiannual mowing and signage maintenance for both sites for 30 year. O&M would support the required CERCLA five-year reviews.

2.13 Expected Outcomes of Selected Remedy

The purpose of this remedial action is to attain the RAO of protecting human health and safety from explosive hazards that may have remained at the sites. The LUCs will promote ongoing protection of human safety against potential explosive hazards that may have remained at the site. The limited groundwater monitoring for perchlorate will confirm levels in groundwater are below the GW-Ind to verify protection for human health and the environment.

2.14 Statutory Determinations

Under CERCLA §121 and the NCP, the U.S. Army must select remedies that are protective of human health and the environment, comply with ARARs (unless a statutory waiver is justified), are cost effective, and utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. In addition, CERCLA includes a preference for remedies that employ treatment that permanently and significantly reduce the volume, toxicity, or mobility of hazardous wastes as a principal element and a bias against off-site disposal of untreated wastes. The following sections discuss how the selected remedy meets the statutory requirements.

2.14.1 Protection of Human Health and the Environment

The selected remedy, LUCs and limited groundwater monitoring will achieve the RAO. The LUCs provide an effective solution for reducing the risk of exposure by reducing the potential for any direct contact with MEC remaining at the sites after the 2008 removal action. Because of the reasonable potential that some MEC may remain, the sites are not suitable for unrestricted use. The LUCs at both LHAAP-001-R and LHAAP-003-R will promote ongoing protection of human safety against potential explosive hazards that may have remained at the sites. Notification of the LUCs will be recorded with Harrison County. The limited groundwater monitoring for perchlorate provides overall protection of human health by assuring that perchlorate in groundwater does not exceed the TCEQ GW-Ind, which is protective of human health.

A site-wide ecological baseline risk assessment has been performed for LHAAP. As noted in **Sections 2.7.1.3**, and **2.7.2.3** the BERA concluded that no unacceptable ecological risk was present at LHAAP-001-R and LHAAP-003-R.

2.14.2 Compliance with ARARs

The selected remedy complies with all ARARs. The ARARs are presented below and in **Table 2-4**.

Chemical-specific ARARs

Because the screening of MC and WP sampling data at LHAAP-001-R and LHAAP-003-R indicated they were not constituents of concern, the RAO was met and the addition of MC-related ARARs, with the exception of perchlorate in groundwater, is not necessary. The chemical-specific ARAR is relevant and appropriate for perchlorate. Specifically, 30 TAC 335 provides the TCEQ GW-Ind of 72 µg/L for perchlorate in groundwater.

Location-specific ARARs

There are no location-specific ARARs.

Action-specific ARARs

The selected remedy triggers an action-specific ARAR related to well abandonment. Available standards for well plugging/abandonment would provide ARARs for such actions. Texas has promulgated technical requirements in Chapter 76 of Title 16 of the TAC applicable to plugging/abandonment of water wells. In particular, 16 TAC 76.1004 (*Standards for Capping and Plugging of Wells and Plugging Wells that Penetrate Undesirable Water or Constituent Zones*) provides ARARs for the plugging/abandonment of groundwater monitoring wells.

2.14.3 Cost-Effectiveness

There are no costs associated with the no action alternative. **Tables 2-2** and **2-3** present cost estimates for the LUCs and groundwater monitoring for LHAAP-001-R and LHAAP-003-R, respectively. Completion of the MEC removal action and the design and construction of LUCs under the 2008 removal action lowered costs for the sites.

2.14.4 Utilization of Permanent Solutions and Alternative Treatment (or Resource Recovery) Technologies to the Maximum Extent Practicable

The U.S. Army has determined that the selected remedy represents the maximum extent to which permanent solutions and treatment technologies can be utilized in a practicable manner at the site. The MEC removal action provided an effective solution for reducing risk of exposure by reducing the volume of the potential source of MEC contaminant and pollutants and for any direct contact with MEC or MPPEH. LUCs provide immediate protection. Maintenance of this control would be required as long as there is a potential of hazards from MEC that might have remained at the site.

2.14.5 Preference for Treatment as a Principal Element

The statutory preference for treatment was addressed with the MEC removal action which removed source material from the site and destroyed MEC. The LUCs do not include treatment of MEC but will promote ongoing protection of human safety against potential explosive hazards that may have remained at the sites.

2.14.6 Five-Year Review Requirements

Section 121(c) of CERCLA and NCP §300.430(f)(5)(iii)(C) provide the statutory and legal basis for conducting five-year reviews. Although the MEC removal actions provide an effective solution for reducing risk of exposure by reducing the potential for any direct contact with MEC, there is the potential that some MEC remains. Therefore, the sites are not suitable to allow unlimited use and unrestricted exposure. A review will be conducted at least every five years to confirm that the remedy continues to provide adequate protection of human health and safety.

2.15 Documentation of Significant Changes

The Proposed Plan for LHAAP-001-R and LHAAP-003-R was released for public comment in July 2011. The Proposed Plan included the LUCs in Alternative 2 as well as limited groundwater monitoring for perchlorate. No significant changes have been made to the proposed plan for the sites. Written comments were received during the public comment period. It was determined that no significant changes to the decision, as originally identified in the Proposed Plan, were necessary or appropriate.

Table 2-1
Comparative Analysis of Alternatives

Comparative Analysis of Alternatives Criteria	Alternative 1 No Action	Alternative 2 Land Use Controls and Limited Groundwater Monitoring
Overall protection of human health and safety	No protection. Does not achieve RAOs.	Protection of human health and safety provided by maintenance of LUCs that cuts off the exposure pathway. Includes groundwater monitoring to confirm the levels of perchlorate in groundwater are protective of human health. Achieves the RAOs.
Compliance with ARARs	Does not comply with ARARs	Complies with ARARs.
Long-term effectiveness and permanence	Not effective due to the presence of residual MEC that may have remained at the site.	High in effectiveness by prohibiting use of the site and educating the public of the potential hazards.
Reduction of toxicity, mobility, or volume through treatment	No active reduction.	No active reduction.
Short-term effectiveness	No reduction in risk in the short term.	LUCs provide short-term risk reduction by informing workers conducting groundwater monitoring activities of the potential MEC hazards and of the use restrictions. .
Implementability	Readily implemented.	Readily implemented, technical needs are not complex.
Costs * LHAAP-001-R Capital Expenditure O & M Expenditure Total Present Worth	 $0 $0 $0	 $16,600 $97,300 $113,900
LHAAP-003-R Capital Expenditure O & M Expenditure Total Present Worth	 $0 $0 $0	 $11,100 $71,127 $82,200

Table 2-2
Remediation Cost Table, Selected Remedy (LHAAP-001-R)
Present Worth Analysis

PROJECT LOCATION:	Karnack, Texas								DATE:	September 2011	
			O & M Costs						Present Value (NPV)		
FY	Capital Costs	Capital Costs							Discount Rate	Capital	O & M
		Other	LTM					Total	2.3%		
									NPV	16,618	97,317
2011	16,618	0	36,263					36,263			
2012	0	0	1,344					1,344			
2013	0	0	8,815					8,815			
2014	0	0	1,344					1,344			
2015	0	0	1,344					1,344			
2016	0	0	1,344					1,344			
2017	0	0	1,344					1,344			
2018	0	0	8,815					8,815			
2019	0	0	1,344					1,344			
2020	0	0	1,344					1,344			
2021	0	0	1,344					1,344			
2022	0	0	1,344					1,344			
2023	0	0	8,815					8,815			
2024	0	0	1,344					1,344			
2025	0	0	1,344					1,344			
2026	0	0	1,344					1,344			
2027	0	0	1,344					1,344			
2028	0	0	8,815					8,815			
2029	0	0	1,344					1,344			
2030	0	0	1,344					1,344			
2031	0	0	1,344					1,344			

Table 2-2 *(continued)*
Remediation Cost Table, Selected Remedy (LHAAP-001-R)
Present Worth Analysis

PROJECT LOCATION:	Karnack, Texas								DATE:	September 2011	
			O & M Costs						Present Value (NPV)		
FY	Capital Costs	Capital Costs							Discount Rate	Capital	O & M
		Other	LTM					Total	2.3%		
									NPV	16,618	97,317
2032	0	0	1,344					1,344			
2033	0	0	8,815					8,815			
2034	0	0	1,344					1,344			
2035	0	0	1,344					1,344			
2036	0	0	1,344					1,344			
2037	0	0	1,344					1,344			
2038	0	0	8,815					8,815			
2039	0	0	1,344					1,344			
2040	0	0	1,344					1,344			
Total Expenditures	16,618	0	120,053					120,053			**$113,935**

Notes:

The discount rate of 2.3% is based on OMB Circular A-94 Appendix C, Revised December 2010.

CERCLA	*Comprehensive Environmental Response, Compensation, and Liability Act*
LTM	*long-term monitoring*
LUC	*land use control*
NPV	*net present value*
O&M	*operation & maintenance*

Table 2-3
Remediation Cost Table, Selected Remedy (LHAAP-003-R)
Present Worth Analysis

PROJECT LOCATION:		Karnack, Texas							DATE:	September 2011	
			O & M Costs						Present Value (NPV)		
FY	Capital Costs	Capital Costs							Discount Rate	Capital	O & M
		Other	LTM					Total	2.3%		
									NPV	11,079	71,127
2011	11,079	0	10,073					10,073			
2012	0	0	1,344					1,344			
2013	0	0	8,815					8,815			
2014	0	0	1,344					1,344			
2015	0	0	1,344					1,344			
2016	0	0	1,344					1,344			
2017	0	0	1,344					1,344			
2018	0	0	8,815					8,815			
2019	0	0	1,344					1,344			
2020	0	0	1,344					1,344			
2021	0	0	1,344					1,344			
2022	0	0	1,344					1,344			
2023	0	0	8,815					8,815			
2024	0	0	1,344					1,344			
2025	0	0	1,344					1,344			
2026	0	0	1,344					1,344			
2027	0	0	1,344					1,344			
2028	0	0	8,815					8,815			
2029	0	0	1,344					1,344			
2030	0	0	1,344					1,344			
2031	0	0	1,344					1,344			
2032	0	0	1,344					1,344			
2033	0	0	8,815					8,815			

Table 2-3 *(continued)*
Remediation Cost Table, Selected Remedy (LHAAP-003-R)
Present Worth Analysis

PROJECT LOCATION:	Karnack, Texas								DATE:	September 2011		
			O & M Costs						Present Value (NPV)			
FY	Capital Costs	Capital Costs							Discount Rate	Capital	O & M	
		Other	LTM					Total	2.3%			
									NPV	11,079	71,127	
2034	0	0	1,344					1,344				
2035	0	0	1,344					1,344				
2036	0	0	1,344					1,344				
2037	0	0	1,344					1,344				
2038	0	0	8,815					8,815				
2039	0	0	1,344					1,344				
2040	0	0	1,344					1,344				
Total Expenditures	11,079	0	93,864					93,864			$82,206	

<u>*Notes and Abbreviations:*</u>

The discount rate of 2.3% is based on OMB Circular A-94 Appendix C, Revised December 2010.

CERCLA	*Comprehensive Environmental Response, Compensation, and Liability Act*
LTM	*long-term monitoring*
LUC	*land use control*
NPV	*net present value*
O&M	*operation & maintenance*

Table 2-4
Description of ARARs for Selected Remedy

Citation	Activity or Prerequisite/Status	Requirement
Groundwater		
TCEQ Texas Risk Reduction Rules 30 TAC 335	Applicable to industrial groundwater—relevant and appropriate for hypothetical future maintenance worker exposure to groundwater.	If no maximum contaminant level has been promulgated, groundwater must not exceed the industrial medium-specific concentration. For perchlorate, the GW-Ind is 72 µg/L.
Wells		
Well Construction Standards—Monitoring or Injection Wells 16 TAC 76.1000	Construction of water wells—**applicable** to construction of new monitoring or injection wells, if needed.	Wells shall be abandoned in accordance with the technical requirements of Section 76.1004, as appropriate.

Figure 2-1
Location of Longhorn AAP

Figure 2-2
Site Location Map LHAAP-001-R and LHAAP-003-R

Figure 2-3
Sampling Locations South Test Area/Bomb Test Area LHAAP-001-R

Figure 2-4
MEC/MPPEH Location Map South Test Area/Bomb Test Area LHAAP-001-R

Figure 2-5
Sampling Locations Ground Signal Test Area LHAAP-003-R

Figure 2-6
MEC/MPPEH Location Map Ground Signal Test Area LHAAP-003-R

Figure 2-7
LUC Boundary for LHAAP-001-R

Figure 2-8
LUC Boundary for LHAAP-003-R

3.0 Responsiveness Summary

The Responsiveness Summary serves three purposes. First, it provides the U .S. Army, USEPA, and TCEQ with information about community concerns with the remedy at LHAAP-001-R and LHAAP-003-R as presented in the Proposed Plan. Second, it shows how the public's comments were considered in the decision-making process for selection of the remedy. Third, it provides a formal mechanism for the U.S. Army to respond to public comments.

The U.S. Army, USEPA, and TCEQ provide information regarding LHAAP-001-R and LHAAP-003-R through public meetings, the Administrative Record file for the facility, and announcements published in the Shreveport Times and Marshall News Messenger newspapers. **Section 2.3** discusses community participation on LHAAP-001-R and LHAAP-003-R, including the dates for the public comment period, the date, location, and time of the public meetings, and the location of the Administrative Record. The following documents related to community involvement were added to the Administrative Record:

- Transcript of the public meeting on July 21, 2011
- Presentation slides from the July 21, 2011 public meeting
- Questions and comments from the public during the public comment period, and the response to comments from the U.S. Army dated July 27, 2011.

Written comments were received from the general public during the public comment period and Proposed Plan meeting in July 2011 for LHAAP-001-R and LHAAP-003-R. The Proposed Plan was finalized without revision. **Appendix** A contains the public announcement for the Proposed Plan meeting and public comment period.

3.1 Stakeholder Issues and Lead Agency Responses

This section responds to significant issues raised by stakeholders including the public and community groups that were received in written or verbal form.

Question/comment: High concentrations (greater than the MCL) of metals have been found in groundwater at both sites since the early 1980s. In the most recent round of groundwater sampling (2009), high concentrations of beryllium and chromium were detected at site 001-R, and high concentrations of arsenic and chromium were detected at site 003-R.

However, the Army does not intend to monitor metals in groundwater at either site. This is despite the fact that the EPA sent the Army a letter that recommended monitoring metals in groundwater. Letters between the EPA and Army are reproduced in appendix 1.

The Army should monitor metals in groundwater at both sites.

Response: Perchlorate and white phosphorus (WP) are the data gap contaminants of concern for LHAAP-001-R and LHAAP-003-R under the Military Munitions Response Program (MMRP). Metals were addressed at sites LHAAP-27 and LHAAP-54, which are co-located with LHAAP-001-R and LHAAP-003-R respectively, under the 1998 Installation Restoration Program (IRP) ROD. Therefore any metals issues/concerns for these two sites must be addressed with respect to the 1998 IRP ROD and would not be included in this Proposed Plan. Army is in the process of reviewing the new metal results and historical results and has committed to respond to EPA and TCEQ under a path separate from the MMRP.

Question/comment: Soils at sites 001-R and 003-R are contaminated with a variety of metals (e.g., arsenic, barium, cadmium, lead). However, the Army does not plan to remove contaminated soil from either site.

According to the Army, the contaminants do not represent a threat to human health. However, there are problems with the Army's human health risk assessment (HHRA).

First, many of the soil analyses are not useful because of high detection limits (see below).

Second, the HHRA was performed in 1997. Therefore, it did not use the most recent data. The more recent data shows that some metal concentrations are significantly higher than those used in the HHRA (**Table 3-1**). Also, perchlorate was not included in the HHRA.

Table 3-1
Contaminant Concentrations Used in HHRA
Old and New Maximums

Contaminant/Site	Old Maximum (mg/kg)	New Maximum (mg/kg)
Barium/001-R	123	639
Copper/001-R	18.7	41.1
Lead/001-R	18	26.3
Nickel/001-R	2.41	18.6
Thallium/003-R	-	0.2
Perchlorate/001-R	-	28.9 (µg/kg)

The Army should remove contaminated soils from both sites.

Response: Please see response to the first comment above.

Question/comment: In some cases, the Army used detection limits for metals in soil and sediment that are higher than the standards established to protect human health (see **Table 3-2**). Thus, the Army cannot know whether these contaminants are present in concentrations that threaten human health.

Table 3-2
Detection Limits for Metals in Soil and Sediment

Contaminant	Site	Date	Detection Limit (mg/kg)	Standard (TCEQ GWP-Ind, mg/kg)
Antimony	001-R & 003-R	1982	0.76	0.6
	001-R & 003-R	1993	1	0.6
	001-R	1994	1.1-1.3	0.6
	001-R	1996	10.3-10.9	0.6
	003-R	1996/1997	1.1-1.2	0.6
Arsenic	001-R & 003-R	1982	0.3	1
	001-R & 003-R	1993	0.1-1	1
	001-R	1996	2.58-2.74	1
	003-R	1996/1997	0.596-58.7	1
	001-R & 003-R	2003	0.52-0.54	1
Beryllium	001-R & 003-R	1982	0.5	0.4
	001-R	1997	0.62-0.77	0.4
	001-R & 003-R	2003	0.20-0.22	0.4
Cadmium	001-R & 003-R	1982	0.5	0.5
	001-R & 003-R	1993	1	0.5
	001-R	1994	0.56-0.63	0.5
	001-R	1996	2.06-2.19	0.5
	003-R	1996/1997	2.22-2.38	0.5
	001-R & 003-R	2003	0.25-0.27	0.5
Thallium	001-R & 003-R	1982	3	0.2
	001-R & 003-R	1993	0.2	0.2
	001-R	1994	0.55-1.2	0.2
	001-R	1996	15.5-16.4	0.2
	003-R	1996/1997	0.6	0.2

The Army should re-sample soil and sediment at both sites. The samples should be analyzed using detection limits that are lower than the human health-based standards.

Response: Please see response to the first comment above.

Question/comment: The Army does not appear to have done the work required to determine groundwater flow directions at either site. Effective and efficient groundwater monitoring cannot be performed unless groundwater flow directions are known.

The Army should produce maps showing groundwater flow directions at each site.

Response: Hydrogeology was already addressed at sites 001-R and 003-R under the 1998 IRP ROD (see 1997 Remedial Investigation Report). Based on the Hydrogeological Assessment, the groundwater and surface flow direction at LHAAP-003-R are to the northwest and parallel to Sanders Branch and Harrison Bayou and at LHAAP-001-R groundwater flow is northerly. In addition, groundwater surface data from May 2000 (attached) for monitoring wells 127, 128 and 18WW16 at site LHAAP-003-R has been evaluated and confirms a northwest groundwater flow direction. Groundwater surface data from May 2000 for monitoring wells 27WW01, 27WW02, 27WW03, 27WW04, 131 and 132 at site LHAAP-001-R confirm a groundwater flow direction to the northeast. Maps showing groundwater flow direction at each site are attached as **Appendix B**.

Question/comment: There are six monitor wells at site 001-R, and four monitor wells at site 003-R. In addition, one-time grab samples were obtained from borings at each site.

The Army does not know whether there are a sufficient number of monitor wells at each site because it does not know whether the wells are down gradient of contaminated areas (see above comment on groundwater flow directions). The Army should evaluate the need for additional monitor wells after it has determined groundwater flow directions at each site.

Response: Please see the above response. Hydrogeology was already addressed at these sites.

Question/comment: The Army is using a groundwater standard for perchlorate of 72 µg/L. However, the EPA health reference level (HRL) for perchlorate is 15 µg/L. In addition, the EPA has decided to establish a primary drinking water standard (MCL) for perchlorate. When established, the perchlorate MCL will probably be similar to the HRL.

If the Army abandons the monitor wells based on the 72 µg/L standard, it may have to re-install monitor wells when the EPA establishes an MCL for perchlorate.

Until the EPA establishes an MCL for perchlorate, the Army should use a standard that is no greater than 15 µg/L.

Response: The Army is using the appropriate standard for comparison of perchlorate in groundwater and that is the TCEQ GW-Ind value of 72 µg/L, which is promulgated and enforceable in the State of Texas. If EPA establishes an MCL for perchlorate in the future, it will be addressed during the 5-year reviews.

Question/comment: The Army has analyzed soil and water samples for two isomers of dinitrotoluene (DNT): 2,4-DNT and 2,6-DNT. These are the most common isomers in technical grade DNT. However, there are four other isomers of DNT (2,3-DNT; 2,5-DNT; 3,4-DNT; and 3,5-DNT). All of the isomers are toxic.

At the Badger Army Ammunition Plant, high concentrations of the other isomers have been found in groundwater. In some cases, concentrations of the other isomers are significantly higher than the concentrations of 2,4-DNT and 2,6-DNT.

The Army should analyze soil and water samples for all isomers of DNT, not just the 2,4-DNT and 2,6-DNT isomers.

Response: At this time, there are no Federal or State of Texas promulgated screening levels for DNT isomers, other than for 2,4-DNT and 2,6-DNT. However, as part of the CERCLA process, the statutory five-year reviews will evaluate the effectiveness of the remedy, including any changes in ARARs concerning DNT isomers, and would recommend implementation of other measures if needed.

Question/comment: The Army has developed source-receptor conceptual site models for munitions constituents and OE at LHAAP sites 001-R and 003-R. The Army should also develop source-receptor conceptual site models for metals at both sites.

Response: Please see response to the first comment above.

Question/comment: The following documents were listed as primary reference documents in the Final Proposed Plan. However, they do not appear to have been included in the Army Administrative Record.

- CAPE, 2007b, Final Engineering Evaluation/Cost Analysis Action Memorandum Revision 1, Longhorn Army Ammunition Plant, Karnack, Texas, Signed by Thomas Lederle, BRAC Division, ACSIM, United States Army, 5 December.
- Environmental Protection Systems, Inc. (EPS), 1984, Longhorn Army Ammunition Plant Contamination Survey, June.
- EODT Technology, Inc., (EODT), 2009, Final Site Specific Final Report for the MEC Removal Action at the Former Longhorn Army Ammunition Plant, LHAAP-001-R (Site 27) and LHAAP-003-R (Site 54), Karnack, Texas, September.

The Army should ensure that all documents referred to in the Proposed Plan are included in the Administrative Record. If any document has been misfiled or mislabeled in the Administrative Record, the Army should so indicate when referring to that document.

Response: The Final Engineering Evaluation/Cost Analysis Action Memorandum, signed by Thomas Lederle 5 December 2007, is located in the Administrative Record in Volume 9, Year 2008. It is listed out of date in sequence.

The other two references appear to have been overlooked and will be incorporated into the Administrative Record.

4.0 References

CAPE, 2007, *Final Engineering Evaluation/Cost Analysis: Report, Longhorn Army Ammunition Plant, Karnack, Texas,* January.

e^{2}M, 2002, *Final U.S. Army Closed, Transferring and Transferred Range/Site Inventory for Longhorn Army Ammunition Plant, Texas*, 15 September.

e^{2}M, 2005, *Final Site Inspection Report, Military Munitions Response Program Sites, Longhorn Army Ammunition Plant, Texas*, June.

Environmental Protection Systems, Inc. (EPS), 1984, Longhorn Army Ammunition Plant Contamination Survey, June.

EODT Technology, Inc., (EODT), 2008, *Final Work Plan for the MEC Removal Action at the Former Longhorn Army Ammunition Plant, LHAAP-001-R (Site 27) and LHAAP-003-R (Site 54), Karnack, Texas, July.*

EODT, 2009, *Final Site Specific Final Report for the MEC Removal Action at the Former Longhorn Army Ammunition Plant, LHAAP-001-R (Site 27) and LHAAP-003-R (Site 54), Karnack, Texas*, September.

Shaw Environmental, Inc. (Shaw), 2007, *Installation-Wide Baseline Ecological Risk Assessment, Volume 1: Step 3 Report, Longhorn Army Ammunition Plant, Karnack, Texas, Houston, Texas,* November.

Shaw, 2011, *Munitions Constituents Data Summary Report, South Test Area/Bomb Test Area, LHAAP-001-R and Ground Signal Test Area, LHAAP-003-R, Longhorn Army Ammunition Plant, Karnack, Texas, Houston,* Texas, June.

Solutions to Environmental Problems (STEP), 2005, *Plant-wide Perchlorate Investigation, Longhorn Army Ammunition Plant, Karnack, Texas,* April.

U.S. Army, 2004, *Memorandum of Agreement Between the Department of the Army and the Department of the Interior for the Interagency Transfer of Lands at the Longhorn Army Ammunition Plant for the Caddo Lake National Wildlife Refuge, Harrison County, Texas,* signed by the Department of the Interior on April 27, 2004 and the Army on April 29, 2004.

U.S. Army, 2007, *Action Memorandum for Three Munitions Response Sites: South Test Area/Bomb Test Area, Static Test Area, and Ground Signal Test Area, Longhorn Army Ammunition Plant, Karnack, Texas,* August. Signed 5 December 2007 by Thomas E. Lederle.

U.S. Army, 2011, *Final Proposed Plan for LHAAP-001-R, South Test Area/Bomb Test Area and LHAAP-003-R,Ground Signal Test Area, Longhorn Army Ammunition Plant, Karnack, Texas,* June.

U.S. Army Corps of Engineers (USACE), Tulsa District, 1998, *Record of Decision at Group 1 Sites (Sites 11, 1, XX, 27), Longhorn Army Ammunition Plant, Karnack, Texas,* January.

U.S. Department of the Army (Army), Longhorn Army Ammunition Plant, 2011, "Army Response to EPA Letter of June 2010: Munitions Constituents Data Summary Report Response to Comments, Longhorn Army Ammunition Plant, Karnack, Texas", Letter from Rose M. Zeiler, Longhorn Army Ammunition Plant Site Manager to Stephen Tzhone, Remedial Project Manager of USEPA, Region 6, Superfund Division, March 10.

U.S. Environmental Protection Agency (USEPA), 2010, "Munitions Constituents Data Summary Report, Longhorn Army Ammunition Plant, Karnack, Texas", Letter from Stephen Tzhone, Remedial Project Manager of USEPA, Region 6, Superfund Division to Rose M. Zeiler Longhorn Army Ammunition Plant Site Manager, June 11.

U.S. Environmental Protection Agency (USEPA), 2011, "Army Response to EPA Letter of June 2010: Munitions Constituents Data Summary Report, Longhorn Army Ammunition Plant, Karnack, Texas," Letter from Stephen Tzhone, Remedial Project Manager of USEPA, Region 6, Superfund Division to Rose M. Zeiler Longhorn Army Ammunition Plant Site Manager, June 03.

U.S. Fish and Wildlife Service (USFWS), 2003, *Contaminant Investigation of Northern, Central, and Eastern Portions of Caddo Lake National Wildlife Refuge, Texas,* November.

Glossary of Terms

Administrative Record File – The body of reports, official correspondence, and other documents that establish the official record of the analysis, clean up, and final closure of a site.

Characterization – The compilation of all available data about the waste unit to determine the rate and extent of contaminant migration resulting from the waste site, and the concentration of any contaminants that may be present.

Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) – CERCLA was enacted by Congress in 1980 and was amended by the Superfund Amendments and Reauthorization Act in 1986. CERCLA provides federal authority to respond directly to releases or threatened releases of hazardous substances that may endanger public health or the environment. CERCLA established prohibitions and requirements concerning closed and abandoned hazardous waste sites and established the Superfund Trust Fund.

Exposure – Contact of an organism with a chemical or physical agent. Exposure is quantified as the amount of the agent available at the exchange boundaries of the organism (e.g., skin, lungs, gut) and available for absorption.

Federal Facility Agreement – A legal binding agreement among USEPA, TCEQ, and U.S. Army that sets the standards and schedules for the comprehensive remediation of Longhorn Army Ammunition Plant.

Groundwater – Underground water that fills pores in soil or openings in rocks to the point of saturation.

Human Health Risk Assessment – A study conducted as part of a remedial investigation to determine the risk posed to human health by site-related chemicals.

Land Use Controls – Physical, legal, or administrative mechanisms that restrict the use of, or limit access to, contaminated property in order to reduce risk to human health and the environment. Physical mechanisms encompass a variety of engineered remedies to contain or reduce contamination and/or physical barriers to limit access to property, such as fences or signs.

Material That Potentially Presents an Explosive Hazard (MPPEH) – Material potentially containing explosives or munitions (e.g., munitions containers and packaging material; munitions debris remaining after munitions use, demilitarization, or disposal; and range-related debris), or material potentially containing a high enough concentration of explosives such that the material presents an explosive hazard.

Munitions and Explosives of Concern - This term, which distinguishes specific categories of military munitions that may pose unique explosives safety risks, means:
(A) Unexploded Ordnance (UXO), as defined in 10 U.S.C. 2710 (e) (9);
(B) Discarded military munitions (DMM), as defined in 10 U.S.C. 2710 (e) (2); or
(C) Explosive munitions constituents (e.g., TNT, RDX) present in high enough concentrations to pose an explosive hazard.

Munitions Constituents - Any materials originating from unexploded ordnance, discarded military munitions, or other military munitions, including explosive and nonexplosive materials, and emission, degradation, or breakdown elements of such ordnance or munitions.

Munitions Debris (MD) – Remnants of munitions (e.g., fragments, penetrators, projectiles, shell casings, links, fins) remaining after munitions use, demilitarization, or disposal.

Munitions Response Site (MRS) – A discrete location within a munitions response area that is known to require a munitions response.

National Priorities List (NPL) – The USEPA's list of the most serious uncontrolled or abandoned hazardous waste sites identified for possible long-term remedial action under Superfund. USEPA is required to update the NPL at least once a year. A site must be on the NPL to receive money from the Trust Fund for remedial action.

Responsiveness Summary – A summary of oral and/or written comments received during the proposed plan comment period and includes responses to these comments. The responsiveness summary is a key part of a decision document highlighting community concerns.

Proposed Plan – A plan for a site cleanup that proposes a recommended or preferred remedial alternative. The Proposed Plan is available to the public for review and comment and the preferred alternative may change based on public and other stakeholder input.

Superfund Amendments and Reauthorization Act (SARA) – Amended CERCLA in 1986. SARA resulted in more emphasis on permanent remedies for cleaning up hazardous waste sites, increased the focus on human health problems posed by hazardous waste sites, and encouraged greater citizen participation in making decisions on how sites should be cleaned up.

Surface Media – The soil (surface or subsurface), surface water, and sediment present at a site as applicable. The source material in the surface media may be contributing to groundwater contamination.

Superfund – The common name used for CERCLA; also referred to as the Trust Fund. The Superfund Program was established to help fund cleanup of hazardous waste sites. It also allows legal action to force those responsible for sites to clean them up.

Appendix A

Public Announcement

PUBLIC NOTICE
THE UNITED STATES ARMY INVITES PUBLIC COMMENT ON THE PROPOSED PLAN FOR MUNITIONS RESPONSE SITES LHAAP-001-R AND LHAAP-003-R, LONGHORN ARMY AMMUNITION PLANT, TEXAS

PUBLIC MEETING ON JULY 21, 2011 AT THE KARNACK COMMUNITY CENTER, KARNACK, TEXAS

The U.S. Army, as lead agency for environmental response actions at Longhorn Army Ammunition Plant (LHAAP), in partnership with Texas Commission on Environmental Quality and the U.S. Environmental Protection Agency Region 6, has developed a proposed plan for the following sites: LHAAP-001-R and LHAAP-003-R. Beginning on July 13, 2011, copies of the Proposed Plan and supporting documentation will be available for public review at the Marshall Public Library, 300 S. Alamo, Marshall, Texas, 75670. The public comment period is July 13, 2011, through August 13, 2011. A public meeting for the public to view information and ask questions will be held on July 21, 2011 from 6:00 to 7:30 p.m. at the Karnack Community Center, Highway 134 and Spur 449, Karnack, Texas. Questions, comments, and responses on the Proposed Plan will be recorded by a court reporter during the public meeting. Written comments will be accepted throughout the public comment period.

LHAAP-001-R, the South Test Area/Bomb Test Area, is located in the southern portion of LHAAP and covers an area of approximately 79 acres. LHAAP-001-R was constructed in 1954 and used for testing photoflash bombs produced at the facility until about 1956. During the late 1950s, illuminating signal devices were also demilitarized within pits excavated within the vicinity of the test pad. During the early 1960s, leaking production items may have been demilitarized by detonation. Leaking white phosphorus (WP) munitions were supposedly disposed of although no primary source documentation concerning this effort was located. A 1984 LHAAP Contamination Survey stated the area had been relatively inactive since the early 1960s and no disposal or testing activities were carried out. LHAAP-001-R is co-located with the Installation Restoration Program (IRP) site LHAAP- 27.

LHAAP-003-R, the Ground Signal Test Area, is located in the southeastern portion of LHAAP and covers an area of approximately 80 acres. LHAAP-003-R was used intermittently starting in April 1963 for aerial and on-ground testing and destruction of a variety of devices, including pyrotechnic signal devices, red phosphorus smoke wedges, infrared flares, illuminating mortar shells and cartridges, button bombs, and various types of explosive simulators. The site was also used intermittently over a 20-year period for testing and burn-out of rocket motors. From late 1988 through 1991, the site was also used for burn-out of rocket motors in Pershing missiles. Occasionally, leaking WP munitions were burned at the site as a demilitarization activity. LHAAP-003-R is co-located with the IRP site LHAAP-54.

The Proposed Plan documents a 2008 removal action of munitions and explosives of concern (MEC) at LHAAP-001-R and LHAAP-003-R and proposes limited groundwater monitoring for perchlorate at these sites beyond the land use controls (LUCs) already in place as a result of the 2008 removal action. The purpose of the additional monitoring is to confirm perchlorate levels in groundwater are below groundwater MSC for industrial use (GW-Ind). Furthermore, implementation, maintenance, inspection, reporting and enforcement of the LUCs will continue to promote the ongoing protection of human safety against explosive hazards that may have remained at the sites in the subsurface.

The U.S. Army is soliciting public review and comment on the recommendation of limited groundwater monitoring for perchlorate for LHAAP-001-R and LHAAP-003-R. Copies of the Proposed Plan and supporting documentation are available for public review at the Marshall Public Library, 300 S. Alamo, Marshall, Texas, 75670.

The U.S. Army encourages the public to participate in the decision-making process by offering comments on the Proposed Plan. For further information, contact: Dr. Rose M. Zeiler, Longhorn Army Ammunition Plant, P.O. Box 220, Ratcliff, Arkansas, 72951; phone number 479-635-0110 or e-mail rose.zeiler@us.army.mil.

Appendix B

Water Level Measurements for May 2000 and Maps Showing Groundwater Flow Direction

Subject:	**Final Minutes, Quarterly Restoration Advisory Board (RAB) Meeting, Longhorn Army Ammunition Plant (LHAAP)**
Location of Meeting:	**Karnack Community Center, Karnack, Texas**
Date of Meeting:	**May 15, 2014, 6:00 – 7:30 PM**

Meeting Participants:

LHAAP/BRAC:	Rose M. Zeiler, Tom Lederle
USACE:	Aaron Williams
USAEC:	
AECOM:	Dave Wacker, Gretchen McDonnell, David Rowlands (World Environmental)
TCEQ:	April Palmie
USEPA Region 6:	Rich Mayer, Steve Tzhone, Janetta Coats, Kent Becher (USGS liaison)
USFWS:	Paul Bruckwicki
RAB:	**Present:** Charles Dixon, Paul Fortune, Carol Fortune, Judith Johnson, John Pollard, Jr., Tom Walker **Absent:** Terry Britt, Ken Burkhalter, Robert Cargill, Lee Guice, Ted Kurz, James Lambright, Richard LeTourneau, Nigel Shivers, Judy Vandeventer, Pickens Winters
Public:	Dawn Orsak, CLI-TAG

An agenda handout for the RAB meeting was provided for the meeting. Additional hard copy meeting materials provided included the AECOM slide presentation, surface water and perimeter well perchlorate data handouts, and a GWTP summary handout showing pounds of chemicals removed and volume of water treated. Draft February 2014 RAB meeting minutes were provided to RAB members for review prior to the meeting.

Welcome and Introduction

Mr. Fortune opened the meeting and introduced visitors to the meeting: Mr. Tom Lederle, Army BRAC and Mr. David Rowlands, World Environment (an AECOM contractor).

Open Items – Rose Zeiler

RAB Administrative Issues

Minutes
Dr. Zeiler and Mr. Fortune stated that RAB members made no comments on the Draft February 2014 meeting minutes. Ms. Fortune made a motion to approve the February 2014 RAB meeting minutes. Motion seconded by Ms. Johnson.

Tour of Longhorn Sites Question & Answer
The annual RAB tour of Longhorn sites was conducted earlier in the day. Ms. Zeiler opened the floor for any questions regarding the tour. No questions were asked, but Mr. Fortune stated that he thought the tour went well and that Mr. Wacker made things very clear to understand. Mr. Wacker stated that he was glad weather and ground conditions allowed us to get to LHAAP-29, because the interior of that site had not been visited for quite some time.

Website Update
When the site becomes active, a notice will be sent to the RAB members and the interested parties list. The address will be http://www.longhornaap.com.

An interactive map of the site will allow viewers to click on a site of interest, and be led directly to documents relating to that site. Links to meeting minutes and the administrative record documents will be available.

Ms. Orsak reminded the group that CLI has a website through the TAG that contains a significant amount of information. The address is caddolakeinstitute.us/lhaap.

Open Questions

Defense Environmental Restoration Program (DERP) Update – AECOM (Dave Wacker)

Dense Non-Aqueous Phase Liquids (DNAPLs)
Mr. Wacker explained that the main focus of field work right now are sites with DNAPL, so a review of what DNAPL is was presented. Two locations at LHAAP-18/24 and one location at LHAAP-29 are believed to have DNAPL, and all three of those locations are currently being investigated to determine the size of the DNAPL plume present.

DNAPLs are typically chlorinated solvents (methylene chloride, TCE, PCE) which are heavier than water and sink in an aquifer, as opposed to light non-aqueous phase liquids (LNAPLs) like gasoline or oil which will float on water. Due to their density, DNAPLs will travel down through the subsurface leaving a “smear” of contamination until they hit an aquitard (a layer that impedes its progress, like a clay) where it will pool.

Dr. Zeiler explained that DNAPL is difficult to find because the layered sands and clays at Longhorn provide discontinuous “shelves” of limited extent that can be overflowed with DNAPL and make movement unpredictable. DNAPL moves through pore space and moves as a continuous mass until it loses head and then will stop moving, forming isolated pockets. These pockets of DNAPL dissolve slowly and that dissolved phase moves along with groundwater flow. (See attached AECOM PowerPoint presentation slides 6 through 8 for an illustration of how DNAPL moves in the subsurface.) At LHAAP-18/24, Army believes there are pockets of DNAPL causing dissolved contaminant plumes in the groundwater.

DNAPL is extremely difficult to clean-up because it diffuses into clay pore space, remaining there even after residual is removed from sand pore space. Once sand pore space is cleared of DNAPL, the contaminant will begin to diffuse out of the clays. It is difficult to get access to contaminant in the clay pore space to remediate it because there is little usable/connected pore space in the clay.

Dr. Zeiler stated that she had previously asked the Longhorn team to try to find a completely remediated DNAPL site. Ms. Palmie and Mr. Becher stated that they had not been able to identify a completely remediated site, in the traditional sense of being completely remediated to promulgated standards. Dr. Zeiler stated that often with DNAPL sites, an alternative clean-up goal must be developed because typical standards cannot be achieved.

CPT/MIP is currently being used in the field to identify locations of potential DNAPL at LHAAP-18/24 and LHAAP-29, which will be further sampled and determined if DNAPL is actually present. AECOM will likely present data from this work at the next RAB meeting.

Mr. Fortune asked how far DNAPL will migrate in a year's time. Dr. Zeiler stated that an interim measure cutting off groundwater flow is in place, so it is not migrating at LHAAP-18/24. Mr. Wacker showed a map with the LHAAP-18/24 ICT trenches that collect groundwater and cut off contaminant migration. For LHAAP-29, the extent of the DNAPL plume is known, but a more exact volume is needed to develop the best treatment technology for our situation. Mr. Fortune asked whether clean-up of a remote site would be treated differently than one in a developed area. Ms. Palmie stated that it is much easier to implement any clean-up effort when you are in a remote area without the complications of operating in an urban environment. Mr. Becher stated that contamination in clay is hard to get clean, but the blessing is that it doesn't come out of the clay very quickly either.

Dr. Zeiler stated that use of solvent grew after World War II to a large scale from the 1960s through the late 1970s. Common disposal practice into the early 1970s was to dispose by pouring on dry sand or earth or into evaporation pits or ponds to evaporate. Solvent was known to be highly volatile, so it was thought that the material would evaporate before entering the ground.

Mr. Dixon said that evaporation ponds in east Texas are very inefficient because the evaporation rate of water is not significant.

Dr. Zeiler stated that many DNAPL sites have instead been remediated to "alternative clean-up levels" developed and agreed to by regulatory agencies because the technology did not exist to achieve clean-up to drinking water standards. In summary, Dr. Zeiler stated that Army is going to take the best approach to find the DNAPL and get rid of it, but that even after active remediation it is a long-term endeavor to clean-up residual DNAPL left in an aquifer. Mr. Mayer stated that daughter products are another issue that complicates remediation.

Mr. Fortune asked if people could have been harmed by contact with these materials. Mr. Wacker stated that field staff is required to wear protective gloves to prevent contact with the chemicals.

Dr. Zeiler went on to explain that when a remedial technology reaches a point of “diminishing returns”, you typically switch to a different method, such as MNA, to reach the end goal. Or, using LHAAP-29 as an example, when you find the assumptions made when the remedy was decided were not valid, another option needs to be explored. For LHAAP-29, an additional technology will be evaluated and treatability testing done to ensure options being evaluated are viable. The last resort for remediation is to arrive at agreement on an alternative clean-up standard, as has been done at many sites with residual DNAPL impacts similar to LHAAP-18/24, where clean-up to the usual standards is beyond our existing technology.

On-Going Field Work at LHAAP-18/24 and LHAAP-29
Mr. Wacker provided a brief overview the CPT/MIP and DPT work to identify potential DNAPL and the step-out strategy (split the difference) to yield extent of contamination. Over thirty locations have already been explored as part of the current field effort. LHAAP-18/24 areas being examined are the Unlined Evaporation Pond and Air Curtain Destructor.

Mr. Wacker described the LHAAP-29 area. (See presentation for details.) At LHAAP-29, the soak out area may have led to methylene chloride groundwater contamination. Exploration for DNAPL is being performed. Additionally, soil sampling for explosives is being done in six specific areas where historical data was not suitable for use. The groundwater plume has been bounded, but the actual volume needs to be better defined for remediation selection and design purposes.

Shallow soil investigation is being conducted across two areas within LHAAP-29 to find a surface source for the contamination we see at depth.

See slides 19 and 20 for treatability testing work details discussed by Mr. Wacker.

MNA Sites Update LHAAP-46, LHAAP-50, LHAAP-35A(58), LHAAP-67
Mr. Wacker stated that annual reports will be coming out for some of the MNA sites, as four quarters of data will have been collected soon. This information will be reported to the RAB.

GWTP Update
The GWTP continues to operate to contain the groundwater plumes at LHAAP-18/24 and LHAAP-16. See attached handout showing treated groundwater volumes and mass of chemicals removed. Semi-annual compliance monitoring continues at LHAAP-18/24 at about 50 wells.

Perimeter Well and Surface Water Sampling
Perchlorate sampling is conducted quarterly at several wells locations along the perimeter of the former facility footprint and at several surface water locations in accordance with the 1999 dispute resolution. The latest data from the February 2014 sampling event indicated no detections of perchlorate at any of the surface water sampling locations (see attached handout), and no real changes in observations from the monitoring wells. Mr. Dixon noted on the

declining perchlorate concentrations shown in handout graph. Dr. Zeiler stated that particular reduction on the graph is actually due to an improvement in the analytical method that lowered the detection limit.

Ms. Palmie stated that during the tour, Mr. Fortune asked whether the amount of contaminant we are removing with the GWTP has been declining. Mr. Wacker stated that AECOM would assess this and present some additional information to the RAB.

Other Environmental Restoration Issues – Rose Zeiler

Bioplug Demonstration at LHAAP-37
Mr. Dixon asked if there is a dissolved oxygen probe to monitor that parameter during the system operation. Dr. Zeiler stated that the bioplug demonstration site is completely automated, but was not specifically aware if a dissolved oxygen probe is part of the operation. Mr. Wacker stated that dissolved oxygen is measured at all groundwater sampling events, but is unaware of whether that is being assessed as an input to the bioplug system.

Dispute Status Update
Mr. Lederle stated he attended the meeting in March 2014 with EPA Administrator McCarthy and Assistant Secretary of the Army Katherine Hammack. It was a cordial meeting with minimal discussion. Ms. Hammock made a few points for Army and provided a binder of information to the Administrator, asking her to evaluate this information along with information presented previously by Army. Army is now waiting on the decision.

Mr. Tzhone stated that the dispute comes down basically to a policy decision on what direction EPA wants to go on groundwater clean-up. Mr. Lederle stated that the remedy itself is not in question, but finer points about how it is handled over the long term. Mr. Tzhone agreed, and stated that it is essentially a dispute over where the remedy stops (clean-up goals). Mr. Fortune asked who makes the final decision if Army and EPA can't agree. Mr. Mayer stated that the FFA dictates the dispute resolution and the FFA indicates the EPA Administrator is the final word. However, Mr. Lederle stated there is one more level of appeal where the issue could be referred to the Office of Management and Budget where disputes between federal agencies are mediated. Mr. Tzhone stated that this particular dispute is a Longhorn dispute, but the topic under dispute could have wider implications.

Dr. Zeiler stated that the dispute has stopped work at most of the LHAAP sites (LHAAP-03, LHAAP-04, LHAAP-16, LHAAP-17, LHAAP-47, LHAAP-001-R-01, and LHAAP-003-R-01). Additionally, work at LHAAP-29 continues only because an additional remedy is being evaluated for addition to the feasibility study, and will stop once that work is complete. Ms. Palmie and Dr. Zeiler stated that Army is doing everything they can do that is not impacted by the dispute.

Ms. Orsak asked if the RAB will be provided with an update on all the delayed sites once the dispute has been resolved. Mr. Wacker stated that a status refresher will be provided when work begins again. RODs may require modification depending upon the EPA Administrator decision. After that, remedial designs and remedial action work plans will need to be created so it will likely be another year before work actually resumes. Mr. Tzhone asked if the planning of the work can be done in advance of dispute resolution. Dr. Zeiler stated that some of this has been done and she already has some of the remedial design documents on her desk for review; however, these may need to be revised based on dispute outcome.

LHAAP-12 and LHAAP-16 Ongoing Activities
Mr. Wacker provided an update of ongoing maintenance work at LHAAP-12 and LHAAP-16. See attached presentation for details.

Five-Year Review Report
Mr. Wacker stated that the update of the Five-Year Review of sites that have been closed with contamination in place has been completed. A copy of the finalized document was available for RAB examination during the meeting.

Schedule

Next RAB Meeting Schedule and Closing Remarks

Next RAB meeting is tentatively scheduled for August 7th from 6PM – 7:30PM at the Karnack Community Center.

A motion to adjourn was made by Mr. Pollard and seconded by Mr. Fortune.

Adjourn

May Meeting Attachments and Handouts:

- *Meeting Agenda*
- *Minutes from February 2014 RAB meeting*
- *AECOM PowerPoint Presentation*
- *AECOM RAB Tour PowerPoint Presentation*
- *GWTP Treated Groundwater Volumes Handout*
- *Surface Water Sampling Results Handout*
- *LHAAP Perimeter Well Sampling Results Handout*

Acronyms

AECOM	AECOM Technical Services, Inc.
BRAC	Base Realignment and Closure
CERCLA	Comprehensive, Environmental Response, Compensation, and Liability Act
CLI	Caddo Lake Institute
CPT/MIP	Cone Penetrometer Testing/Membrane Interface Probe
DERP	Defense Environment Response Program
DNAPL	Dense Non-Aqueous Phase Liquid
DPT	Direct Push Technology
FFA	Federal Facility Agreement
GWTP	Groundwater Treatment Plant
ICT	interceptor-collector trench

INF	Intermediate-Range Nuclear Forces
ISB	In-Situ Bioremediation
LHAAP	Longhorn Army Ammunition Plant
LNAPL	Light Non-Aqueous Phase Liquid
MNA	Monitored Natural Attenuation
PCE	tetrachloroethylene
RAB	Restoration Advisory Board
ROD	Record of Decision
TAG	Technical Assistance Grant
TCE	trichloroethene
TCEQ	Texas Commission on Environmental Quality
USACE	United States Army Corps of Engineers
USAEC	United States Army Environmental Center
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
µg/L	micrograms per liter
VOC	volatile organic compound

LONGHORN ARMY AMMUNITION PLANT
RESTORATION ADVISORY BOARD
Karnack, Texas
(479) 635-0110

AGENDA

DATE: Thursday, May 15, 2014
TIME: 6:00 – 7:30 PM
PLACE: Karnack Community Center, Karnack, Texas

06:00 Welcome and Introduction

06:05 Open Items {RMZ}
- RAB Administrative Issues
- Minutes
- Tour of Longhorn Sites Question & Answer
- Website

06:15 Defense Environmental Restoration Program (DERP) Update {AECOM}
- On-going work LHAAP 18/24, LHAAP 29
- Groundwater Treatment Plant (GWTP) Update
- Dense Non-Aqueous Phase Liquids (DNAPLs)
- MNA Site Overview (LHAAP-46, 50, 58, 67)
- Surface Water and Perimeter Well Sampling

07:15 Other Environmental Restoration Issues {RMZ}
- Bioplug Demonstration at LHAAP-37
- Dispute Status Update
- Schedule
- Environmental Condition of Property VII

07:20 Next RAB Meeting Schedule and Closing Remarks

07:30 Adjourn {RMZ}

AECOM

Subject:	**Final Minutes, Quarterly Restoration Advisory Board (RAB) Meeting, Longhorn Army Ammunition Plant (LHAAP)**
Location of Meeting:	**Karnack Community Center, Karnack, Texas**
Date of Meeting:	**February 20, 2014, 6:00 – 7:30 PM**

Meeting Participants:

LHAAP/BRAC:	Rose M. Zeiler
USACE:	Aaron Williams, Rick Smith
USAEC:	Robin Paul
AECOM:	Dave Wacker, Gretchen McDonnell
TCEQ:	April Palmie
USEPA Region 6:	Rich Mayer, Janetta Coats, Kent Becher (USGS liaison), Barry Forsythe (USFWS Liason)
USFWS:	Paul Bruckwicki
RAB:	**Present:** Paul Fortune, Terry Britt, Charles Dixon, Carol Fortune, Judith Johnson, Ted Kurz, Richard LeTourneau, Tom Walker, John Pollard, Jr., Nigel Shivers, Pickens Winters **Absent:** Ken Burkhalter, Robert Cargill, Lee Guice, James Lambright, Judy Vandeventer
Public:	Dawn Orsak, CLI-TAG Mary Britt, Carlos Black, Joe Black, Robert Keathley

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An agenda handout for the RAB meeting was provided for the meeting. Additional hard copy meeting materials provided included the AECOM slide presentation, a surface water and perimeter well perchlorate data handout, and a GWTP summary handout showing pounds of chemicals removed and volume of water treated. Draft November 2014 RAB meeting minutes were provided to RAB members for review prior to the meeting.

Welcome – Rose Zeiler

Mr. Fortune opened the meeting and invited any first-time attendees to introduce themselves.

Mr. Joe Black introduced himself as a first-time meeting attendee, but lifelong Caddo Lake area resident. Mr. Black stated his son, also named Joe Black, is a candidate for Harrison County judge.

Open Items – Rose Zeiler

Minutes
Ms. McDonnell noted that one change was made to the version of the minutes that had been distributed for RAB review, which was to correct the name of the church where Mr. Pollard serves as deacon. Ms. Fortune made a motion to approve the November 2013 RAB meeting minutes. Motion seconded by Mr. Pollard.

Tour of Longhorn Sites Planned for May
By vote of the RAB members, the tour was scheduled for May 15th at 3PM. Participants should meet in front of the entrance for the USFWS building, just inside the gates of the refuge. The tour will likely take two hours. The tour is for RAB members, but members of the public may attend if their name and contact information is submitted in advance.

New Members
Mr. Kurz stated that he knew a potential candidate for the RAB. Mr. Fortune asked that AECOM provide an application.

Website
The Longhorn website is schedule for debut at the next RAB meeting. When the site becomes active, a notice will be sent to the RAB members and the interested parties list. The address will be http://www.longhornaap.com.

A map of the site will allow viewers to click on a site of interest, and be led directly to documents relating to that site. Groundwater plume map updates, fact sheets on remedial technologies in use, and administrative record documents are anticipated to be available on the website.

Installation Action Plan
Dr. Zeiler asked the group if any RAB member had not received their copy of the Installation Action Plan. No member indicated they had not received the document.

Open Questions
Ms. Coats, USEPA, asked if any local government officials had requested tours of Longhorn. Dr. Zeiler stated that local government officials are on the Longhorn interested parties list, so receive notifications of Longhorn RAB activities, but no requests have been received for several years. Dr. Zeiler stated that the interested parties list would be reviewed to ensure it is updated to include current local government officials. William Hatfield was identified as the current county commissioner for the Longhorn area and should be on the interested parties list.

Defense Environmental Restoration Program (DERP) Update – AECOM (Dave Wacker)

Fieldwork Completed and Upcoming Field Activities Planned
Mr. Wacker provided a brief overview of the CERCLA process phases, to facilitate discussion on the status of progress at several LHAAP sites where field work has recently been completed or is underway (LHAAP-46, LHAAP-67, LHAAP-18/24, LHAAP-35B(37), LHAAP-50,

LHAAP-35A(58), LHAAP-12 and LHAAP-16). Five sites (LHAAP-46, LHAAP-67, LHAAP-35B(37), LHAAP-50, LHAAP-35A(58)) are currently in the “remedy in place” phase of the process, undergoing monitored natural attenuation (MNA). See attached AECOM PowerPoint presentation for maps and tables associated with sites referenced below.

LHAAP-46 Plant 2 Area Update – Remedy In Place

Primary contaminant is trichloroethene (TCE) in groundwater with a maximum current concentration of 144 micrograms per liter (μg/L), and a clean-up level of 5 μg/L. The remedy for the site is MNA and land use controls, so additional wells were installed earlier this year and the initial monitoring round conducted.

Contamination at the site consists of shallow (to ~30’ bgs) and intermediate (~30-60’ bgs) groundwater zone plumes with a total of 21 wells now being monitored to observe the plumes. Mr. Wacker showed maps of the shallow and intermediate zone groundwater TCE plumes. Quarterly MNA monitoring is in progress. A Remedial Action Completion Report is being generated at this time.

Mr. Fortune asked how long a site will be monitored to determine whether MNA is a suitable remedy. Eight quarters of monitoring are prescribed before enough data is collected to perform an initial evaluation of MNA effectiveness. Mr. Wacker stated that the total estimated duration to complete remediation is stated in the ROD. Mr. Fortune asked when the quarterly monitoring started. Mr. Wacker stated that the remedy for LHAAP-46 has been in place for about a year, and the eight quarters of monitoring needed to judge MNA effectiveness started when the remedy was put in place. Mr. Fortune asked if there was additional data collected from prior to AECOM that could be used in determining whether MNA is working. Mr. Wacker stated that, although older data was used for nature and extent definition prior to implementation of the remedy, the eight quarters of monitoring needed to judge the effectiveness of MNA started when the remedy was implemented.

LHAAP-67 AST Farm – Remedy In Place

This site has TCE concentrations similar to the LHAAP-46 site, but confined to the shallow groundwater zone. MNA and land use controls for TCE in groundwater is the remedy. Additional wells were installed and the initial monitoring round conducted. The total plume size is relatively small, approximately 300 feet by 400 feet.

A Remedial Action Completion Report is being generated at this time, and the annual report will be prepared in August 2014.

LHAAP-18/24 Burning Ground 3 & Unlined Evaporation Pond – Interim Remedy In Place

As background, Mr. Wacker stated that LHAAP-18/24 was the primary waste management area for LHAAP and is the most highly contaminated site at Longhorn. Currently, the interim remedial action in place consists of collection of impacted groundwater from collection trenches (located along down-gradient sides of the site and in hot spots within the site), and routing of collected groundwater to the GWTP for removal of contaminants. Annual sampling of the interceptor collection trenches (ICTs), will be conducted in February.

A significant amount of additional investigation work has been completed at LHAAP-18/24 this year toward completing a revised feasibility study for the site, and additional work is being proposed to collect more information required to support the revised feasibility study. The additional work relates to defining the extent of DNAPL source material in the former Unlined Evaporation Pond (UEP) area where liquid wastes were disposed on a daily basis during the site's operation.

Mr. Fortune asked for clarification on the UEP versus the INF Pond. Mr. Wacker explained that the UEP was a waste disposal area within the LHAAP-18/24 site. The INF Pond is in different location, not within the LHAAP-18/24 site, where treated water from the GWTP can be stored when water cannot be discharged to Harrison Bayou due to low water flow in the bayou.

LHAAP-35B(37) – Chemical Laboratory – Remedy In Place
This site is the former Chemical Laboratory with shallow groundwater impacted by tetrachloroethylene (PCE) and TCE plumes. LHAAP-35B(37) is also the site of the bioplug demonstration study being conducted by the US Army's Aberdeen Testing Center. The bioplug demonstration study is separate from the remediation specified in the ROD for the site.

If the bioplug approach does not reduce contaminants to acceptable levels during its performance period, the aquifer will be allowed to return to natural conditions and AECOM will begin the monitored natural attenuation remedy as approved in the ROD. AECOM has already installed the MNA monitoring well network specified in the ROD.

LHAAP-50 Former Sump Water Tank – Remedy In Place

LHAAP-50 was the site of a large above-ground water tank that received sump water from across the plant. Issues at the site are perchlorate in soil, and perchlorate and VOCs in groundwater.

Areas of perchlorate-impacted surface soil have been excavated and removed (approximately 183 cubic yards), and disposed at an off-site landfill. Mr. Wacker showed a map defining the excavation area.

To address groundwater, 19 new monitoring wells were installed to support implementation of the approved monitored natural attenuation remedy. An annual report will be prepared to provide an evaluation of the remedy.

LHAAP-58 Shops Area – Remedy In Place
Multiple plant activities that were conducted in this area and could have contributed to contamination at the site (paint shop, laundry, carpentry, etc.). VOCs have impacted groundwater at the site. There are two separate groundwater plumes; "eastern plume" and "western plume", each with their own remediation strategy.

In the center of the east plume, where concentrations are on the order of a few thousand micrograms per liter, In-Situ Bioremediation (ISB) is being completed to more aggressively treat those higher concentration impacts. Approximately 225 gallons of Wil-Clear Plus, a sodium lactate food source for microbes that will degrade VOCs, was injected at each of 12 injection points in the east plume. Injection of the food source was followed by injection of bioaugmentation solution after confirmation that the type of microbes required to degrade the contaminants were not present at the site. This site is subject to quarterly MNA monitoring.

Mr. Wacker reviewed some initial contaminant data from the eastern plume, showing a reduction of PCE and TCE in well 03WW01. However, well 35AWW09 showed an increase of PCE, which is likely due to movement of contaminated water resulting from injection of the food source and bioaugmentation solution. Mr. Wacker used these examples to illustrate why we perform eight quarters of sampling over two years to obtain a better view of the actual performance of the remedy after the immediate effects of fluid injection dissipate.

Mr. Fortune asked what the western plume contaminants were. Mr. Wacker stated that the contaminant is TCE. Mr. Fortune asked what activities were done to create the contamination. Mr. Wacker stated that there were multiple operations in this area that could have caused solvent impacts, including a paint shop.

LHAAP-12 and LHAAP-16 – Remedy In Place (Operation and Maintenance)

Continuing operation and maintenance activities have been performed at these landfill sites.

Annual sampling of wells associated with LHAAP-12 was recently completed. MNA is being reevaluated at LHAAP-12 and there is the possibility some minor additional work may be done (i.e., installation of a new well). The contaminant concentrations at LHAAP-12 are fairly low and Army is working to demonstrate that MNA is reducing contaminant concentrations at the site. This year, MNA effectiveness could not be effectively evaluated because the only contaminated well at the site was dry during the sampling event, and could not be sampled, leaving us without a new data point for the trend analysis.

As an interim measure to prevent impacts to Harrison Bayou, LHAAP-16 has extraction wells collecting water for treatment at the GWTP. The annual sampling of these extraction wells was done in February. An additional round of sampling more wells at LHAAP-16 was done a few months ago, and that data will likely be presented at the next RAB meeting. Mr. Wacker noted that decision on a final remedy for LHAAP-16 has been delayed due to the dispute between Army and USEPA.

CERCLA 5-Year Review Process for Multiple Sites

The 5-Year Review has been performed and the report document is being reviewed by the USEPA. The review included sites with either final or interim remedies in place, such as LHAAP-12 and LHAAP-16 landfill sites, LHAAP-18/24 associated with the GWTP, the Pistol Range and LHAAP-49 Acid Storage Area.

Mr. Wacker explained that a CERCLA 5-Year Review is required every five years for any site that has been closed but not restored to unrestricted use conditions. Sites at Longhorn that are restored to conditions suitable for future industrial use, but not suitable for residential use, require these reviews.

GWTP

The GWTP continues to operate to contain the groundwater plumes at LHAAP-18/24 and LHAAP-16. See attached handout showing treated groundwater volumes and mass of chemicals removed. Treated water is either discharged to Harrison Bayou or released back to the LHAAP-18/24 site.

Mr. Dixon asked if the chemicals removed from groundwater are destroyed or released to the air. Mr. Wacker stated that perchlorate is destroyed by bacterial treatment. Metals are precipitated from the water, resulting in a small amount of sludge that is periodically disposed of at a landfill. VOCs are stripped from the water and discharged to the air, with air discharges being monitored in several locations to ensure Texas air standards are not exceeded. Mr. Wacker pointed out that air samples have been collected from multiple locations for over a year without any Texas air standard being exceeded. Dr. Zeiler stated that the GWTP will be on the Longhorn RAB tour route in May, where the RAB will be provided with a briefing on how the plant works.

Perimeter Well and Surface Water Sampling

Perchlorate sampling is conducted quarterly for groundwater at several locations along the perimeter of the former facility footprint in accordance with the 1999 dispute resolution. Historically, Army voluntarily sampled these wells for a wide variety of chemicals that were used at the plant. Surface water is also sampled for perchlorate at five locations. The latest quarterly data is from the September 2013 sampling event indicated no detections of perchlorate at any of the surface water sampling locations (see attached handout), and no real changes in observations from the monitoring wells.

Upcoming Work, Meetings and Documents

Remedial Action Operation quarterly sampling will continue at LHAAP-46, LHAAP-50, LHAAP-58 and LHAAP-67. Semi-annual compliance sampling will be conducted at LHAAP-18/24 in May. Finalization of the CERCLA 5-Year Review report will be signed this year. Generation of remedial action completion reports for LHAAP-37, LHAAP-46, LHAAP-50, LHAAP-58 and LHAAP-67 is ongoing.

LHAAP-18/24 and LHAAP-29 will have some additional field work completed to install a few wells, and perform some soil sampling associated with the feasibility studies for both the sites. Work on remaining sites will be delayed until resolution of the dispute between Army and USEPA.

Mr. LeTourneau asked who is responsible for abandonment of monitoring wells once they are no longer needed. Dr. Zeiler stated that most wells are maintained for long periods of time, beyond the contract duration of any one consultant, so the Army is responsible for abandonment of wells.

Other Environmental Restoration Issues – Rose Zeiler

Dispute Resolution

Mr. Wacker showed a list of sites where work is being delayed due to the dispute between Army and USEPA over clean-up levels and land use controls. Mr. Mayer explained that USEPA has a dispute process that is followed when they disagree with what another federal agency wants to do with respect to conducting clean-up of sites. Mr. Mayer stated that the Longhorn dispute is being worked at the highest levels in both Army and USEPA, where it is in the hands of the Deputy Assistant Secretary of the Army and the USEPA Administrator.

Mr. Mayer stated that a meeting between Army and USEPA had been planned for next week, but it has now been tentatively rescheduled for April.

Mr. Fortune asked if the dispute will be settled at this meeting. Mr. Mayer stated that the Deputy Assistant Secretary of the Army will present their side of the dispute to the USEPA Administrator during this meeting, and the USEPA Administrator will likely make a decision after that meeting. Dr. Zeiler stated that the Army has an appeal process to follow if the Army does not agree with the USEPA Administrator’s decision.

Mr. Britt asked what we are doing to make sure conditions are not degrading while the dispute goes on. Dr. Zeiler stated that we are doing monitoring.

Dr. Zeiler asked AECOM to prepare a slide bulleting the dispute issues for the next RAB meeting.

DNAPL Presentation

Dr. Zeiler provided a basic introduction to Dense Non-Aqueous Phase Liquids, or DNAPLs. DNAPLS are heavier than water, opposed to light non-aqueous phase liquids (LNAPLs) like gasoline or oil which will float on water. Due to their density, DNAPLs will travel down through the subsurface until they hit an aquitard (a layer that impedes its progress, like a clay). The layered sands and clays at Longhorn provide discontinuous “shelves” of limited extent that can be overflowed with DNAPL. (See attached AECOM Powerpoint presentation slides 8 through 10 for an illustration of how DNAPL moves in the subsurface.)

There are areas where DNAPL “pools” in places, but there is also “residual” left behind in cracks and fractures where DNAPL once was in greater quantities. Our biggest challenge is to find it. Whatever treatment is used, it will be to treat that DNAPL where it is. DNAPL is extremely difficult to clean-up. In 2003, well-known contaminant hydrogeologist John Cherry said that a DNAPL residual site had never been remediated to true drinking water standards. Many DNAPL sites have instead been remediated to “alternative clean-up levels” developed and agreed to by regulatory agencies because the technology did not exist to achieve clean-up to drinking water standards. In summary, Ms. Zeiler stated that the best approach is to find the DNAPL and get rid of it, because it is a long-term endeavor to clean-up residual DNAPL left in an aquifer.

For LHAAP-18/24 and LHAAP-29, we will be working to collect additional data to more closely define the volumes of DNAPL we need to treat so we can identify which technology has the best chance of success. Mr. Mayer stated that even dissolved-phase chlorinated solvents are very difficult to remediate because they partition into soil materials and then release into groundwater later. Mr. Mayer further stated that over 100 sites nationwide have been approved for an alternative clean-up level because they have tried various technologies and demonstrated that remediation to the USEPA maximum contaminant level (MCL) is “impracticable”.

Mr. LeTourneau asked what depth the contamination is at. Mr. Wacker stated that LHAAP-29 has contaminants at 90 feet below ground surface. The perimeter of the contamination has been defined horizontally, and we have identified clean groundwater underneath the contamination at 90 feet, but we need to tighten the perimeter to know better how much true volume we are dealing with. Mr. LeTourneau asked how we know contamination will not move from where it is now at 90 feet down to 150 feet or other depths. Dr. Zeiler remarked that is was a primary question, but not one that anyone here could answer, but we do believe the contamination moved quickly to where it is now, in a matter of days or months rather than years. We know where the bottom of the contamination is now, but it could change. An aquitard could stop the travel of the contaminant, but if the aquifer is fractured or discontinuous, it could allow contamination to move deeper.

Mr. Kurz asked whether the work at Longhorn would end up being judged as having diminishing returns at some point, resulting in the government ending funding of remediation work there. Dr. Zeiler responded that Army must continue to fund remediation work at Longhorn until remediation is complete. For funding, Army generates a liability projection every year for their sites as part of the budgeting process, and it projects costs for the next 30 years. Until Army can demonstrate that a clean-up goal will be met, costs will be projected for 30 years out every year.

Dr. Zeiler went on to explain that when a remedial technology reaches a point of “diminishing returns”, you typically to switch to a different method to reach the end goal. Or, using LHAAP-29 as an example, when you find the assumptions made when the remedy was decided were not valid, another option needs to be explored. For LHAAP-29, an additional technology will be evaluated and treatability testing done to ensure options being evaluated are viable. The last resort is to arrive at agreement on an alternative clean-up standard, as has been done at many sites with residual DNAPL impacts similar to LHAAP-18/24, where clean-up to the usual standards is beyond our existing technology.

Mr. Fortune stated that when Longhorn first became an National Priorities List site, the initial estimates given for time and funding to remediate Longhorn were 6-7 years and $50M dollars to clean-up. Mr. Mayer stated that the estimates done at that time were done before migration of contaminants was well understood, and what has been learned since then that has shown those estimates to be invalid.

Look Ahead at the Schedule

Next RAB meeting is tentatively scheduled for May 15th from 6PM – 7:30PM at the Karnack Community Center.

A motion to adjourn was made by Ms. Fortune and seconded by Mr.Britt.

Adjourn

February Meeting Attachments and Handouts:

- *Meeting Agenda*
- *Minutes from November 2013 RAB meeting*
- *AECOM Powerpoint Presentation*
- *GWTP Treated Groundwater Volumes Handout*

- *Surface Water Sampling Results Handout*

Acronyms

AECOM	AECOM Technical Services, Inc.
bgs	below ground surface
BRAC	Base Realignment and Closure
CERCLA	Comprehensive, Environmental Response, Compensation, and Liability Act
CLI	Caddo Lake Institute
DERP	Defense Environment Response Program
DNAPL	Dense Non-Aqueous Phase Liquid
GWTP	Groundwater Treatment Plant
ICT	interceptor-collector trench
INF	Intermediate-Range Nuclear Forces
ISB	In-Situ Bioremediation
LHAAP	Longhorn Army Ammunition Plant
LNAPL	Light Non-Aqueous Phase Liquid
MCL	Maximum Contaminant Level
MNA	Monitored Natural Attenuation
PCE	tetrachloroethylene
RAB	Restoration Advisory Board
ROD	Record of Decision
TAG	Technical Assistance Grant
TCE	trichloroethene
TCEQ	Texas Commission on Environmental Quality
TSDH	Texas State Department of Health
UEP	Unlined Evaporation Pond
USACE	United States Army Corps of Engineers
USAEC	United States Army Environmental Center
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
µg/L	micrograms per liter
VOC	volatile organic compound

LONGHORN ARMY AMMUNITION PLANT
RESTORATION ADVISORY BOARD
Karnack, Texas
(479) 635-0110

AGENDA

DATE: Thursday, February 20, 2014
TIME: 6:00 – 7:30 PM
PLACE: Karnack Community Center, Karnack, Texas

06:00 Welcome and Introduction

06:05 Open items {RMZ}
- RAB Administrative Issues
- Minutes
- Tour of Longhorn Sites Planned for May
- Website
- Installation Action Plan

06:15 Defense Environmental Restoration Program (DERP) Update {AECOM}
- Fieldwork completed and upcoming field activities planned
- Groundwater Treatment Plant (GWTP) Update
- Environmental Update for Active Sites (progress since last meeting)

06:50 Other Environmental Restoration Issues {RMZ}
- Sitewide LUC Management Plan Update
- Bioplug Demonstration at LHAAP-37
- Dispute Status Update
- Schedule

07:00 Presentations:
- Dense Non-Aqueous Phase Liquids (DNAPLs)

07:30 Adjourn {RMZ}

AECOM

Subject:	**Final Minutes, Quarterly Restoration Advisory Board (RAB) Meeting, Longhorn Army Ammunition Plant (LHAAP)**
Location of Meeting:	**Karnack Community Center, Karnack, Texas**
Date of Meeting:	**November 14, 2013, 6:00 – 7:30 PM**

Meeting Participants:

LHAAP/BRAC:	Rose M. Zeiler
USACE:	Aaron Williams, Rick Smith
USAEC:	Marilyn Plitnik, Robin Paul, Cathy Kropp
AECOM:`	Dave Wacker, Gretchen McDonnell
TCEQ:	April Palmie
USEPA Region 6:	Rich Mayer, Janetta Coats, Kent Becher (USGS)
USFWS:	Paul Bruckwicki, Jason Roesner
RAB:	**Present:** Paul Fortune, Carol Fortune, Richard LeTourneau, Tom Walker, Judith Johnson, James Lambright **Absent:** Judy Vandeventer, Ken Burkhalter, Ted Kurz, Charles Dixon, Pickens Winters, Robert Cargill, Lee Guice, Nigel Shivers
RAB Candidates	Terry Britt, John Pollard, Jr.
Public:	Rick Lowerre, CLI-TAG Bridget LaBorde and Robert Whittaker, TMD Technologies Group Tina Walker, Tom Ellerbee, Carrie Bradford, and David Rivera, Texas State Department of Health

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An agenda handout for the RAB meeting was provided for the meeting. Additional hard copy meeting materials provided included the AECOM slide presentation, Draft July RAB meeting minutes, a surface water and perimeter well perchlorate data handout, and a GWTP summary handout showing pounds of chemical s removed and volume of water treated.

Welcome – Rose Zeiler

Ms. Zeiler welcomed attendees to the meeting. Special guests were introduced by Ms. Zeiler:

- TMD Technologies Group (Ms. LaBorde and Mr. Whitaker) will be presenting an update on the demonstration study being conducted at LHAAP-37.
- Texas State Department of Health (TSDH) representatives (Mr. Rivera, Mr. Ellerbe, Ms. Walker and Dr. Bradford). Mr. Ellerbe stated that TSDH brought a handout to the meeting containing information relating to Longhorn, and that if anyone has any questions related to public health, they should contact TSDH.
- Ms. Cathy Kropp from US Army Environmental Center was introduced and will be providing an overview of the Longhorn RAB charter and the process of appointing new members.
- Mr. Rick Lowerre of Caddo Lake Institute (CLI) was introduced.
- Mr. Rick Smith of the U.S. Army Corps of Engineers (USACE) was introduced as replacing Mr. John Lambert as the USACE Project Manager for Longhorn.
- Mr. Terry Britt, a RAB membership candidate, was also introduced.

Open Items – Rose Zeiler

Minutes
Ms. Fortune made a motion to approve the July 2013 RAB meeting minutes. Motion seconded by Ms. Johnson.

New Members
Ms. Kropp provided a summary of the RAB member selection process and the RAB charter. Community RAB members must agree to attend regularly and on a voluntary basis (no compensation). A two-thirds vote of sitting RAB members in attendance is required to approve a new RAB member, and membership is effective starting with the next meeting, assuming approval of the Army BRAC Director.

Mr. Terry Britt was introduced as an applicant for RAB membership. Mr. Britt stated he is a resident of Uncertain, and has already been attending RAB meetings. Mr. Britt is interested in restoration of the refuge as a community member and hunter. Mr. Britt is also the President of the Caddo Lake WSC, with public water supply wells near the boundary of the former LHAAP footprint.

Mr. John Pollard, Jr. (arriving after the meeting was called to order) was introduced upon arrival as an applicant. Mr. Pollard stated that he is 79 years old and married, with children and grandchildren. Mr. Pollard served in the United States Army from 1954 – 1957 and is a deacon at Ebenezer Baptist Church in Marshall. Mr. Pollard stated that he feels it is important to be educated on what is going on in the community, and was interested in RAB membership when he saw the newspaper solicitation. Mr. Pollard is on the city planning and zoning commission, and has been on other boards in the past.

The voting members of the RAB in attendance were provided with paper ballots, and voted unanimously to accept both Mr. Britt and Mr. Pollard as new members. Mr. Britt and Mr. Pollard will be officially seated after approval by Mr. Tom Lederle, Army BRAC Director.

Tour
A RAB tour of Longhorn environmental sites will be scheduled for May on the day of the RAB meeting.

LHAAP-37 Bioplug Demonstration Project Update

Ms. Bridget LaBorde and Mr. Robert Whitaker of TMD Technologies Group provided a presentation explaining the Bioplug demonstration project being conducted at LHAAP-35B(37) by Aberdeen Test Center. RAB member questions regarding the technology were answered. See attached LHAAP-37 Bioplug Demonstration Study Presentation. RAB members were given the opportunity to ask questions about the technology.

Ms. Zeiler prefaced the presentation by saying that, prior to implementation of the approved monitored natural attenuation (MNA) remediation remedy for LHAAP-37, Aberdeen Test Center requested permission to conduct a demonstration study using the “bioplug” remediation technology at the site. Army is holding off on full implementation of the approved MNA remedy while the demonstration study is conducted to see what this technology can do to address the groundwater impacts.

Ms. LaBorde stated that the June 2013 data (after 8 months of operation) was not showing a trend for remediation, attributed to slower-than-anticipated groundwater flow across the site. Groundwater elevations have dropped at the site due to relatively dry conditions over the past several years, and groundwater flow rates have decreased along with that. However, September 2013 data (after 11 months of system operation) showed trends in some wells for degradation of volatile organic compounds (VOCs). The system is planned to operate for a total of 24 months.

Defense Environmental Restoration Program (DERP) Update – AECOM (Dave Wacker)

Fieldwork Completed and Upcoming Field Activities Planned
Mr. Wacker provided an update and summary of several sites where field work has recently been completed or is underway (LHAAP-46, LHAAP-67, LHAAP-18/24, LHAAP-35B(37), LHAAP-50, LHAAP-35A(58), LHAAP-03, LHAAP-12 and LHAAP-16). See attached AECOM PowerPoint presentation for maps and tables referenced below. Mr. Wacker also noted a display of photographs depicting recent field work conducted.

<u>LHAAP-46 Plant 2 Area Update – Remedy In Place</u>

Primary contaminant is trichloroethene (TCE) in groundwater at levels less than 100 micrograms per liter (μg/L), with a clean-up level of 5 μg/L. The remedy for the site is MNA and land use controls, so additional wells were installed earlier this year and the initial monitoring round conducted.

Contamination at the site consists of shallow (to ~30’ bgs) and intermediate (~30-60’ bgs) groundwater zone plumes with a total of 21 wells now being monitored to observe the plumes. Mr. Wacker showed maps of the shallow and intermediate zone groundwater TCE plumes, comparing how the plumes were mapped before and after the addition of data from 7 new monitoring wells installed this Spring.

Mr. Wacker noted that during the most recent sampling event several of the wells monitoring the east side of the shallow groundwater zone plume were dry due to drought conditions. If water returns to those wells, the shape of the plume could change if the water is impacted. The analytical results from the first round of sampling were similar to historical results.

The intermediate groundwater zone plume was previously mapped as one continuous area of impact. However, analytical results from the first round of sampling showed no impacts at 46WW09, resulting in the plume being redrawn as two separate but smaller areas of contamination. Delineation of the north edge of the northern plume area has not been accomplished, so another well will be installed in that area to obtain a clean data point that defines the extent of the plume when future field work is completed in the next several months.

<u>LHAAP-67 AST Farm – Remedy In Place</u>

This site has TCE concentrations similar to the LHAAP-46 site, but confined to the shallow groundwater zone. MNA and land use controls for TCE in groundwater is the remedy. Additional wells were installed and the initial monitoring round conducted.

New wells and direct push sampling identified groundwater impacts farther to the west than had been previously mapped, so the next plume configuration map the RAB will see will show the plume extending farther west. The total plume size is still relatively small, approximately 300 feet by 400 feet.

<u>LHAAP-18/24 Burning Ground 3 & Unlined Evaporation Pond – Interim Remedy In Place</u>

A significant amount of additional investigation work has been completed at LHAAP-18/24 this year and a draft data report has been generated and submitted to TCEQ and EPA for review and comment. Ultimately, a revised feasibility study will be completed for the site.

As background, Ms. Zeiler stated that LHAAP-18/24 is the most highly contaminated at Longhorn. Mr. Wacker added that, because of the high level of contamination, compliance monitoring is performed at this site semi-annually, with ~60 wells being sampled during each event and the next event is planned for December.

<u>LHAAP-35B(37) – Chemical Laboratory – Remedy In Place</u>

This site is the former Chemical Laboratory with shallow groundwater impacted by tetrachloroethylene (PCE) and TCE plumes. LHAAP-35B(37) is the subject of the bioplug demonstration study briefed earlier in the meeting by TMD Technologies Group.

If the bioplug approach does not reduce contaminants to acceptable levels, the aquifer will be allowed to return to natural conditions and AECOM will begin the approved remedy using monitored natural attenuation. New wells have recently been installed, so the approved monitored natural attenuation remedy is ready for implementation if the bioplug activity is not successful.

<u>LHAAP-50 Former Sump Water Tank – Remedy In Place</u>

LHAAP-50 was the site of a large above-ground water tank that received sump water from across the plant. Issues at the site are perchlorate in soil, and perchlorate and VOCs in groundwater.

Two areas of perchlorate-impacted soil were recently excavated and removed (approximately 183 cubic yards), and disposed at an off-site landfill. Mr. Wacker showed several photographs of the excavation work that had been performed, including photos demonstrating the depth of the excavation and silt fencing installed between the excavation site and the nearby Goose Prairie Creek.

Confirmation samples were taken to establish that all perchlorate-impacted soils exceeding the clean-up goals had been removed, and the area was backfilled with clean soil. The confirmation sampling layout showing samples collected from the floor and sidewalls of the excavation was presented and explained.

To address groundwater 19 new monitoring wells were installed to support implementation of the approved monitored natural attenuation remedy.

LHAAP-58 Shops Area – Remedy In Place

Multiple plant activities were completed in this area and could have contributed to contamination at the site. VOC impacts to groundwater is the issue at the site. There are two groundwater plumes; “eastern plume” and “western plume”, each with their own remediation strategy.

In the heart of the east plume, where concentrations are on the order of a few thousand micrograms per liter, In-Situ Bioremediation (ISB) is being completed to more aggressively treat those higher concentration impacts. Approximately 225 gallons of Wil-Clear Plus, a sodium lactate nutrient for microbes that will degrade VOCs, was injected at each of 12 injection points in the east plume over a month ago. Nutrient was injected at depths of between 23 and 33 feet bgs. Mr. Wacker presented and explained photographs of the injection event activities. The type of microbes required to degrade the contaminants were not present at the site as confirmed by a treatability study completed several months ago by the Army, so bioaugmentation was performed this week to add the required microbes. Approximately one gallon of augmentation solution was injected at each of the locations. The next sampling event will be in January and will collect data to monitor progress of the ISB activities.

Fifteen new groundwater monitoring wells were installed this summer at LHAAP-58 to allow implementation of the monitored natural attenuation remedy for both the eastern and western plumes.

LHAAP-03 – Record of Decision In Progress

LHAAP-03 is a small area within LHAAP-35A(58) associated with the former paint shop. The remedy consists of excavating an approximate 20-feet by 25-feet area (~50 cubic yards) of shallow soil that is impacted with arsenic and lead, for landfill disposal. This will result in two or three truckloads of soil being transported. Any groundwater issues associated with LHAAP-03 will be dealt with as part of LHAAP-35A(58) which fully-encompasses LHAAP-03. Army has received TCEQ’s comments on the Record of Decision, and is awaiting EPA’s comments.

LHAAP-12 and LHAAP-16 – Remedy In Place (Operation and Maintenance)
Continuing operation and maintenance activities have been performed at these landfill sites. Repainting and relabeling of wells has been a recent focus to improve visibility.

CERCLA 5-Year Review Process for Multiple Sites
The 5-Year review has been performed and the report document is being reviewed by the agencies. The review includes LHAAP-12 and LHAAP-16 which are landfill sites with remedies in place, LHAAP-18/24 associated with the GWTP, the Pistol Range and LHAAP-49 Acid Storage Area.

GWTP
The GWTP continues to operate to contain the groundwater plumes at LHAAP-18/24 and LHAAP-16. See attached AECOM PowerPoint Presentation for more detail where a groundwater extraction data chart and contaminant mass was presented. There has been no flow in Harrison Bayou lately to facilitate discharge of treated water, so treated water has been applied to the ground surface of LHAAP-18/24 through the sprinkler system. The next semi-annual compliance monitoring event for LHAAP-18/24 will be conducted at the end of the month. Preventive maintenance and repairs continue. Quarterly extraction rates are on par with what has been extracted historically.

Perimeter Well Sampling
Perchlorate sampling is conducted for groundwater at several locations along the perimeter of the former facility footprint. A table showing perchlorate results for perimeter wells was presented and included in the hard copy slide packet available at the meeting. Mr. Wacker noted that five of the six designated perimeter wells were dry during the June 2013 event. These wells show a history of being dry depending upon site weather conditions.

Surface Water Sampling
Mr. Wacker explained a handout showing results of surface water sampling for perchlorate in Goose Prairie Creek and Harrison Bayou. The chart indicates very little perchlorate detected in surface water for the past few years.

Upcoming Work, Meetings and Documents
Remedial Action Operations will continue at LHAAP-46, LHAAP-50, LHAAP-58 and LHAAP-67. Semi-annual compliance sampling will be conducted at LHAAP-18/24. Finalization of the CERCLA 5-Year Review report and generation of draft Remedial Action Completion reports for LHAAP-37, LHAAP-46, LHAAP-50, LHAAP-58 and LHAAP-67 is ongoing.

Other Environmental Restoration Issues – Rose Zeiler

Dispute Resolution

Resolution of the ongoing dispute between USEPA and Army regarding clean-up goals continues. While no specific information is available on details of dispute resolution, Ms. Zeiler explained the impacts of the dispute on the remediation work.

LHAAP-16, LHAAP-17, LHAAP-001-R-01, and LHAAP-003-R-01 were on the original list of disputed RODs and progress on those sites stopped in September 2011 when the dispute was initiated. Progress on LHAAP-29 was halted shortly after the dispute was initiated, when it reached the draft final ROD stage. Draft final RODs have been generated for LHAAP-04 and LHAAP-47, but final RODs could not be achieved due to the dispute.

Ms. Zeiler stated that she would bring any new information relating to resolution of the dispute to the RAB as soon as she receives it. She advised the RAB that there are dispute issues on the table that could cause Army to have to go back and do more work on these sites (even those sites that have already been "closed").

Mr Fortune asked if USEPA was telling Army that the sites haven't been cleaned up correctly. Mr. Mayer stated that there is a disagreement on cleanup level that should be used for certain contaminants. Another part of the issue relates to what land use controls must consist of to protect residents if contamination is left at the site.

Ms. Palmie added that there are promulgated federal clean-up standards for most contaminants, but there is not a federal clean-up standard for perchlorate. Where a federal standard does not exist, state standards are usually used when available. The Texas perchlorate clean-up goals have been historically used at Longhorn, but USEPA now feels that a lower "health advisory level" should be used instead, so the crux of the dispute is whether we continue to use the Texas clean-up goal or start to use a lower concentration goal as USEPA wants to do.

Ms. Zeiler stated that Army can only agree to clean-up standards that have actually been made into legal standards by either state or Federal law, and the health advisory level USEPA wants to use is not a legal standard. Further, when the Federal Facility Agreement was signed, USEPA, TCEQ and Army agreed that the Army was grandfathered into the original Texas Risk Reduction Rules and would conduct all remediation work at LHAAP in accordance with those standards. Therefore, all the sampling and investigation that has been done at LHAAP has been done using those clean-up levels.

Mr. Fortune asked who in USEPA made this decision to dispute Longhorn's contaminant clean up goals. Mr. Mayer stated that USEPA now has a policy that all Superfund sites where groundwater could be used for residential use would be cleaned up to residential standards. Mr. Mayer is hopeful a decision will be made within the next three or four months.

Community Involvement Plan / Community Relations Plan

Comments from the RAB Technical Assistance Grant (TAG) holder, CLI, were reviewed and discussed by Ms. Zeiler.

- CLI's comment regarding placing all Administrative Record documents on a searchable website open to the general public (in addition to the Marshall Public Library repository) is being addressed. Although Army is not required to provide internet accessibility to the data to the general public, they have been working toward a website for some time. USAEC has agreed to fund the current contractor (AECOM) to develop a website. The site should be available about 6-8 weeks from when AECOM is authorized to proceed with development of the website.

- CLI suggested that criteria for determining whether the Community Relations Plan has met its objectives should be developed. Army believes that the best and most direct method for making this determining is through feedback through periodic questionnaires. Questionnaires allow open communication where suggestions for changes or improvements can be made directly.
- CLI suggested that the public be provided the opportunity to make formal comments on a variety of technical documents throughout the CERCLA remedy selection process, and specifically during the Remedial Design phase. Ms. Zeiler states that Army follows CERCLA regulation with respect to public comment, through the Proposed Plan public review process. While the Proposed Plan document itself does not provide all technical remedy selection details, it refers the reader to the documents used in the decision-making process leading to the Proposed Plan. Comments, including technical comments, received from the public during the Proposed Plan public comment period are addressed prior to the ROD. For example, Mr. Wacker cited two rounds of groundwater thallium sampling conducted at twenty wells as part of the remedial action at LHAAP-46, which was included in response to public comments on the ROD for LHAAP-46. Ms. Zeiler also stated that the RAB would be updated throughout the Remedial Design phase for upcoming sites and was welcome to provide comments in or after meeting updates.
- Population density information in the Community Relations Plan was questioned by CLI. Ms. Zeiler stated that the information in the plan was taken from the latest census data at the time it was being written.

Ms. Zeiler asked for any additional questions on these responses. Receiving no additional comments from either the RAB or Mr. Lowerre, CLI, Ms. Zeiler stated the Community Relations Plan would be finalized after the RAB meeting.

Look Ahead at the Schedule

Next RAB meeting is tentatively scheduled for February 20th from 6PM – 7:30PM at the Karnack Community Center.

A motion to adjourn was made by Mr. Fortune and seconded by Mr. Lambright.

Adjourn

November Meeting Attachments and Handouts:

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- *GWTP Treated Groundwater Volumes Handout*
- *Surface Water Sampling Results Handout*
- *LHAAP-37 Bioplug Demonstration Study Presentation*

Acronymns

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USAEC	United States Army Environmental Center
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
µg/L	micrograms per liter
VOC	volatile organic compound
WSC	Water Supply Corporation

Longhorn Army Ammunition Plant Restoration Advisory Board Meeting
February 20, 2014

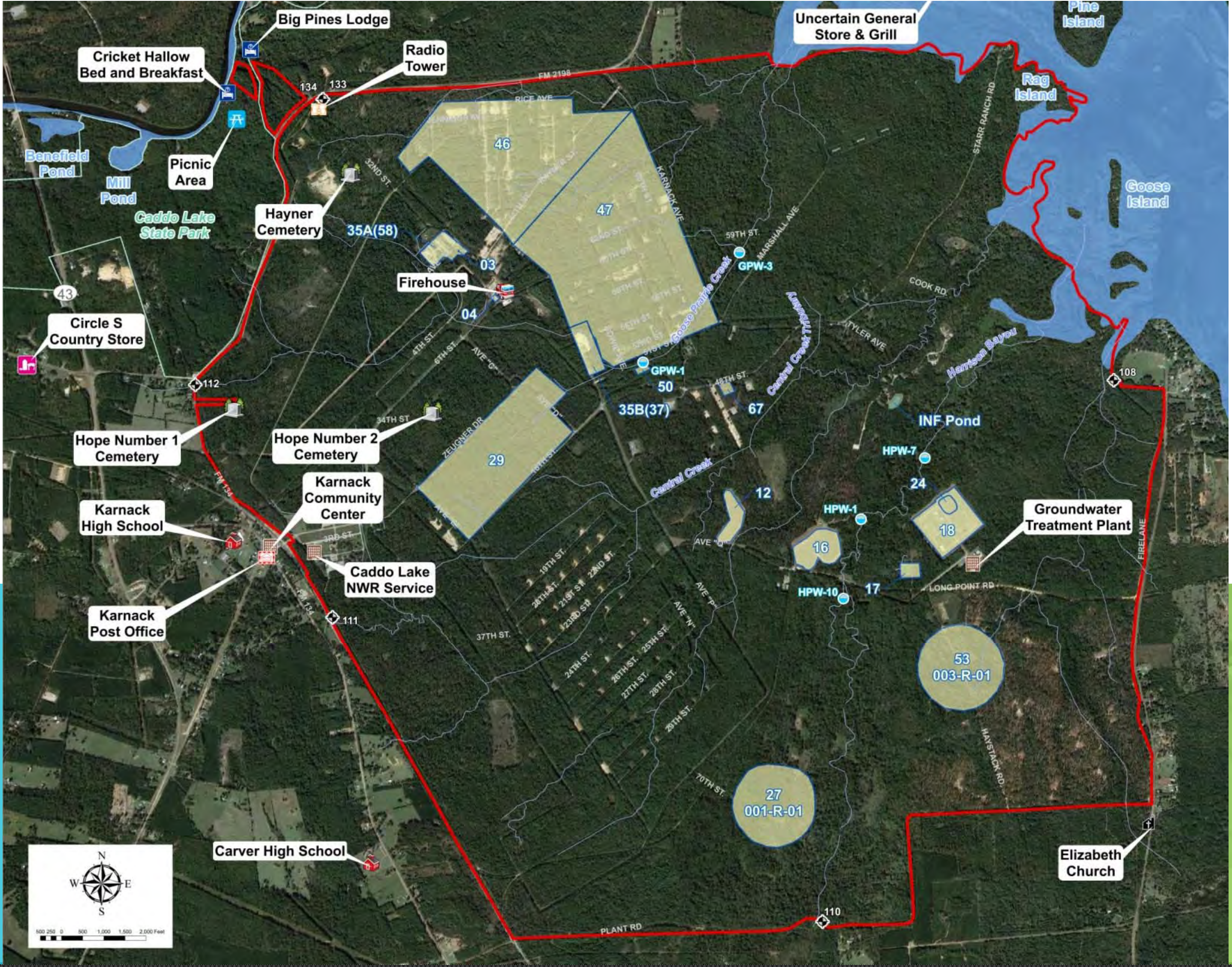
AECOM Environment

Agenda

06:00	Welcome and Introduction
06:05	Open items {RMZ} - RAB Administrative Issues - Minutes - Tour of Longhorn Sites Planned for May - Website - Installation Action Plan
06:15	Defense Environmental Restoration Program (DERP) Update {AECOM} - Fieldwork completed and upcoming field activities planned - Groundwater Treatment Plant (GWTP) Update - Environmental Update for Active Sites (progress since last meeting)
06:50	Other Environmental Restoration Issues {RMZ} - Sitewide LUC Management Plan Update - Bioplug Demonstration at LHAAP-37 - Dispute Status Update - Schedule
07:00	Presentations: - Dense Non-Aqueous Phase Liquids (DNAPLs)
07:30	Adjourn {RMZ}

AECOM

Longhorn Map



Longhorn Active Site List

LHAAP-03	Building 722 Paint Shop
LHAAP-04	Pilot Wastewater Treatment Plant
LHAAP-12	Landfill 12
LHAAP-16	Landfill 16
LHAAP-17	Burning Ground No.2/Flashing Area
LHAAP-18	Burning Ground No.3
LHAAP-24	Unlined Evaporation Pond
LHAAP-29	Former TNT Production Area
LHAAP-37	Chemical Laboratory Waste Pad
LHAAP-46	Plant Area 2
LHAAP-47	Plant Area 3
LHAAP-50	Former Sump Water Tank
LHAAP-58	Maintenance Complex
LHAAP-67	Aboveground Storage Tank Farm
LHAAP-001-R-01	South Test Area/Bomb Test Area
LHAAP-003-R-01	Ground Signal Test Area

RAB Administrative Issues

- Minutes
- Installation Action Plan
- RAB Tour - Planned to coincide with May RAB – Discuss Schedule and Planned Destinations
- Planned Destinations:
  - Groundwater Treatment Plant (LHAAP-18/24)
  - Landfills 12 and 16
  - LHAAP-29
  - LHAAP-03
  - LHAAP-50
  - LHAAP-37
  - LHAAP-58

- Any Other Specific Areas of Interest?

LHAAP Restoration Website

http://www.longhornaap.com

Environmental Restoration for Longhorn Army Ammunition Plant

The next RAB meeting will take place Thursday, February 20 at 6:00 pm. See the Calendar.

LHAAP Restoration Website (cont)

- Created to present the project to the Public and allow for easy access to information and communication between the Army and the Public.
- Contains an overview of LHAAP, individual sites, contamination plume maps, documents, RAB meeting minutes, and Administrative Record.
- Lets you keep up with current LHAAP events and upcoming RAB meetings.

Dense Non-Aqueous Phase Liquid (DNAPL)

- Dense Non-Aqueous Phase Liquids are present at LHAAP-29 and LHAAP-18/24
  - Typically chlorinated hydrocarbons, such as trichloroethylene (TCE) and Methylene Chloride (MC)
  - Compounds with densities greater than water or specific gravity greater than 1
  - These compounds ‘sink’ until they reach an confined unit (aquitard) then spread via preferential pathways along the aquitard (which may be opposite of groundwater flow direction)
- Present in two locations in shallow groundwater at LHAAP-18/24 and one location at LHAAP-29, all three of these locations are proposed for further work to delineate the extent of DNAPL this spring

DNAPL (cont)

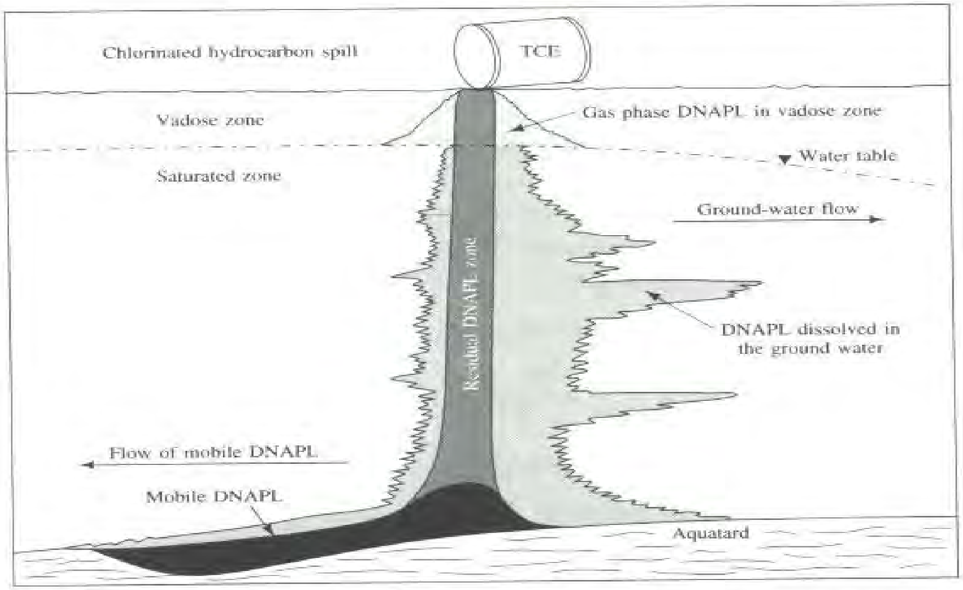


FIGURE 5.28 Distribution of a dense nonaqueous phase liquid in the vadose and saturated zone.

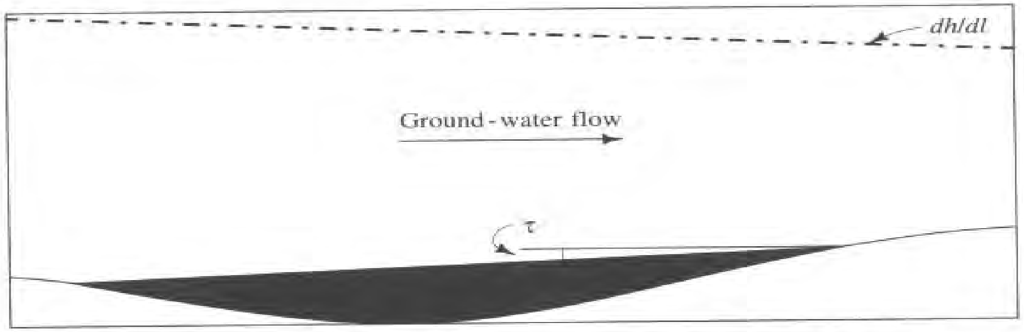
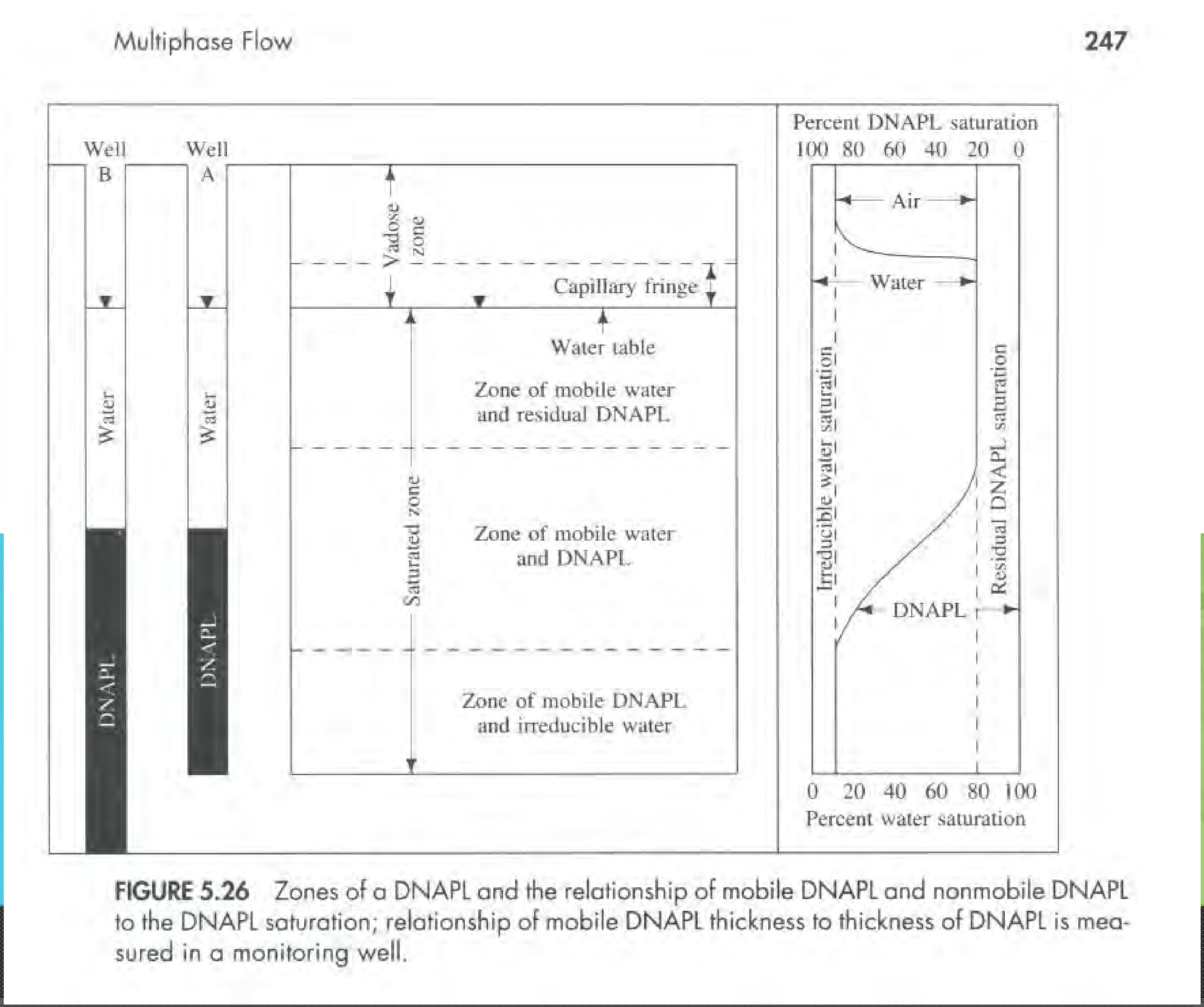


FIGURE 5.29 Sloping interface between a static layer of DNAPL and flowing ground water.

DNAPL (cont)



Multiphase Flow 247

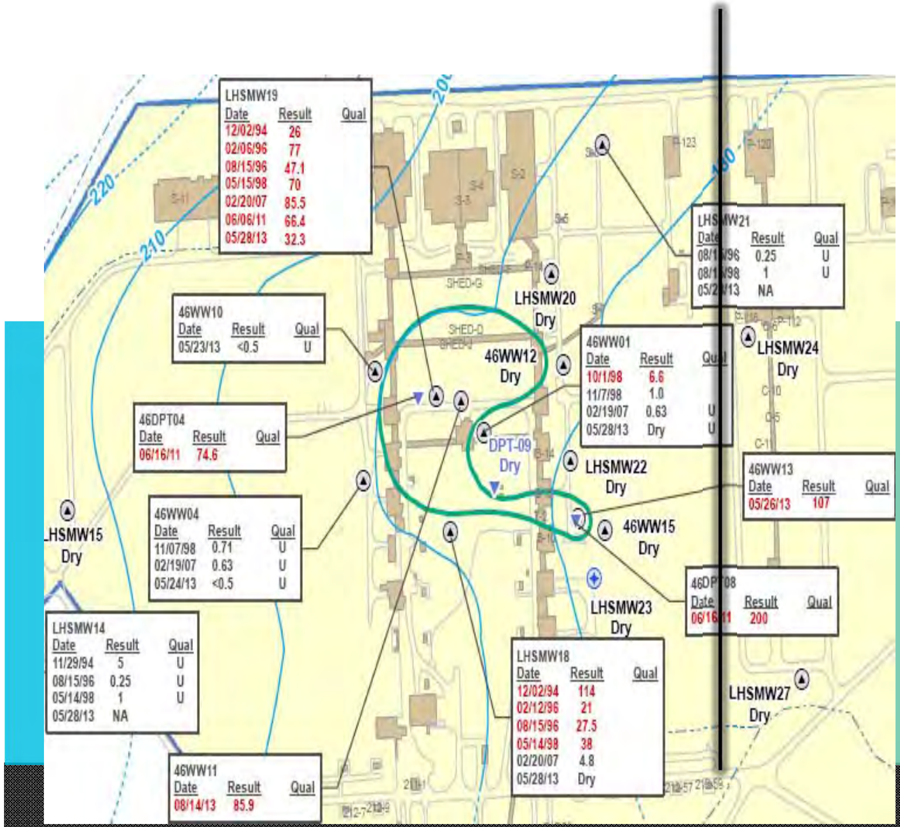
FIGURE 5.26 Zones of a DNAPL and the relationship of mobile DNAPL and nonmobile DNAPL to the DNAPL saturation; relationship of mobile DNAPL thickness to thickness of DNAPL is measured in a monitoring well.

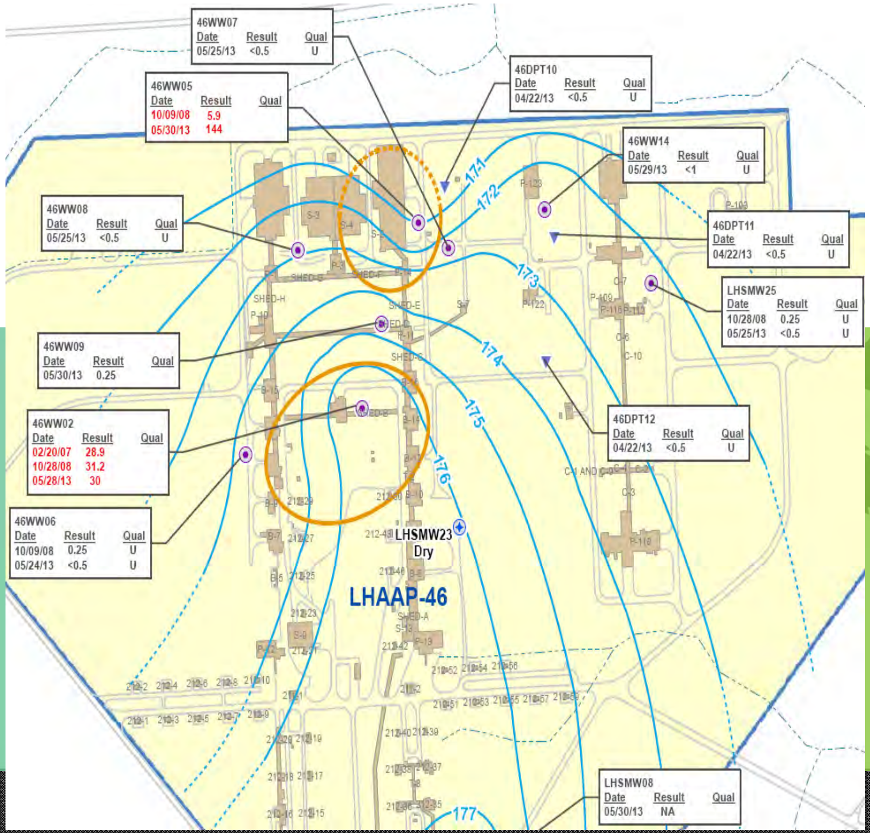
Status of Environmental Sites

- LHAAP-46 – Plant Area 2
  - Final Remedy: Monitored Natural Attenuation (MNA) and Land Use Controls (LUCs)
  - Contaminants of Concern: Volatile Organic Compounds (VOCs, primarily TCE)

Status of Environmental Sites (cont)

- LHAAP-46 – Plant Area 2
  - TCE plumes below. Completion Report in Progress.
  - Three rounds of quarterly sampling for TCE completed, an annual report will be available in ~August documenting the first 4 quarters of sampling
  - Shallow on left, intermediate on right





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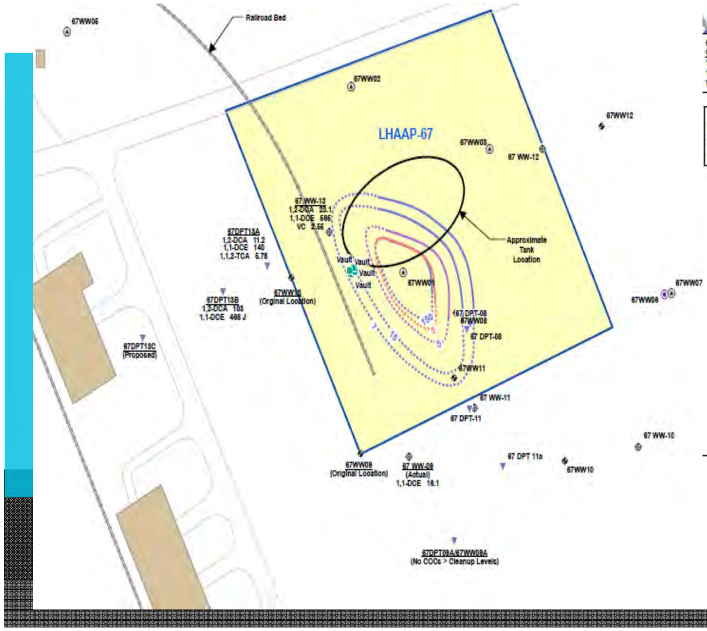
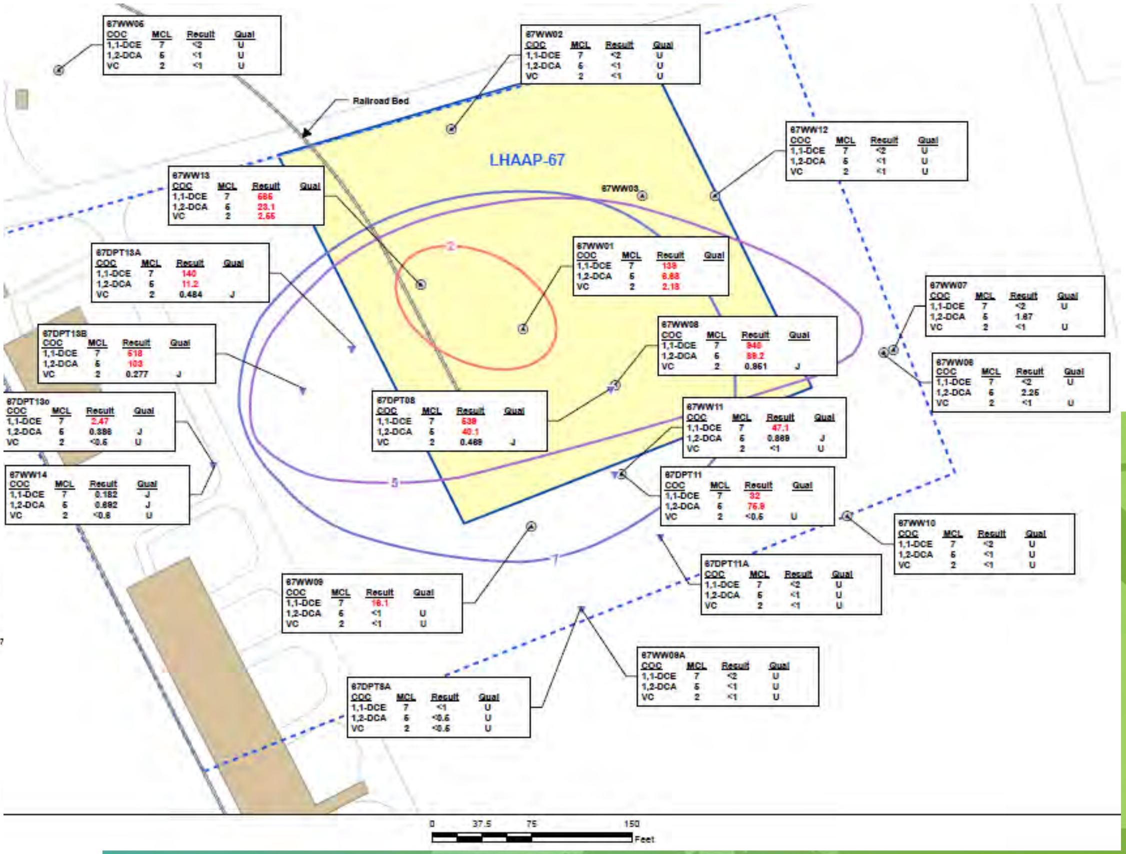
Status of Environmental Sites (cont)

- LHAAP-67 – Aboveground Storage Tank Farm
  - Final remedy: MNA, LUC
  - Contaminants of Concern: VOCs, Contaminants are confined to the upper shallow groundwater zone
  - Three rounds of quarterly sampling for TCE completed, an annual report will be available in ~August documenting the first 4 quarters of sampling

Status of Environmental Sites (cont)

- LHAAP-67 – Aboveground Storage Tank Farm
  - Changes in plume understanding with new data, former boundary map on left, current on right :





67WW05

COC	MCL	Result	Qual
1,1-DCE	7	<2	U
1,2-DCA	5	<1	U
VC	2	<1	U

67WW02

COC	MCL	Result	Qual
1,1-DCE	7	<2	U
1,2-DCA	5	<1	U
VC	2	<1	U

67WW12

COC	MCL	Result	Qual
1,1-DCE	7	<2	U
1,2-DCA	5	<1	U
VC	2	<1	U

67WW13

COC	MCL	Result	Qual
1,1-DCE	7	585	
1,2-DCA	5	23.1	
VC	2	2.55	

67DPT13A

COC	MCL	Result	Qual
1,1-DCE	7	140	
1,2-DCA	5	11.2	
VC	2	0.484	J

67WW01

COC	MCL	Result	Qual
1,1-DCE	7	138	
1,2-DCA	5	6.88	
VC	2	2.18	

67WW07

COC	MCL	Result	Qual
1,1-DCE	7	<2	U
1,2-DCA	5	1.87	
VC	2	<1	U

67DPT13B

COC	MCL	Result	Qual
1,1-DCE	7	518	
1,2-DCA	5	103	
VC	2	0.277	J

67WW08

COC	MCL	Result	Qual
1,1-DCE	7	948	
1,2-DCA	5	89.2	
VC	2	0.951	J

67WW06

COC	MCL	Result	Qual
1,1-DCE	7	<2	U
1,2-DCA	5	2.25	
VC	2	<1	U

67DPT13o

COC	MCL	Result	Qual
1,1-DCE	7	2.47	
1,2-DCA	5	0.388	J
VC	2	<0.5	U

67DPT08

COC	MCL	Result	Qual
1,1-DCE	7	539	
1,2-DCA	5	40.1	
VC	2	0.469	J

67WW11

COC	MCL	Result	Qual
1,1-DCE	7	47.1	
1,2-DCA	5	0.889	J
VC	2	<1	U

67WW14

COC	MCL	Result	Qual
1,1-DCE	7	0.182	J
1,2-DCA	5	0.892	J
VC	2	<0.8	U

67DPT11

COC	MCL	Result	Qual
1,1-DCE	7	32	
1,2-DCA	5	76.9	
VC	2	<0.5	U

67WW10

COC	MCL	Result	Qual
1,1-DCE	7	<2	U
1,2-DCA	5	<1	U
VC	2	<1	U

67DPT11A

COC	MCL	Result	Qual
1,1-DCE	7	<2	U
1,2-DCA	5	<1	U
VC	2	<1	U

67WW09

COC	MCL	Result	Qual
1,1-DCE	7	18.1	
1,2-DCA	5	<1	U
VC	2	<1	U

67WW09A

COC	MCL	Result	Qual
1,1-DCE	7	<2	U
1,2-DCA	5	<1	U
VC	2	<1	U

67DPT9A

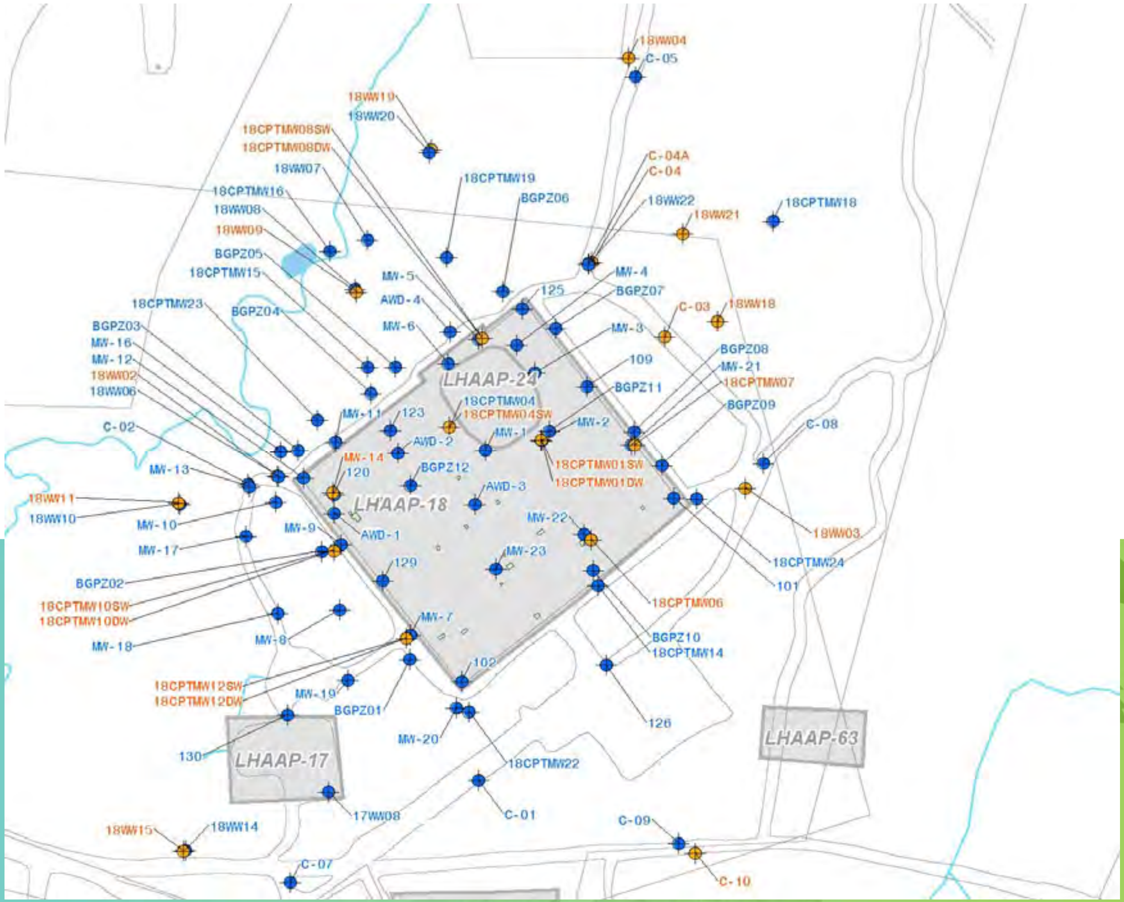
COC	MCL	Result	Qual
1,1-DCE	7	<1	U
1,2-DCA	5	<0.5	U
VC	2	<0.5	U

Status of Environmental Sites (cont)

- LHAAP-18/24 – Burning Grounds #3 and Unlined Evaporation Pond
  - Interim remedy: Continuous extraction and treatment of groundwater from collection trenches surrounding and within the site (green in image below)
  - Contaminants of concern: Perchlorate, VOCs (TCE, MC), Metals

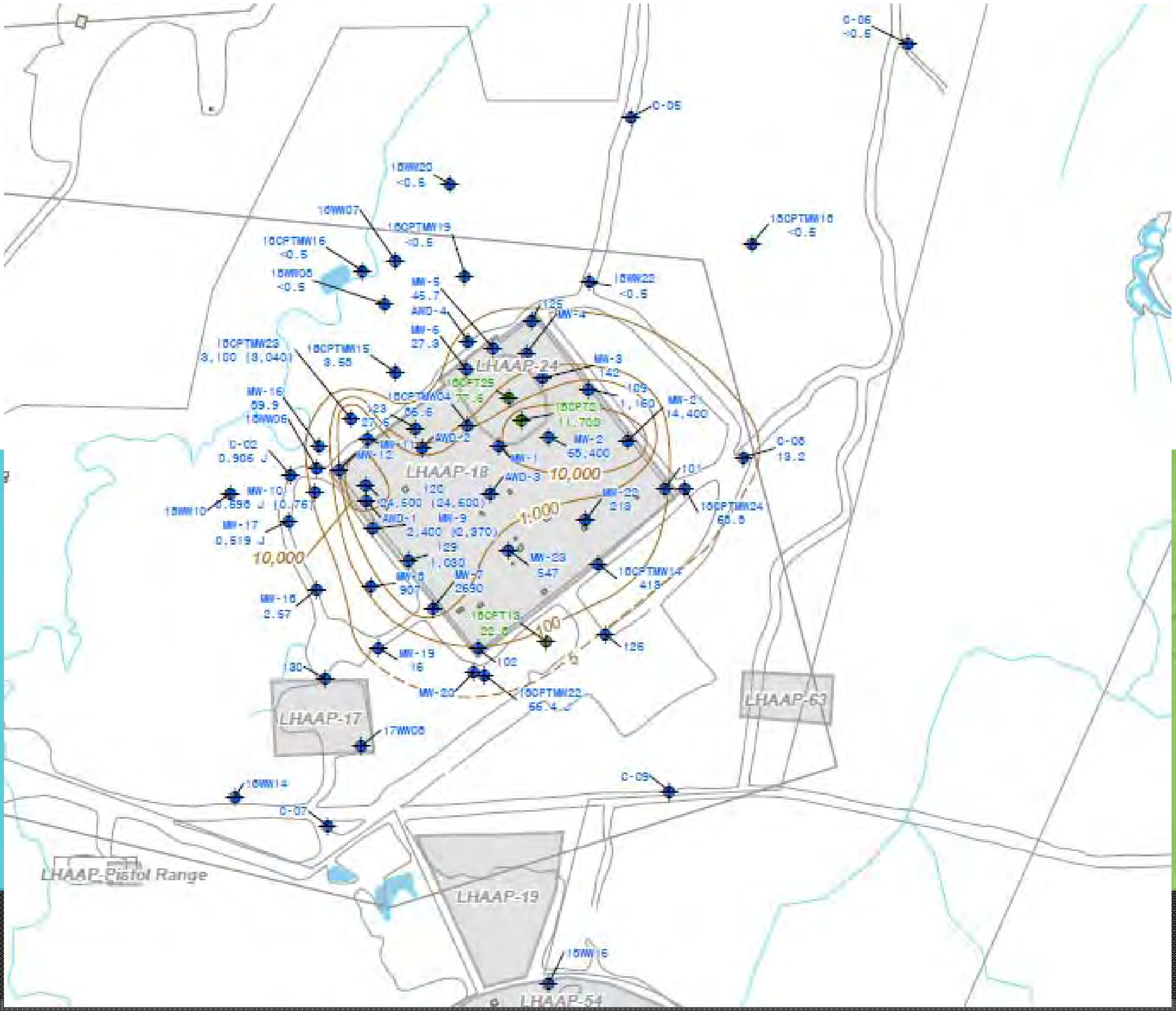
Status of Environmental Sites (cont)

- LHAAP-18/24
  - Revised Feasibility Study in-progress
  - Addenda to Current Work Plan under review to collect additional data based upon DNAPL and additional source material found from field activities completed six months ago.



Status of Environmental Sites (cont)

- LHAAP-18/24
  - DNAPL and Additional Source Material Locations



Status of Environmental Sites (cont)

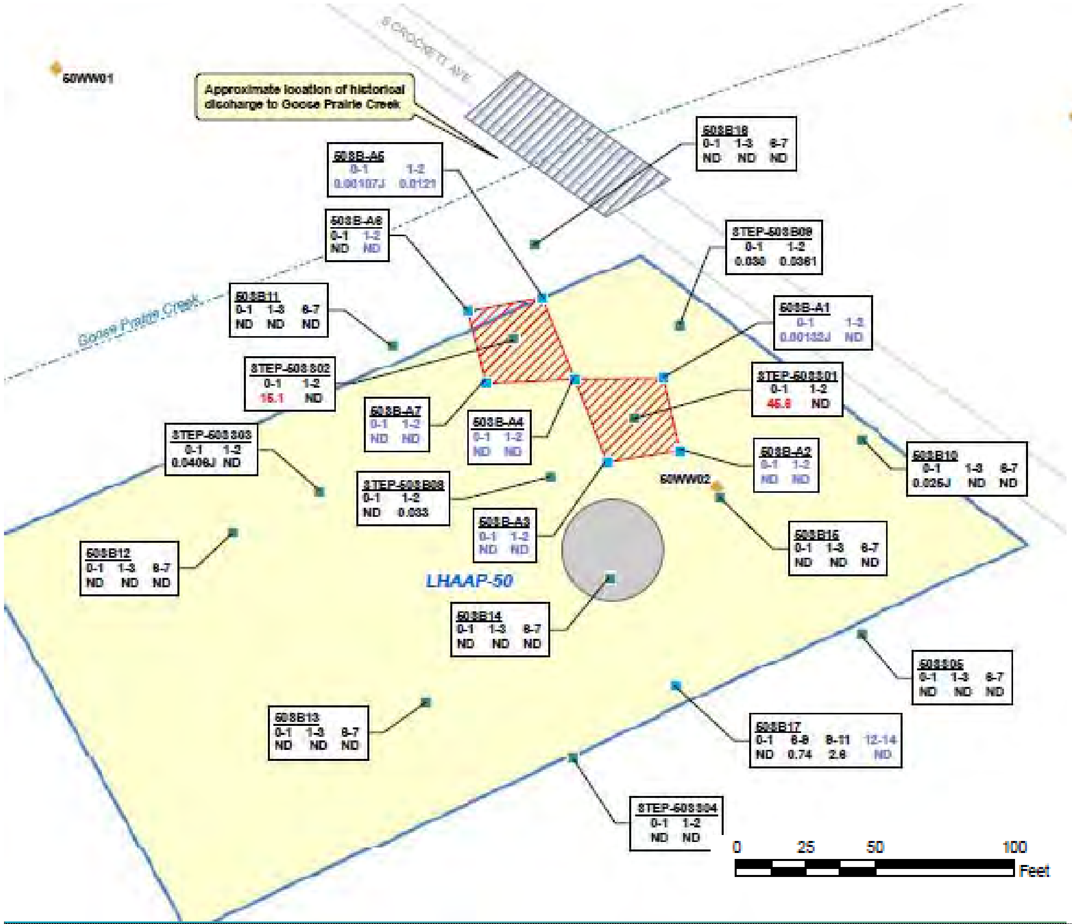
- LHAAP-35B (37) – Chemical Laboratory
  - Final remedy: Monitored Natural Attenuation and Land Use Controls
  - Contaminants of concern: VOCs (PCE and TCE)
    - Only present in the shallow groundwater zone
  - Bio-plug Study On-going Completion Report in progress

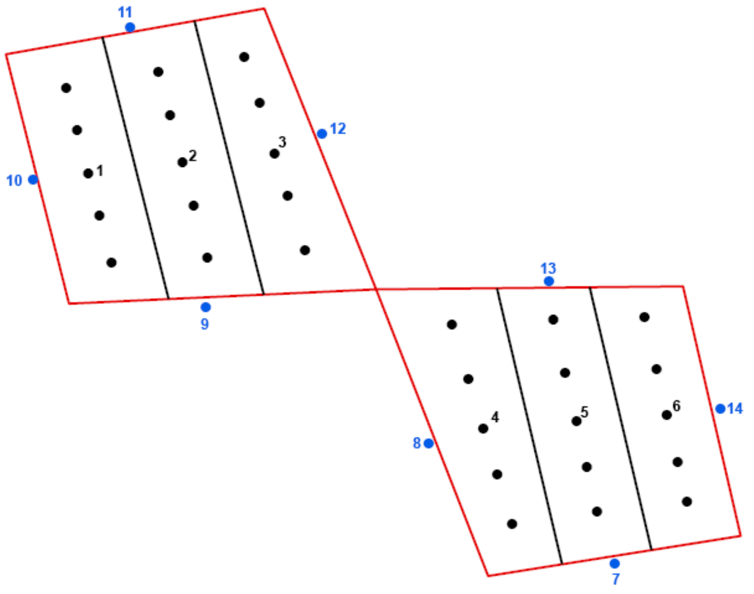
Status of Environmental Sites (cont)

- LHAAP-50 – Former Sump Water Tank
  - Final remedy: Soil excavation, Monitored Natural Attenuation and Land Use Controls for groundwater
  - Contaminants of concern: Perchlorate in soil, and Perchlorate and VOCs in groundwater

Status of Environmental Sites (cont)

- LHAAP-50 – See Photo Board for Excavation Photographs
  - Completion Report in Progress, quarterly sampling underway two rounds completed.





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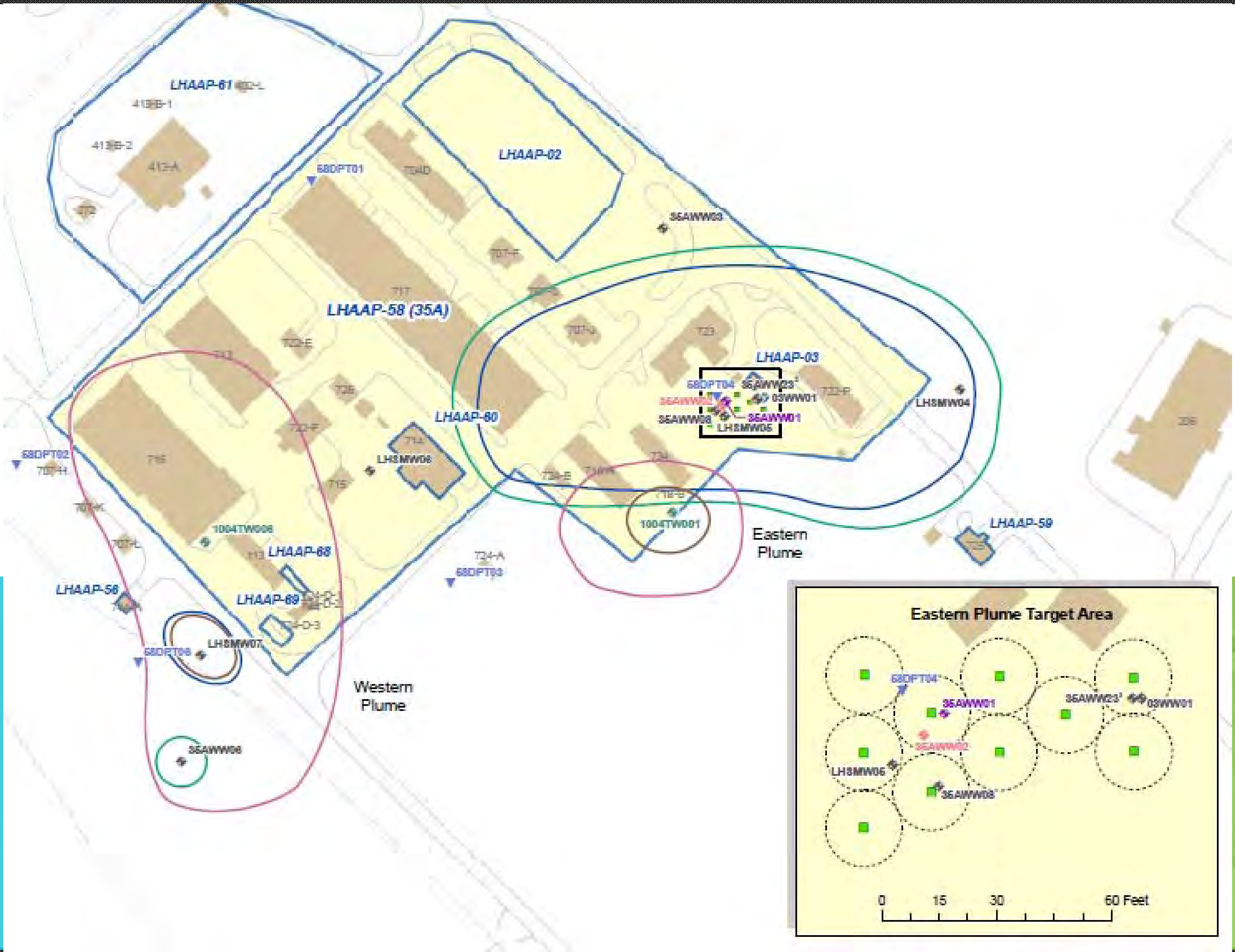
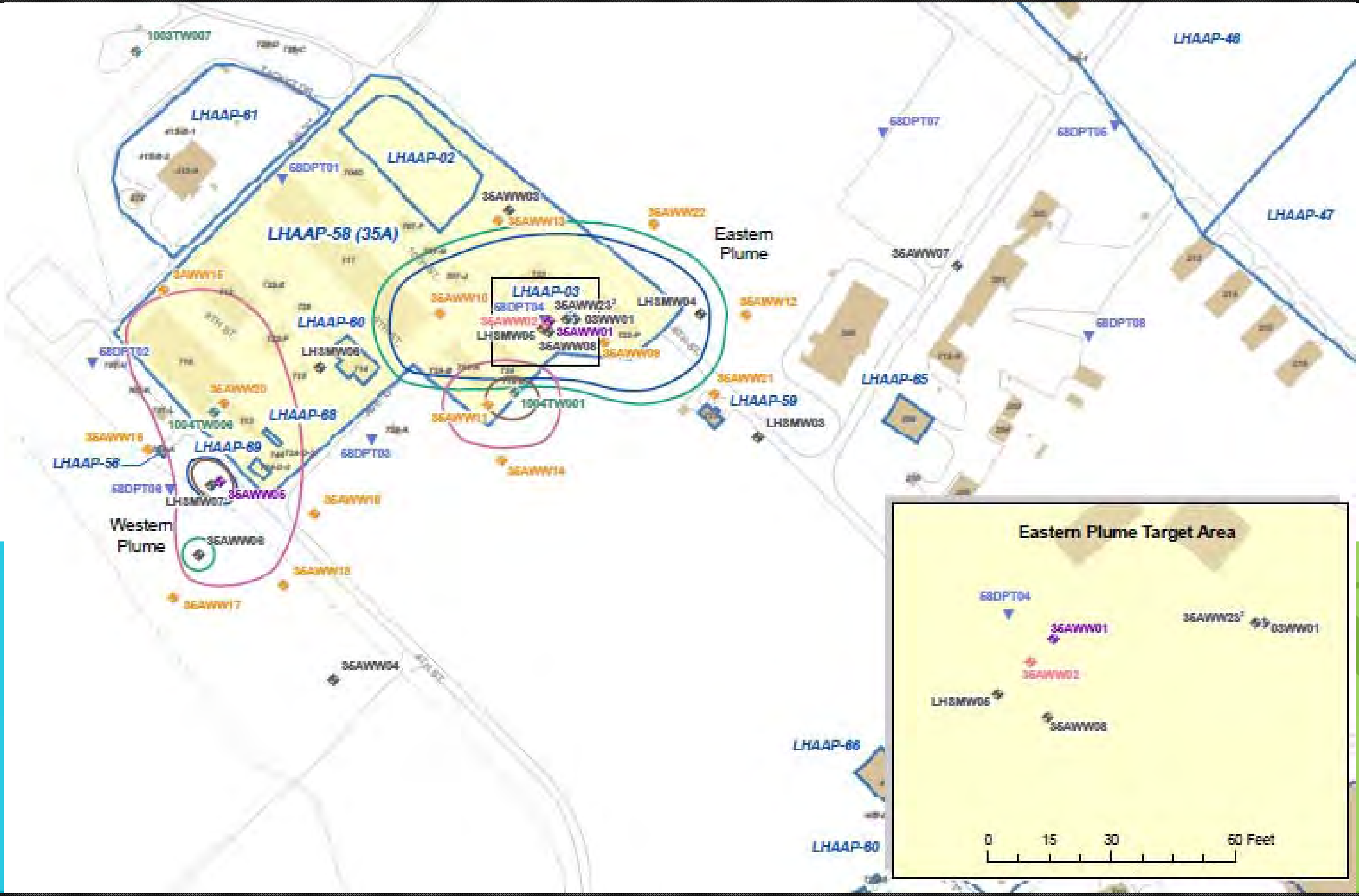
Status of Environmental Sites (cont)

- LHAAP-58 – Shops Area
  - Final remedy:
    - Eastern Plume: In-situ Bioremediation, MNA, LUCs
    - Western Plume: MNA, LUCs
  - Contaminants of concern: VOCs

Status of Environmental Sites (cont)



Status of Environmental Sites (cont)



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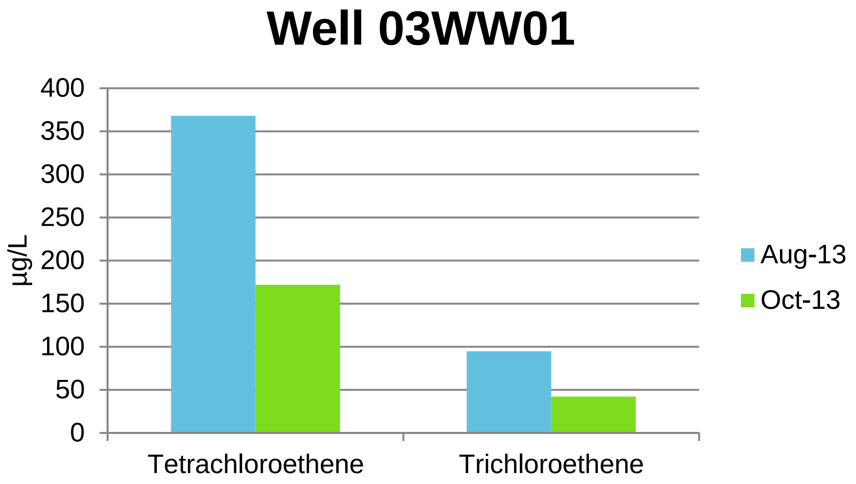
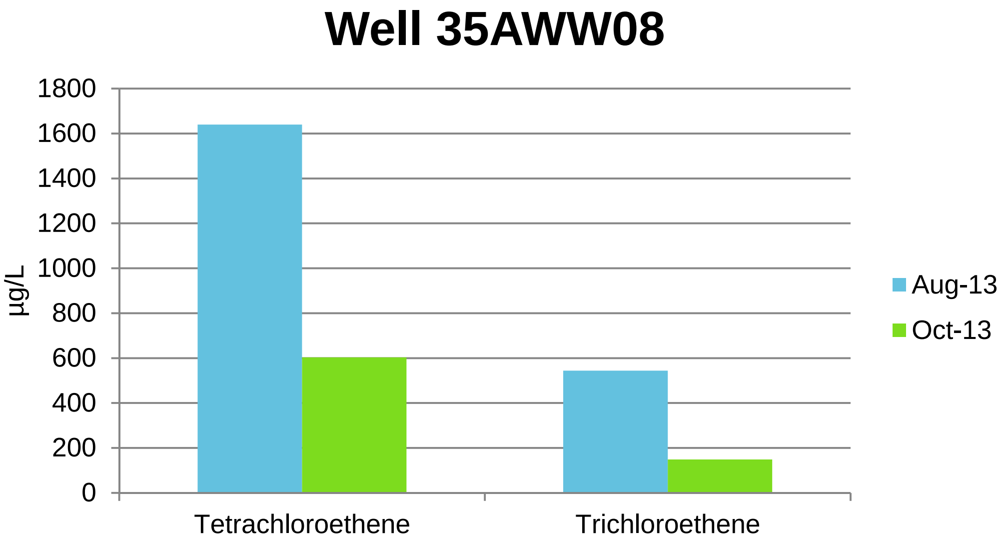
Status of Environmental Sites (cont)

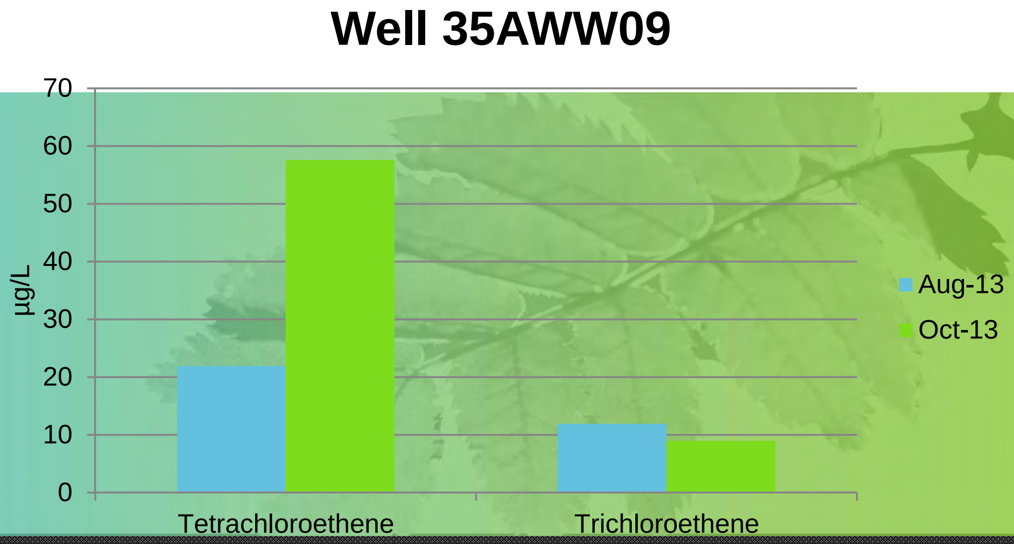
1. Comparison of Baseline to First Round Sampling Data After ISB at LHAAP-58

Monitoring Well	Tetrachloroethene (micrograms per liter)	Trichloroethene (micrograms per liter)
Well 03WW01		
Aug-13	368	94.8
Oct-13	172 J	42.1 J
Well 35AWW08		
Aug-13	1640	544
Oct-13	603 J	149 J
Well 35AWW09		
Aug-13	21.9	11.9
Oct-13	57.6 J	8.97 J
Well 35AWW10		
Aug-13	<0.5 U	<0.5 U
Oct-13	<0.5 U	<0.5 U



Status of Environmental Sites (cont)



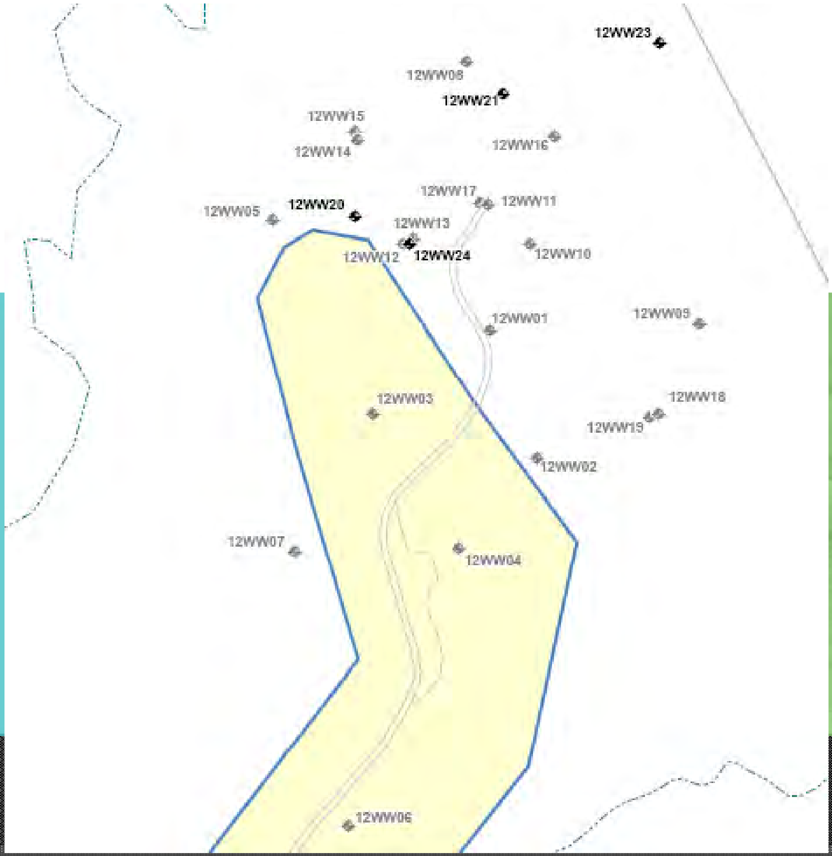


Status of Environmental Sites (cont)

- LHAAP-03 - Record of Decision, Remedial Design/Remedial Action Work Plan On-hold Due to Dispute
- LHAAP-04 - Record of Decision, Remedial Design/Remedial Action Work Plan On-hold Due to Dispute
- LHAAP-16 - Record of Decision, Remedial Design/Remedial Action Work Plan On-hold Due to Dispute
- LHAAP-17 - Record of Decision, Remedial Design/Remedial Action Work Plan On-hold Due to Dispute
- LHAAP-47 - Record of Decision, Remedial Design/Remedial Action Work Plan On-hold Due to Dispute
- LHAAP-001-R-01 - Record of Decision, Remedial Design/Remedial Action Work Plan On-hold Due to Dispute
  LHAAP-003-R-01 - Record of Decision, Remedial Design/Remedial Action Work Plan On-hold Due to Dispute

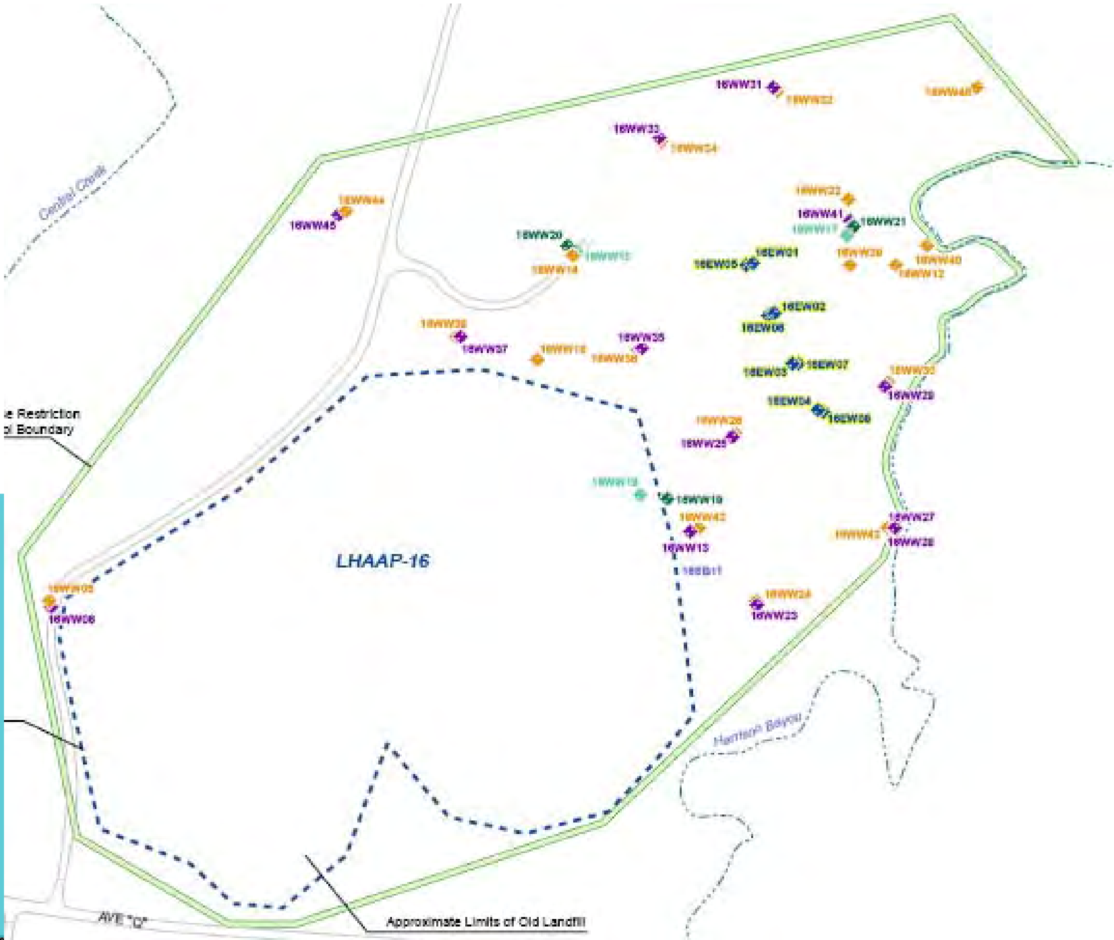
Status of Environmental Sites (cont)

- LHAAP-12 – Landfill 12
  - Completing Operations and Maintenance (mowing, signs, repairing sparse vegetation or subsidence areas)
  - Annual sampling completed in December
  - Evaluating MNA, potentially installing a new well within the plume area



Status of Environmental Sites (cont)

- LHAAP-16 – Landfill 16
  - Eight extraction wells sampled in February



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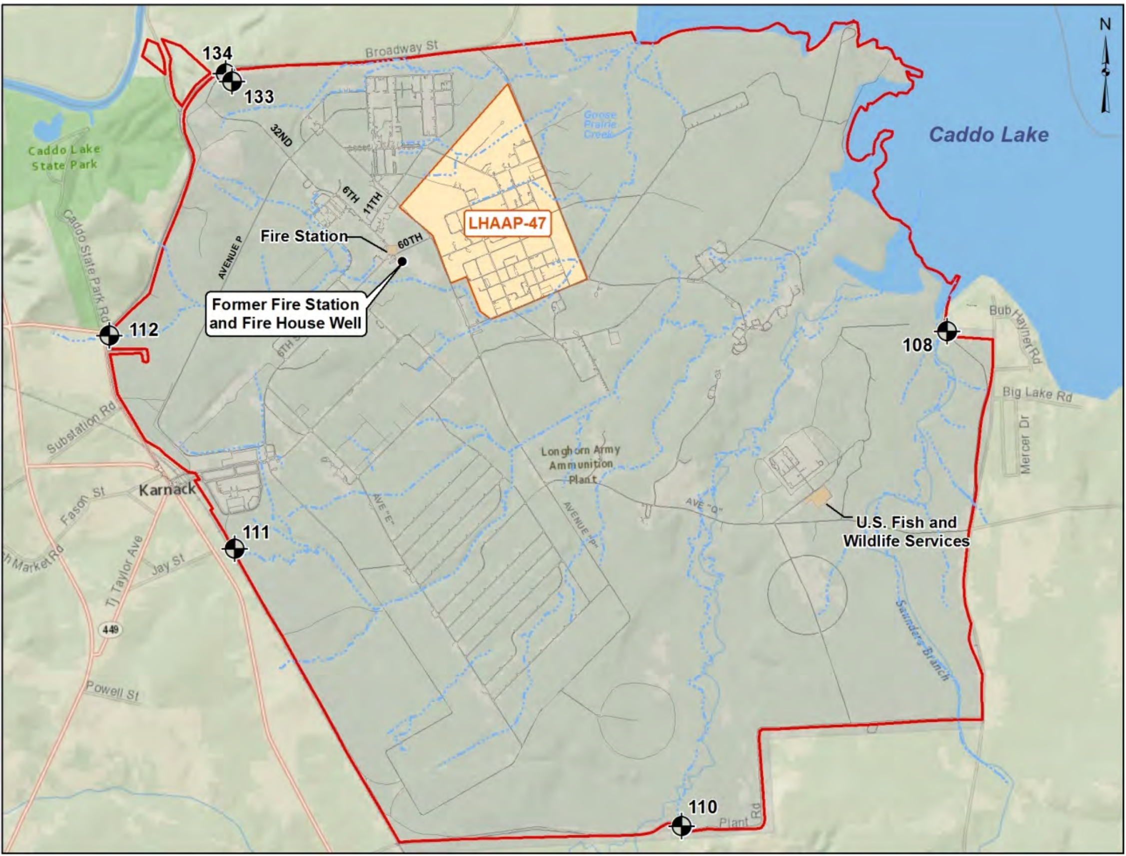
Status of Environmental Sites (cont)

- Perimeter Wells

Well ID	Screen Depth (feet bgs)
108	5.5 - 20.5
110	5 - 20
111	5.4 - 20.4
112	5.25 - 20.25
133	64.5 - 84.5
134	90 -110



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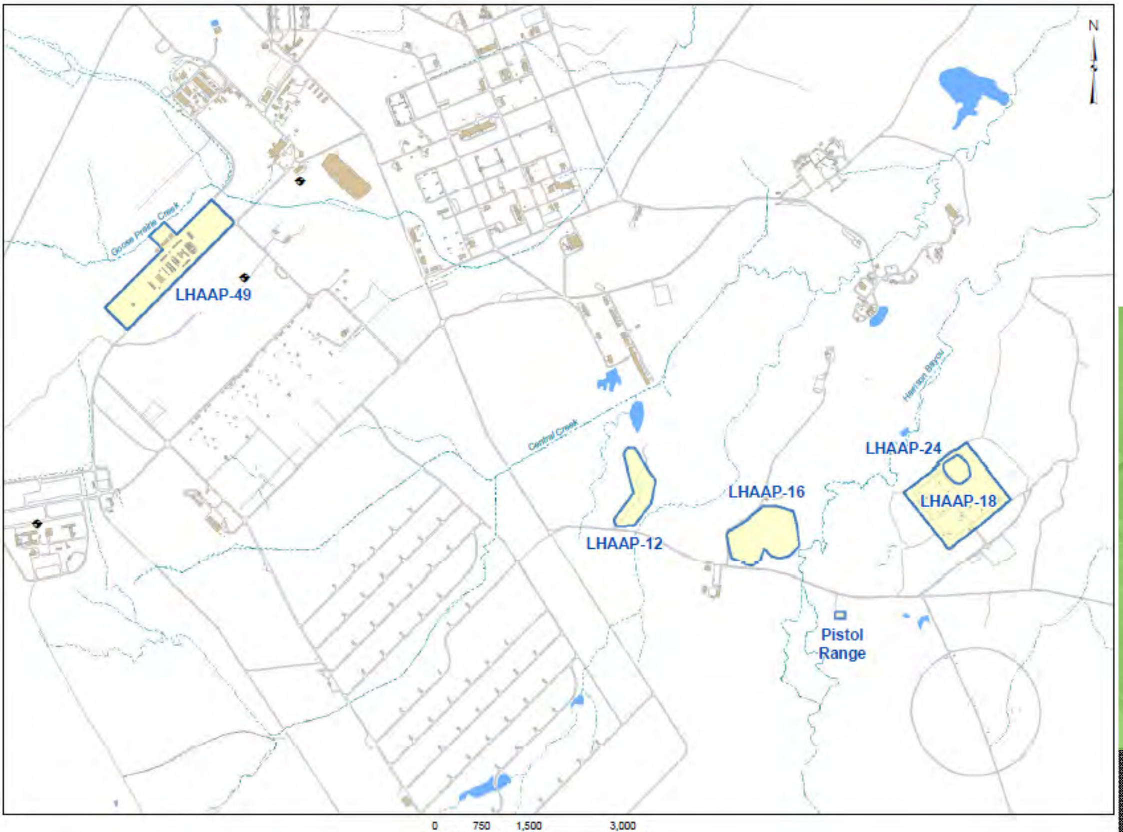
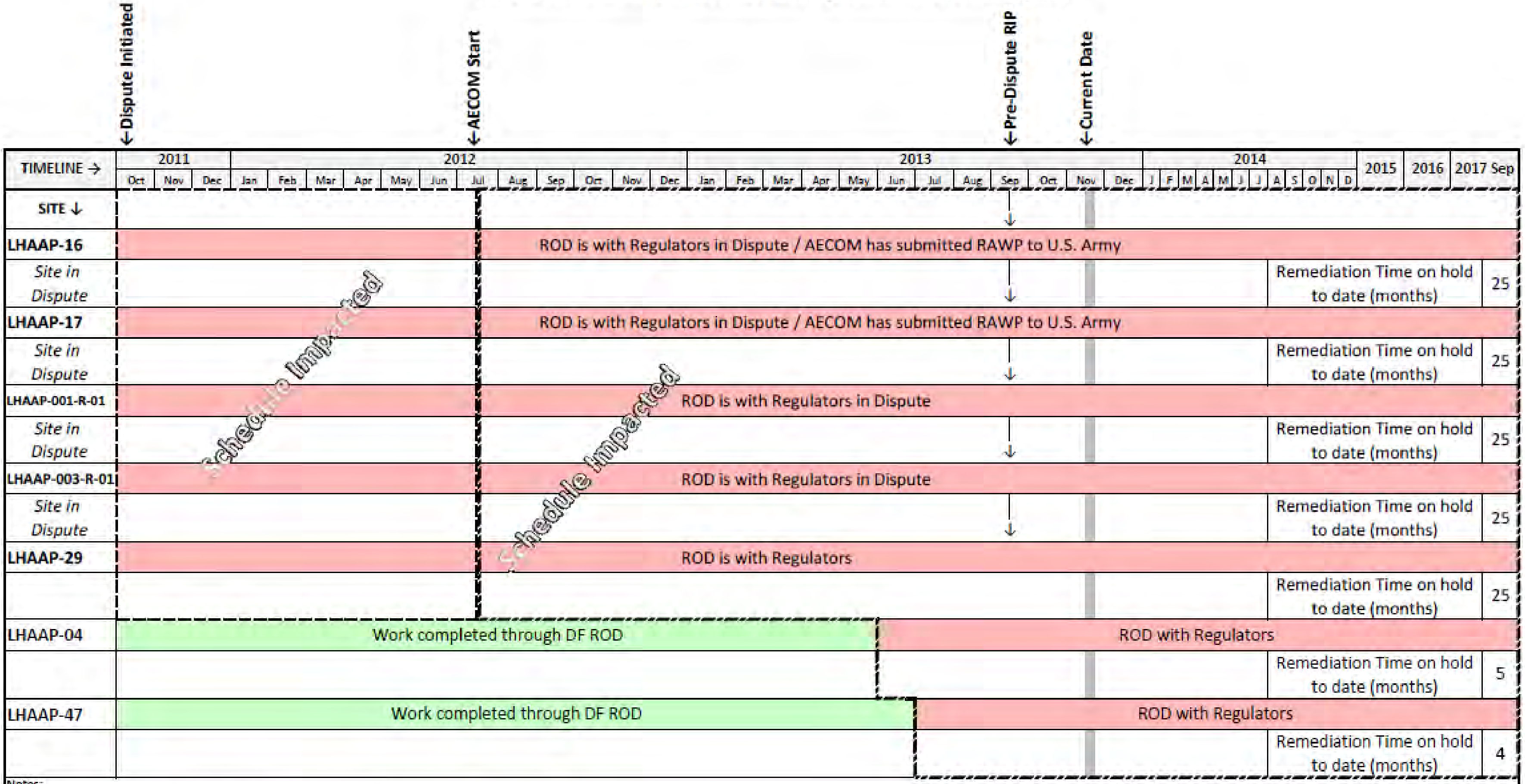
Status of Environmental Sites (cont)

- CERCLA Five-Year Review Process for Multiple Sites
  - Comment/Response to Comments on the Five-Year Review Report On-going
  - Review completed for LHAAP-12, LHAAP-16, LHAAP-18, LHAAP-24, LHAAP-49, and LHAAP-004-R-01



Dispute Status

Sites at which Work has Ceased Pending Resolution of the Dispute



LHAAP-16 — ROD is with Regulators in Dispute / AECOM has submitted RAWP to U.S. Army
Site in Dispute — Remediation Time on hold to date (months) 25

LHAAP-17 — ROD is with Regulators in Dispute / AECOM has submitted RAWP to U.S. Army
Site in Dispute — Remediation Time on hold to date (months) 25

LHAAP-001-R-01 — ROD is with Regulators in Dispute
Site in Dispute — Remediation Time on hold to date (months) 25

LHAAP-003-R-01 — ROD is with Regulators in Dispute
Site in Dispute — Remediation Time on hold to date (months) 25

LHAAP-29 — ROD is with Regulators
Remediation Time on hold to date (months) 25

LHAAP-04 — Work completed through DF ROD — ROD with Regulators
Remediation Time on hold to date (months) 5

LHAAP-47 — Work completed through DF ROD — ROD with Regulators
Remediation Time on hold to date (months) 4

Notes:

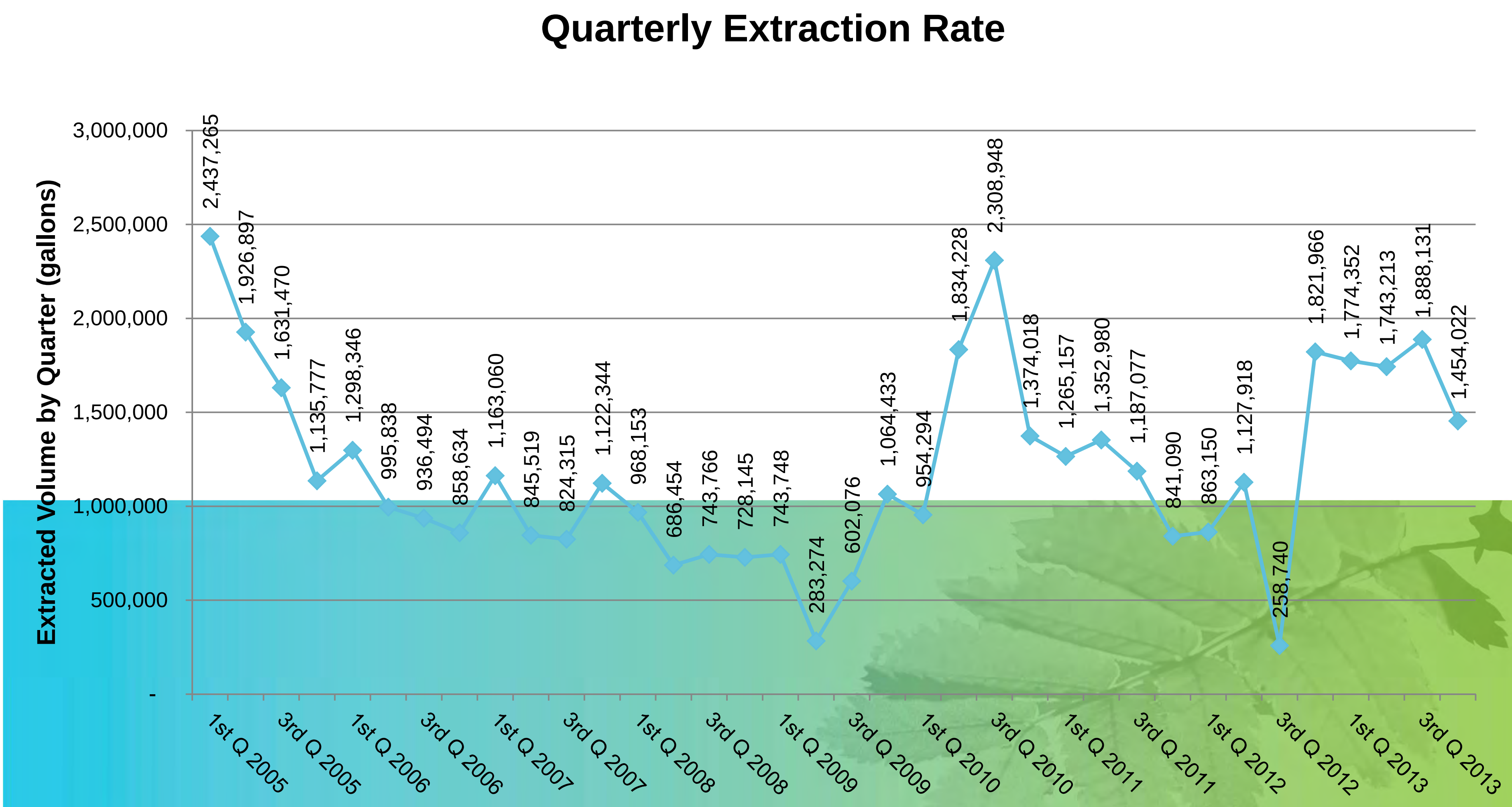
AECOM	AECOM Technical Services, Inc.	PP	Proposed Plan
EE/CA	Engineering Evaluation/Cost Analysis	PSI	Post-Screening Investigation
FFS	Focused Feasibility Study	ROD	Record of Decision
LHAAP	Longhorn Army Ammunition Plant		

L:\work\60256135 LONGHORN Firm Fixed Price\1.0 Project Management\2.2 Six Month Tracker\Dispute

Groundwater Treatment Plant Operations and Management

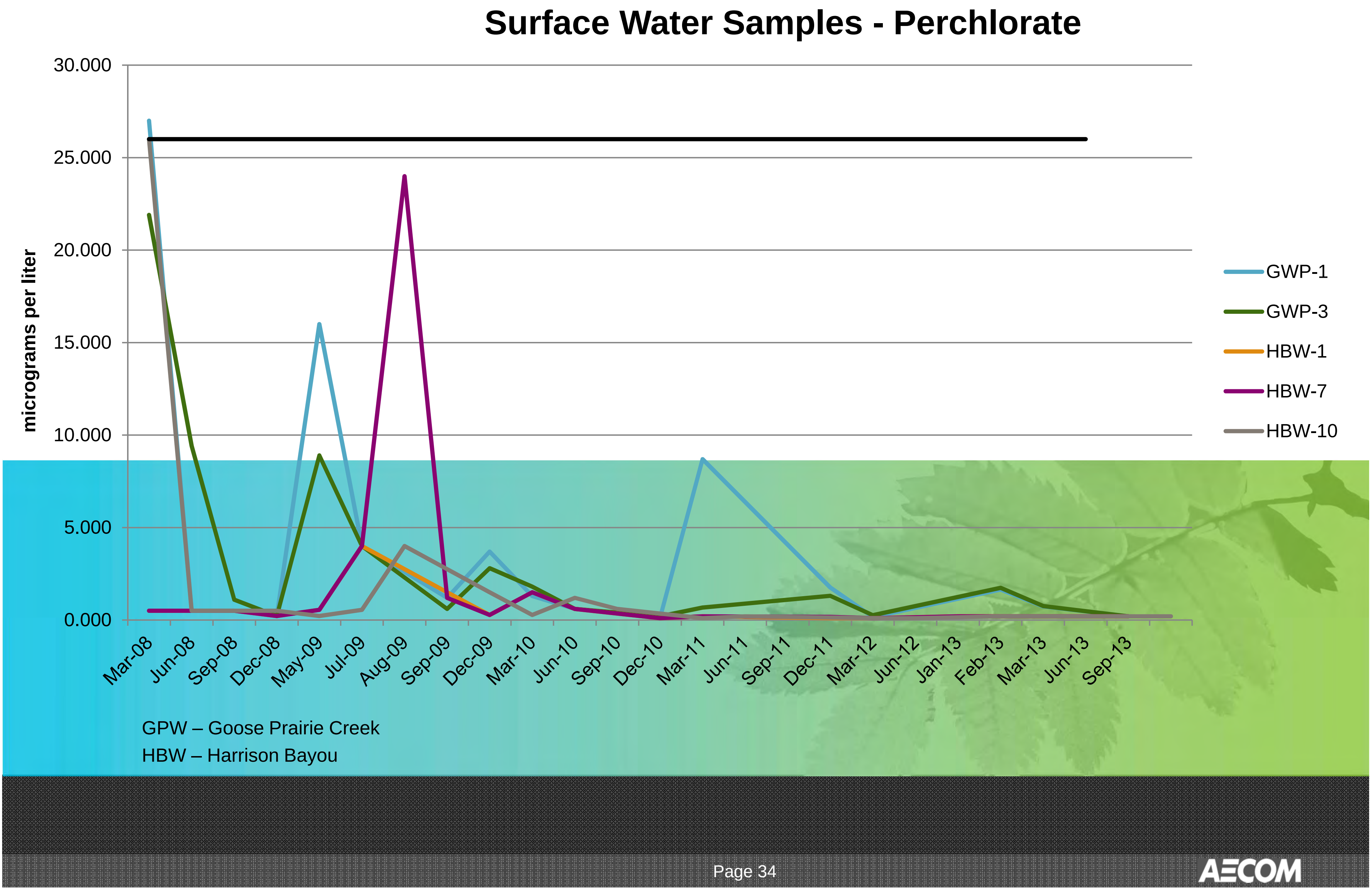
- The Groundwater Treatment Plant continues to operate to contain the plume at LHAAP-18/24 and LHAAP-16.
- Water continues to be returned to LHAAP-18/24 or into Harrison Bayou, depending on the amount of water in the bayou.
- Compliance monitoring continues per existing sampling plan.
- Maintenance and repairs of wells, pumps, tanks, and ancillary equipment is on-going.

GWTP O&M (cont)



Quarterly Extraction Rate

Surface Water Sample Results



GPW – Goose Prairie Creek
HBW – Harrison Bayou

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Upcoming Fieldwork, Meetings, and Documents

1. Continue quarterly groundwater sampling for recently completed monitoring networks at LHAAP-46, 50, 58, 67 in March, in addition to semi-annual compliance sampling at LHAAP-18/24 in May

2. CERCLA Five-Year Review: To be Signed in 2014

3. Final Completion Reports for LHAAP-37, 46, 50, 58, 67

4. LHAAP-18/24 and LHAAP-29 – Well Installation, Soil Sampling, Cone Penetrometer Testing/Membrane Interface Probe, Initial Treatability Testing

5. Sites where work has ceased pending dispute resolution:
    1. LHAAP-03
    2. LHAAP-04
    3. LHAAP-47
    4. LHAAP-16
    5. LHAAP-17
    6. LHAAP-29
    7. LHAAP-001-R-01
    8. LHAAP-003-R-01

Bio Plug Study at LHAAP 35B (37)

- See separate slide presentation

Back-up Slides

Groundwater Treatment Plant - Treated Groundwater Volumes

The amount of groundwater treated is determined by measuring the number of gallons of treated water returned to LHAAP-18/24, released to the INF Pond, or discharged to Harrison Bayou.

Treated Water Data

(in gallons)

Oct-07	Nov-07	Dec-07	Jan-08	Feb-08	Mar-08	Apr-08	May-08	Jun-08	Jul-08	Aug-08	Sep-08
1,041,491	848,356	804,822	792,148	665,883	818,872	791,306	568,812	776,904	748,377	690,052	617,199

Oct-08	Nov-08	Dec-08	Jan-09	Feb-09	Mar-09	Apr-09	May-09	Jun-09	Jul-09	Aug-09	Sep-09
655,059	619,274	726,118	552,299	598,144	433,800	488,807	526,958	387,644	0	414,853	735,716

Oct-09	Nov-09	Dec-09	Jan-10	Feb-10	Mar-10	Apr-10	May-10	Jun-10	Jul-10	Aug-10	Sep-10
808,322	636,306	727,492	391,898	695,343	802,656	894,731	962,121	1,257,977	1,314,924	1,041,495	1,136,547

Oct-10	Nov-10	Dec-10	Jan-11	Feb-11	Mar-11	Apr-11	May-11	Jun-11	Jul-11	Aug-11	Sep-11
956,567	705,805	849,712	811,679	668,281	1,090,348	817,325	900,338	916,552	784,369	652,524	733,456

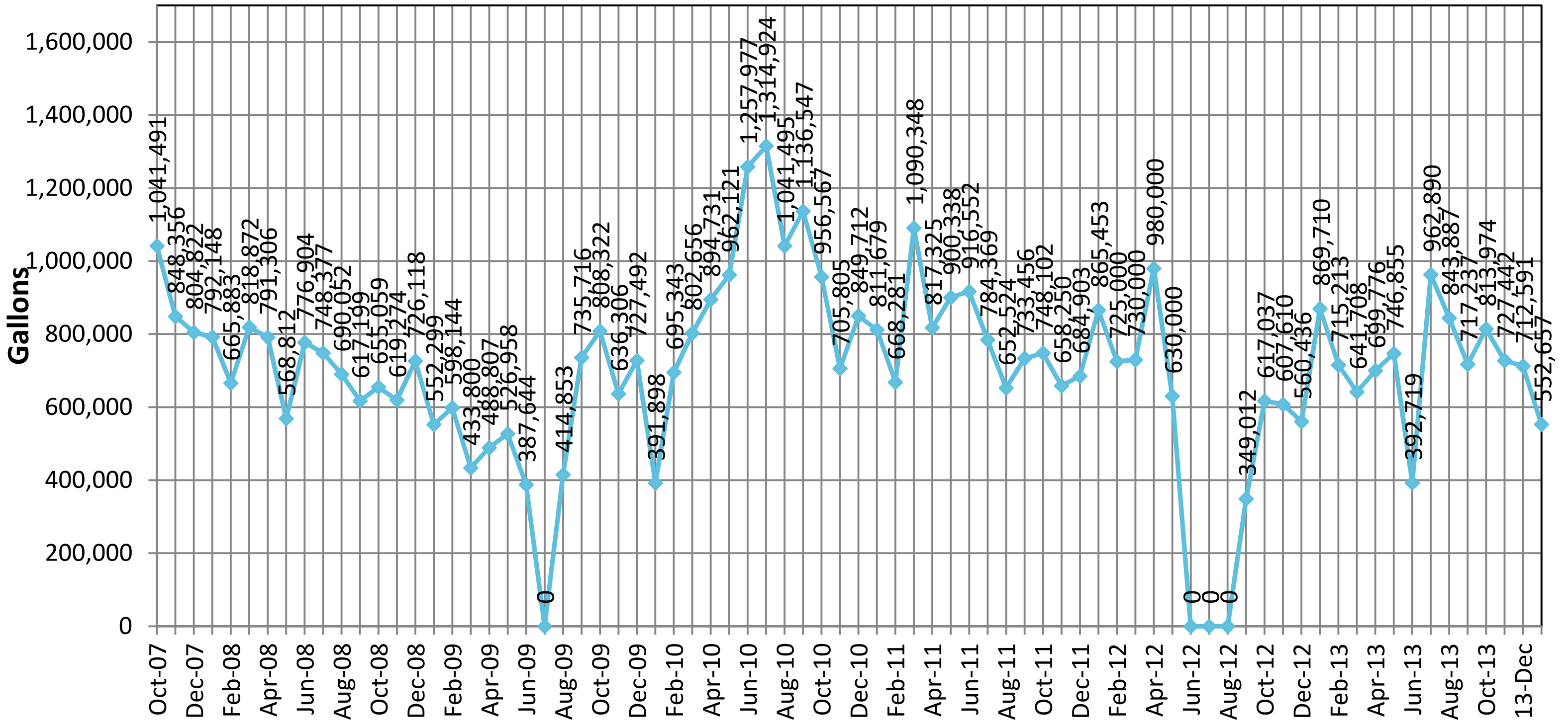
Oct-11	Nov-11	Dec-11	Jan-12	Feb-12	Mar-12	Apr-12	May-12	Jun-12	Jul-12	Aug-12	Sep-12
748,102	658,250	684,903	865,453	725,000*	730,000*	980,000*	630,000*	0	0	0	349,012

Oct-12	Nov-12	Dec-12	Jan-13	Feb-13	Mar-13	Apr-13	May-13	Jun-13	Jul-13	Aug-13	Sep-13
617,037	607,610	560,436	869,710	751,213	641,708	699,776	746,885	392,719	962,890	843,887	717,237

Oct-13	Nov-13	Dec-13	Jan-14
813,974	727,442	712,591	552,657

* Indicates estimate

Figure ES-3
Water Treated Monthly from October 2007 through September 2014

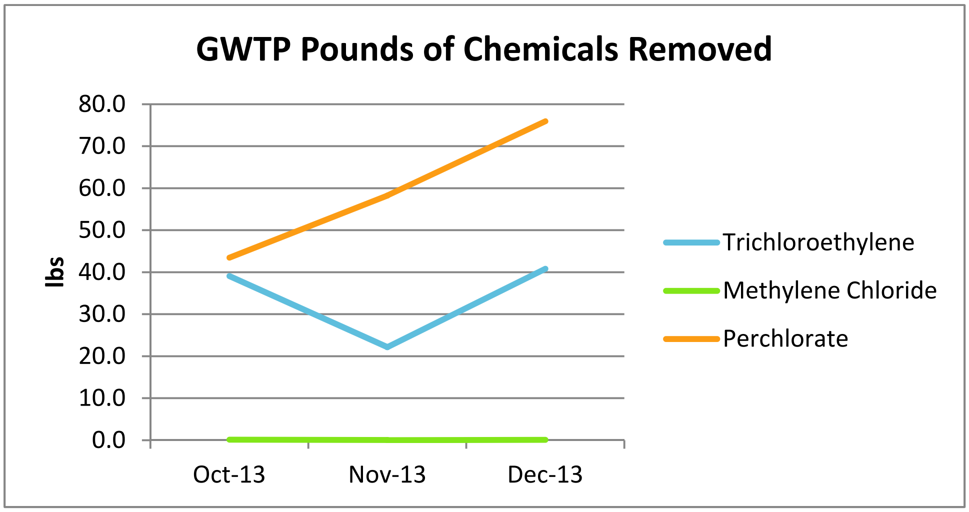


The pounds of chemicals removed for the 3rd Quarter of 2013 can be found below and are calculated by the following formula:

$$\frac{(\text{Concentration } [\mu g/L] \times \text{Volume [gallons]} \times 3.785 \text{ [liters per gallon]})}{(453{,}600{,}000 \ \mu g \text{ per pound})}$$

Pounds of Chemicals Removed From LHAAP-18/24, 3rd Quarter 2013

	Trichloroethylene	Methylene Chloride	Perchlorate
Oct-13	39.1	0.11	43.5
Nov-13	22.2	0.03	58.3
Dec-13	40.8	0.11	76.0



Harrison Bayou and Goose Prairie Creek – Perchlorate Data

Surface water samples are collected quarterly from each location in Harrison Bayou and Goose Prairie Creek unless they are dry.

Historic Surface Water Sample Data

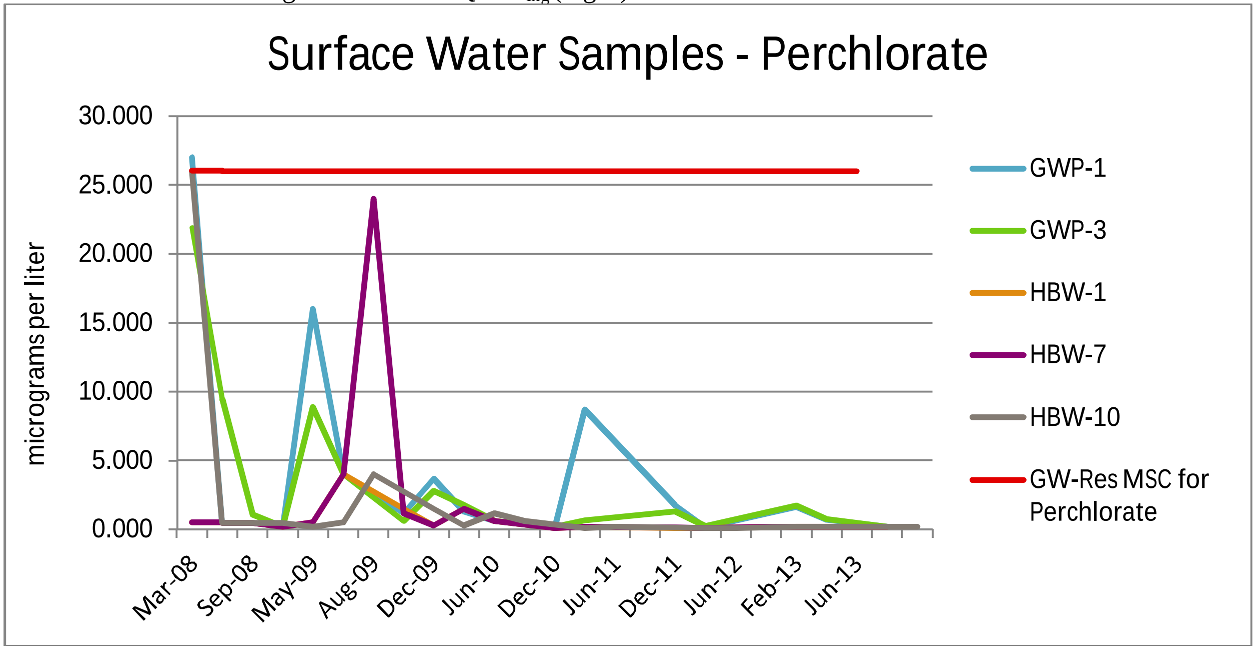
(in micrograms per liter)

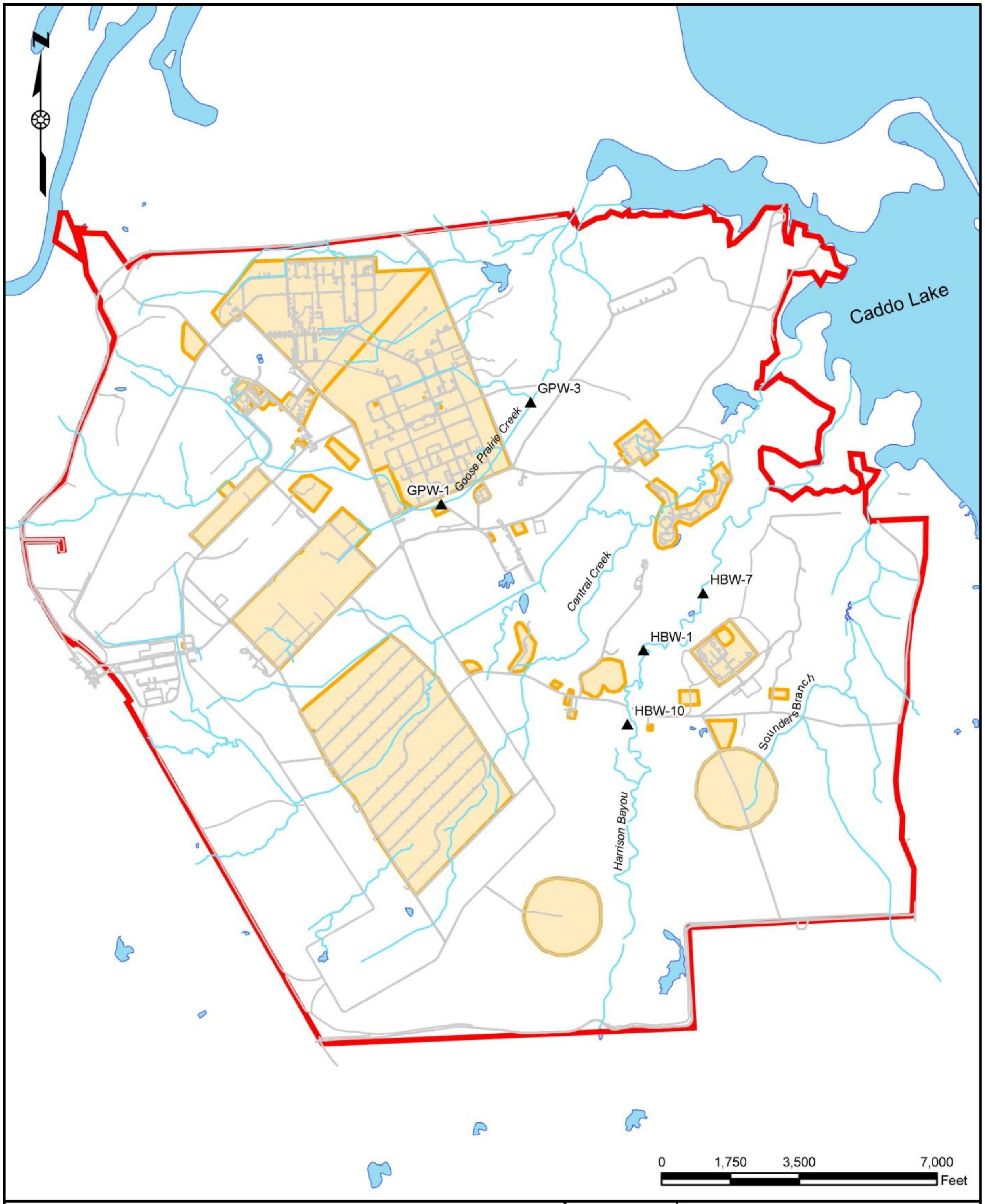
Creek Sample ID	Mar 2008	Jun 2008	Sep 2008	Dec 2008	May 2009	July 2009	Aug 2009	Sep 2009	Dec 2009	Mar 2010	Jun 2010
GPW-1	27	0.5U	0.5U	0.22U	16	4U	dry	1.2U	3.7	1.3J	0.6U
GPW-3	21.9	9.42	1.1	0.22U	8.9	4U	dry	0.6U	2.8	1.8J	0.6U
HBW-1	0.5U	0.5U	0.5U	0.22U	0.55U	4U	dry	1.5U	0.275U	1.5U	0.6U
HBW-7	0.5U	0.5U	0.5U	0.22U	0.55U	4U	24	1.2U	0.275U	1.5U	0.6U
HBW-10	0.5U	0.5U	0.5U	0.22U	0.55U	4U	dry	1.5U	0.275U	1.2U	0.6U

Creek Sample ID	Sep 2010	Dec 2010	Mar 2011	Jun 2011	Sep 2011	Dec 2011	Mar 2012	Jun 2012	Jan 2013	Feb 2013	Mar 2013
GPW-1	dry	0.1U	8.7	dry	dry	1.76	0.163J	dry	dry	1.65	0.735
GPW-3	dry	0.199J	0.673	dry	dry	1.31	0.261	dry	dry	1.74	0.754
HBW-1	dry	0.1U	0.2U	dry	dry	0.1U	0.1U	dry	<0.2U	dry	<0.2U
HBW-7	dry	0.1U	0.2U	dry	dry	0.171J	0.1U	dry	<0.2U	dry	<0.2U
HBW-10	dry	0.1U	0.2U	dry	dry	0.1U	0.1U	dry	<0.2U	dry	<0.2U

Creek Sample ID	Jun 2013	Sept 2013
GPW-1	dry	<0.2 U
GPW-3	dry	<0.2 U
HBW-1	<0.2U	<0.2 U
HBW-7	<0.2U	<0.2 U
HBW-10	<0.2U	<0.2 U

Notes:
Perchlorate Screening Criteria - TCEQ GW$_{Ing}$ (mg/L) 5.1E^{-02}





Legend

- ▲ Surface Water Sampling Location
- — Stream
- — Road
- 🟧 Site
- 🟦 Lake

U.S. ARMY CORPS OF ENGINEERS
TULSA DISTRICT
TULSA, OKLAHOMA

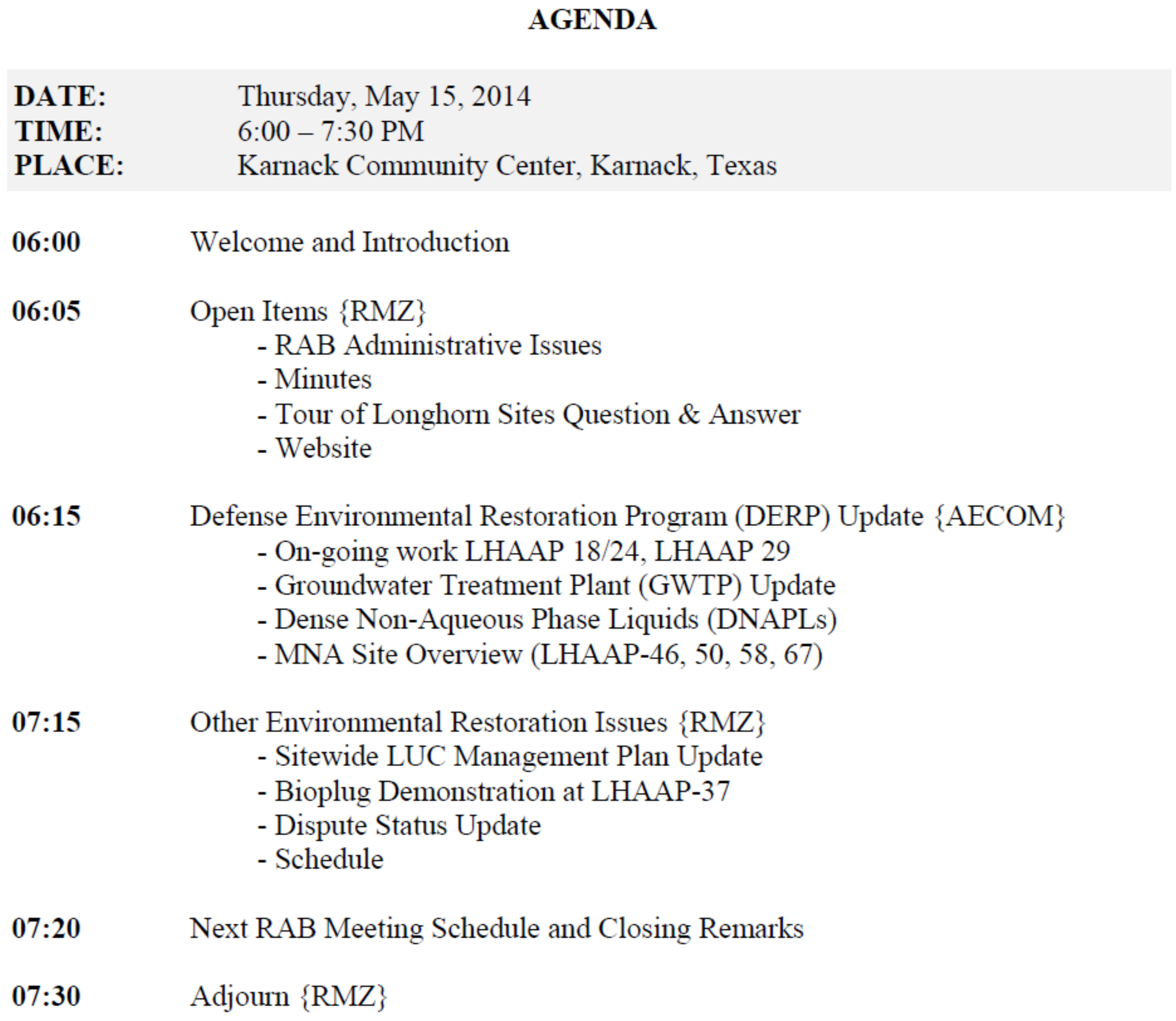
SURFACE WATER SAMPLING LOCATION

LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS

Longhorn Army Ammunition Plant
Restoration Advisory Board Meeting
May 15, 2014

AECOM Environment

Agenda



AGENDA

DATE: Thursday, May 15, 2014
TIME: 6:00 – 7:30 PM
PLACE: Karnack Community Center, Karnack, Texas

06:00 Welcome and Introduction

06:05 Open Items {RMZ}
- RAB Administrative Issues
- Minutes
- Tour of Longhorn Sites Question & Answer
- Website

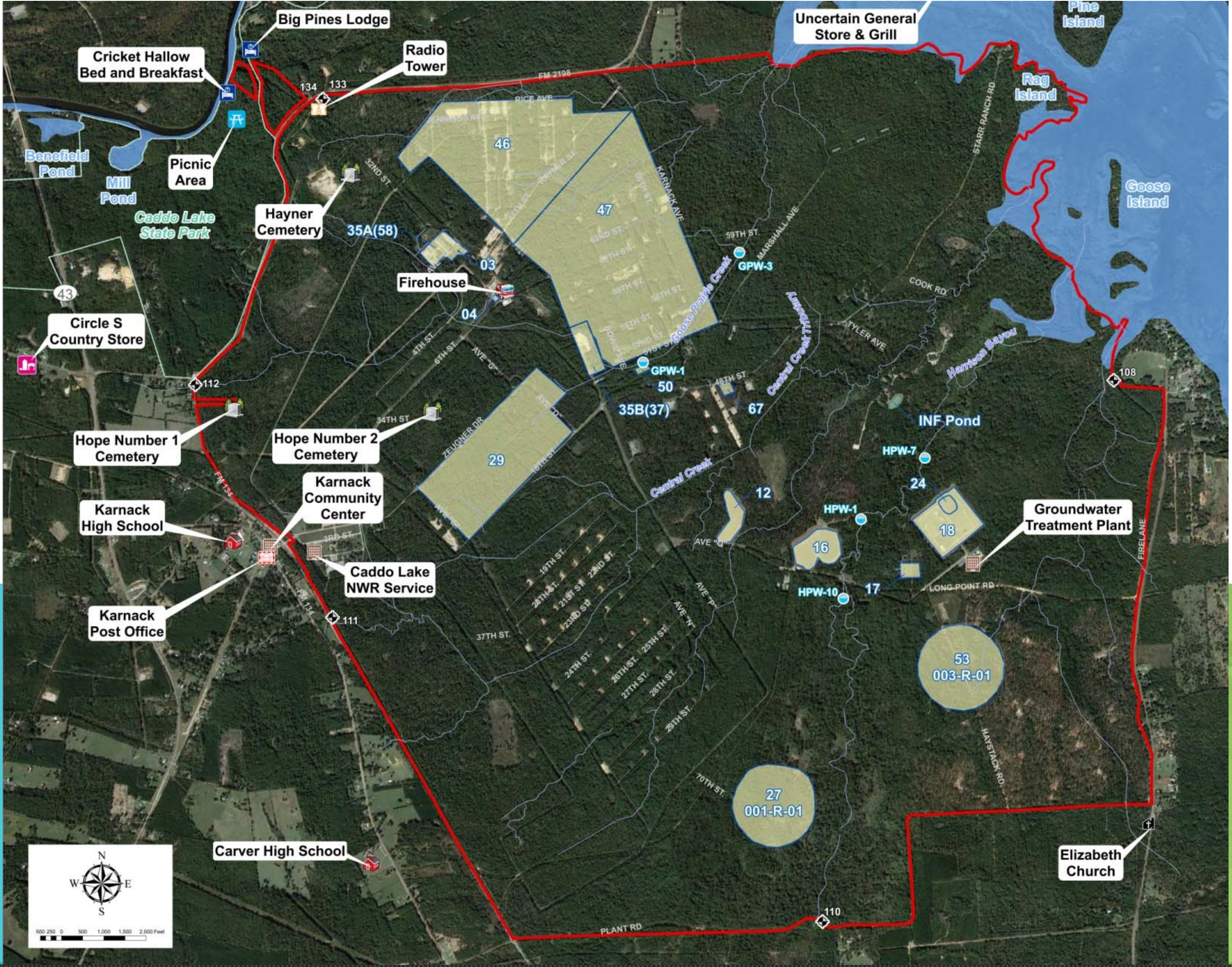
06:15 Defense Environmental Restoration Program (DERP) Update {AECOM}
- On-going work LHAAP 18/24, LHAAP 29
- Groundwater Treatment Plant (GWTP) Update
- Dense Non-Aqueous Phase Liquids (DNAPLs)
- MNA Site Overview (LHAAP-46, 50, 58, 67)

07:15 Other Environmental Restoration Issues {RMZ}
- Sitewide LUC Management Plan Update
- Bioplug Demonstration at LHAAP-37
- Dispute Status Update
- Schedule

07:20 Next RAB Meeting Schedule and Closing Remarks

07:30 Adjourn {RMZ}

Longhorn Map



Longhorn Active Site List

LHAAP-03	Building 722 Paint Shop
LHAAP-04	Pilot Wastewater Treatment Plant
LHAAP-12	Landfill 12
LHAAP-16	Landfill 16
LHAAP-17	Burning Ground No.2/Flashing Area
LHAAP-18	Burning Ground No.3
LHAAP-24	Unlined Evaporation Pond
LHAAP-29	Former TNT Production Area
LHAAP-37	Chemical Laboratory Waste Pad
LHAAP-46	Plant Area 2
LHAAP-47	Plant Area 3
LHAAP-50	Former Sump Water Tank
LHAAP-58	Maintenance Complex
LHAAP-67	Aboveground Storage Tank Farm
LHAAP-001-R-01	South Test Area/Bomb Test Area
LHAAP-003-R-01	Ground Signal Test Area

RAB Administrative Issues

- Minutes from February Meeting
- RAB Tour – Questions and Answers from Tour
- Website Update

Longhorn Army Ammunition Plant

Environmental Restoration Program

The next RAB meeting will take place Thursday, May 15 at 6:00 pm. See the Calendar.

Overview

Print this Overview

Welcome

Dense Non-Aqueous Phase Liquid (DNAPL)

- Dense Non-Aqueous Phase Liquids are present at LHAAP-29 and LHAAP-18/24
  - Typically chlorinated hydrocarbons, such as trichloroethylene (TCE) and Methylene Chloride (MC)
  - Compounds with densities greater than water or specific gravity greater than 1
  - These compounds ‘sink’ until they reach an confined unit (aquitard) then spread via preferential pathways along the aquitard (which may be opposite of groundwater flow direction)
- Present in two locations in shallow groundwater at LHAAP-18/24 and one location at LHAAP-29, all three of these locations are proposed for further work to delineate the extent of DNAPL this spring

AECOM

DNAPL (cont)

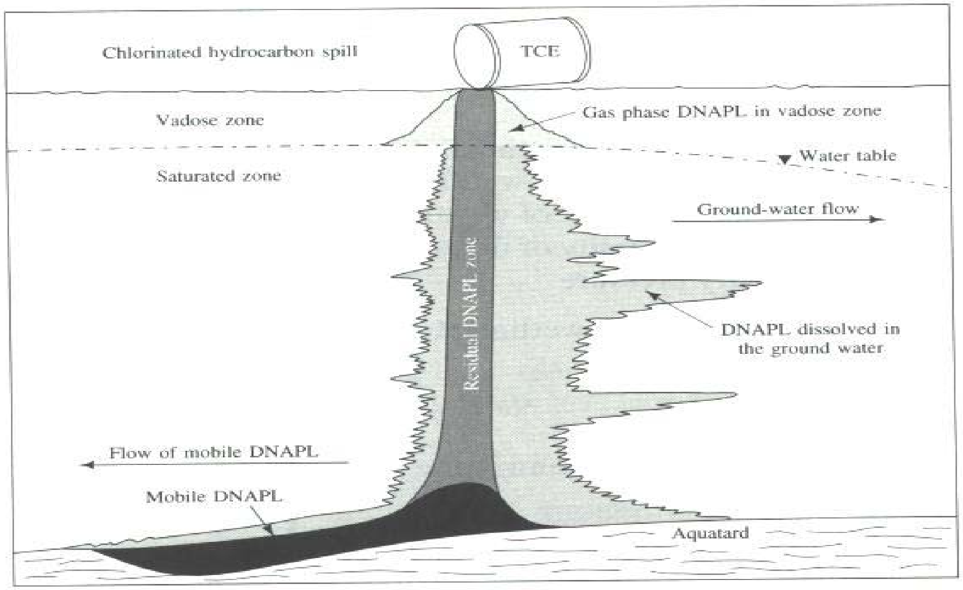


FIGURE 5.28 Distribution of a dense nonaqueous phase liquid in the vadose and saturated zone.

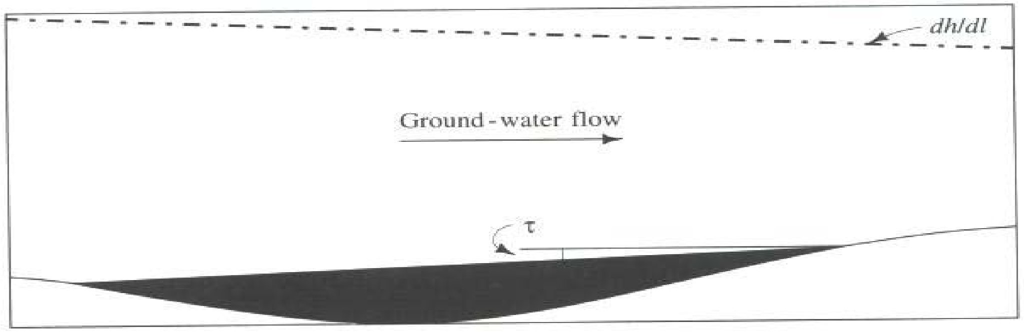
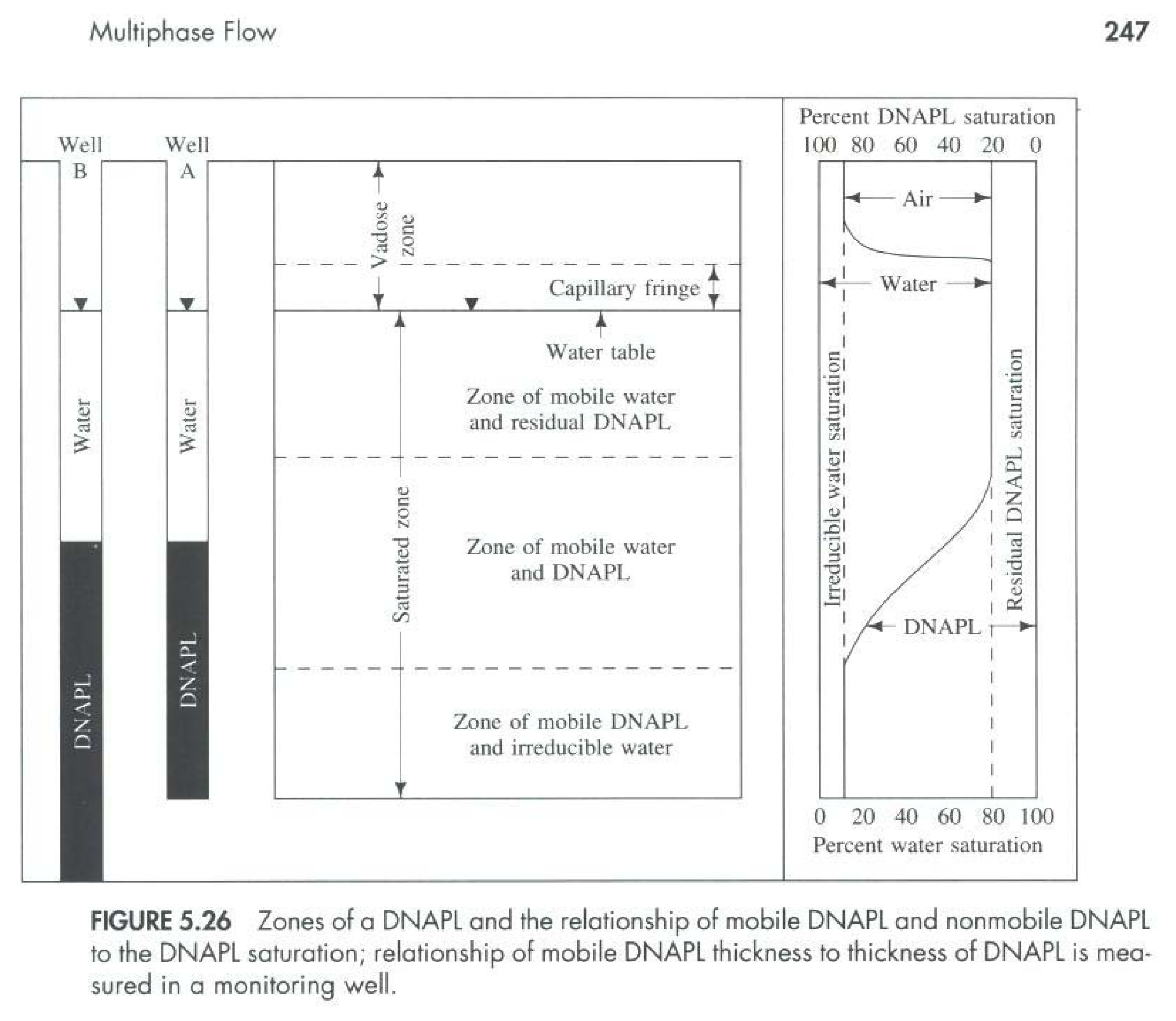


FIGURE 5.29 Sloping interface between a static layer of DNAPL and flowing ground water.

DNAPL (cont)



Multiphase Flow 247

FIGURE 5.26 Zones of a DNAPL and the relationship of mobile DNAPL and nonmobile DNAPL to the DNAPL saturation; relationship of mobile DNAPL thickness to thickness of DNAPL is measured in a monitoring well.

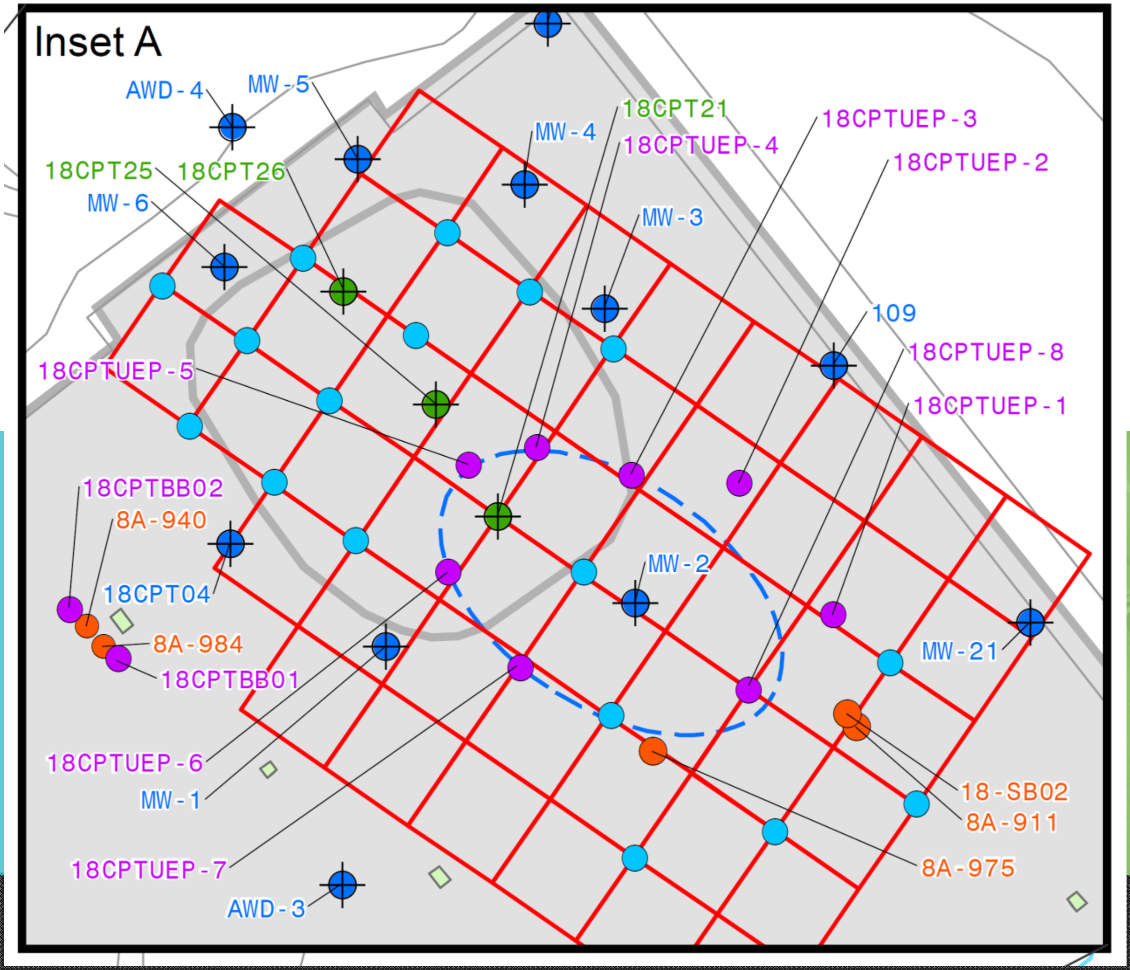
Status of Environmental Sites

- LHAAP-18/24 – Burning Grounds #3 and Unlined Evaporation Pond
  - Interim remedy: Continuous extraction and treatment of groundwater from collection trenches surrounding and within the site (green in image below)
  - Contaminants of Concern: Perchlorate, VOCs (TCE, MC), Metals

AECOM

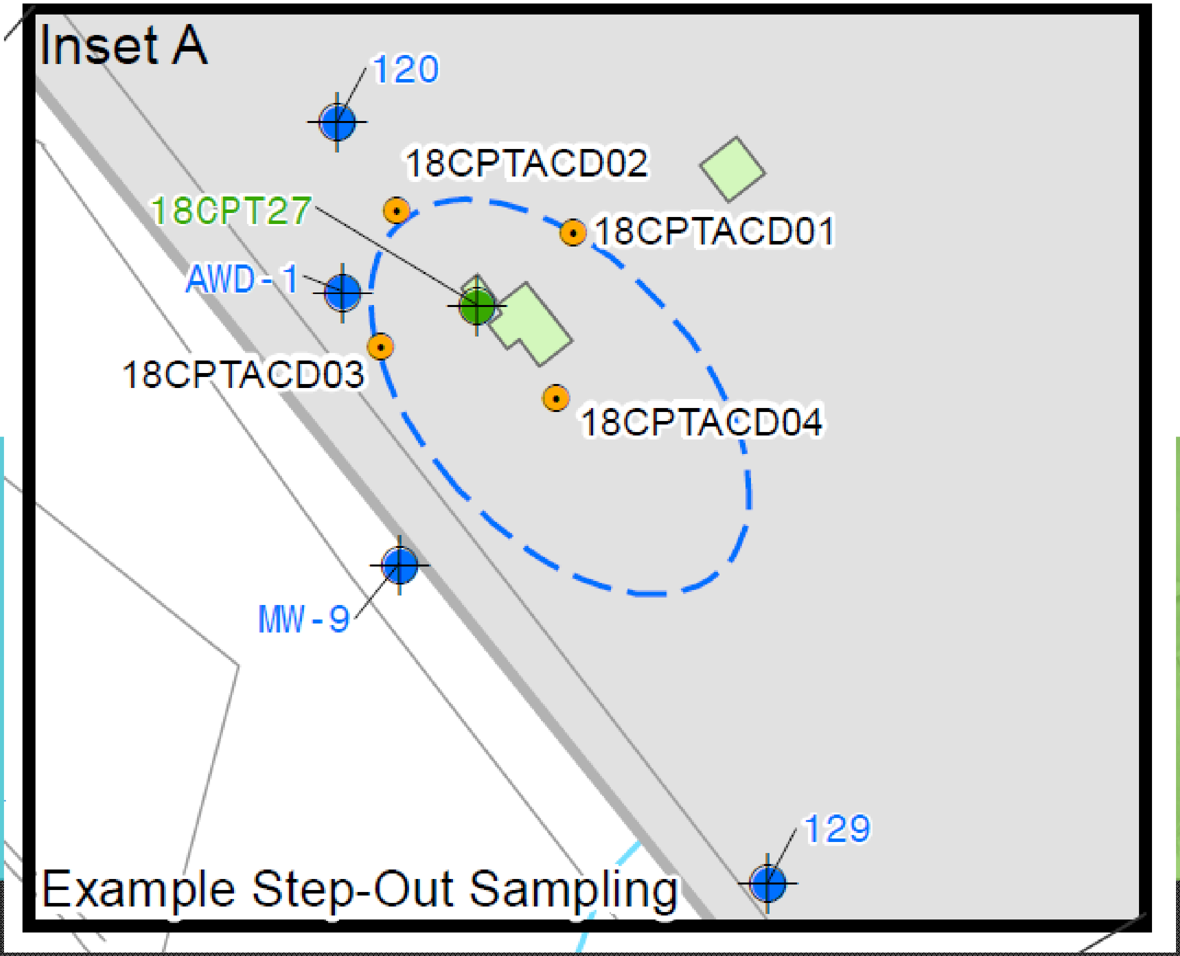
Status of Environmental Sites (cont)

- LHAAP-18/24 – Burning Grounds #3 and Unlined Evaporation Pond
  - Investigation of Dense Non-Aqueous Phase Liquid and Soil Source Material at Unlined Evaporation Pond



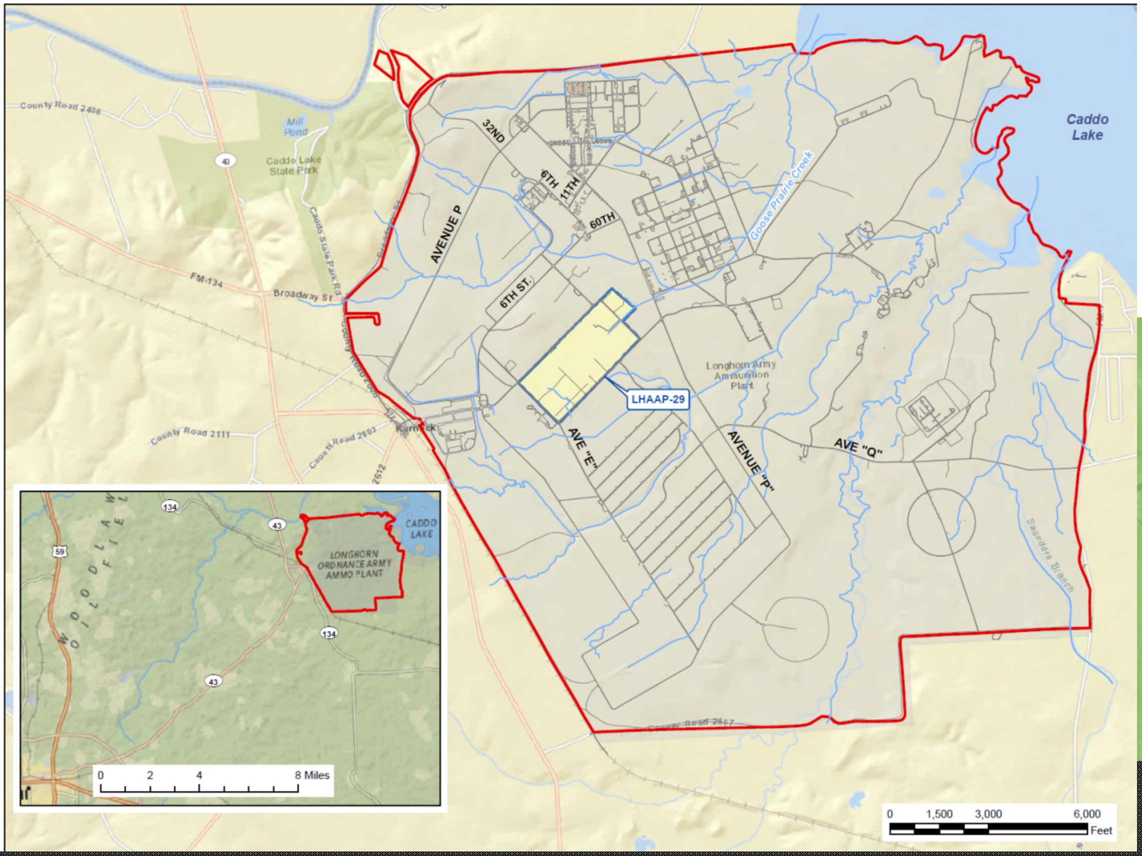
Status of Environmental Sites (cont)

- LHAAP-18/24 – Burning Grounds #3 and Unlined Evaporation Pond
  - Investigation of Dense Non-Aqueous Phase Liquid and Soil Source Material at Air Curtain Destructor



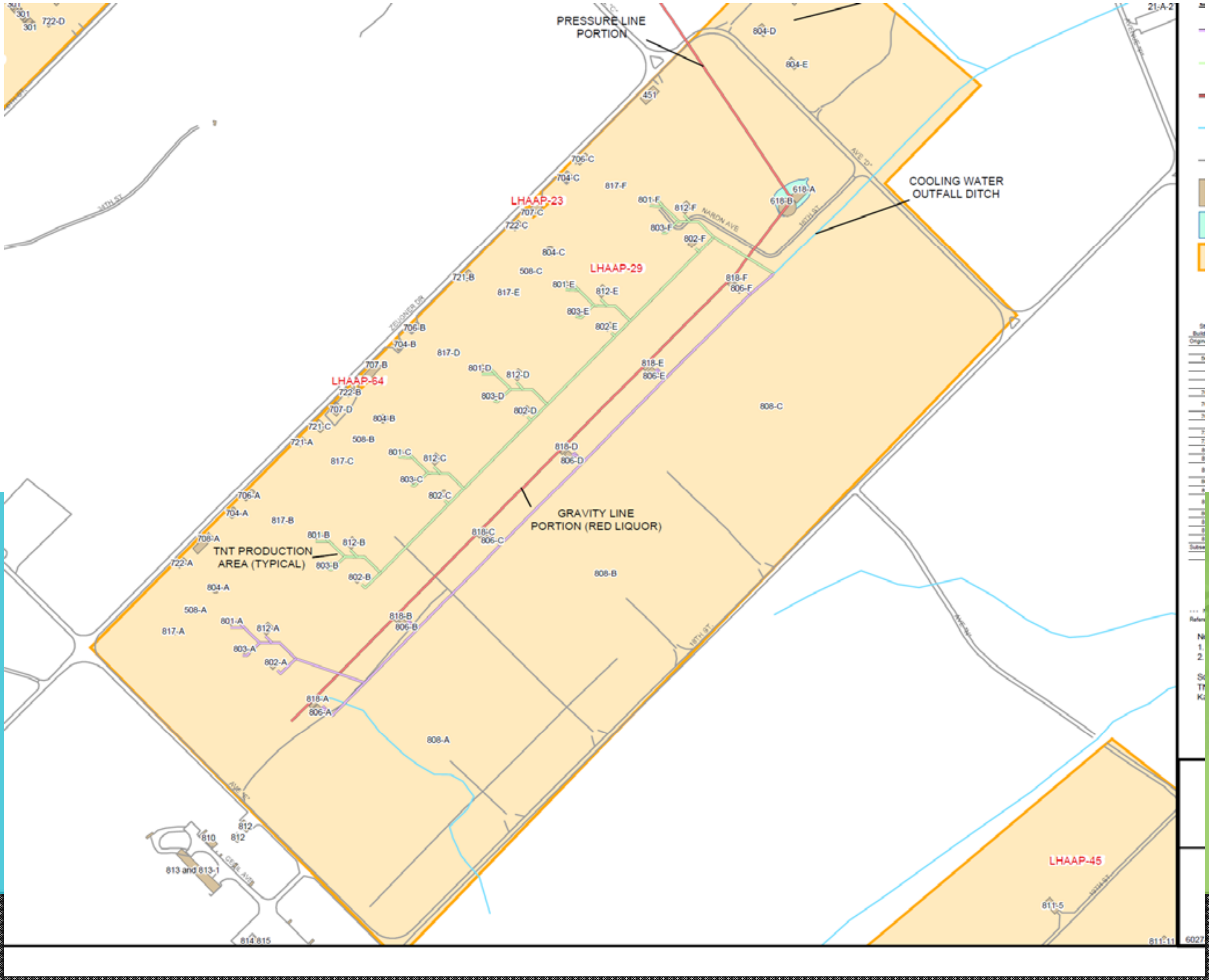
Status of Environmental Sites (cont)

- LHAAP-29 Former TNT Production Area
  - 85-acre site that historically manufactured TNT for use during World War II. Subsequently this area was used for “soak out” or solvent bath of out-of-specification rocket motors from the 1950’s through the 1970’s
  - Contaminants of Concern: Perchlorate, VOCs (TCE, MC), Explosives



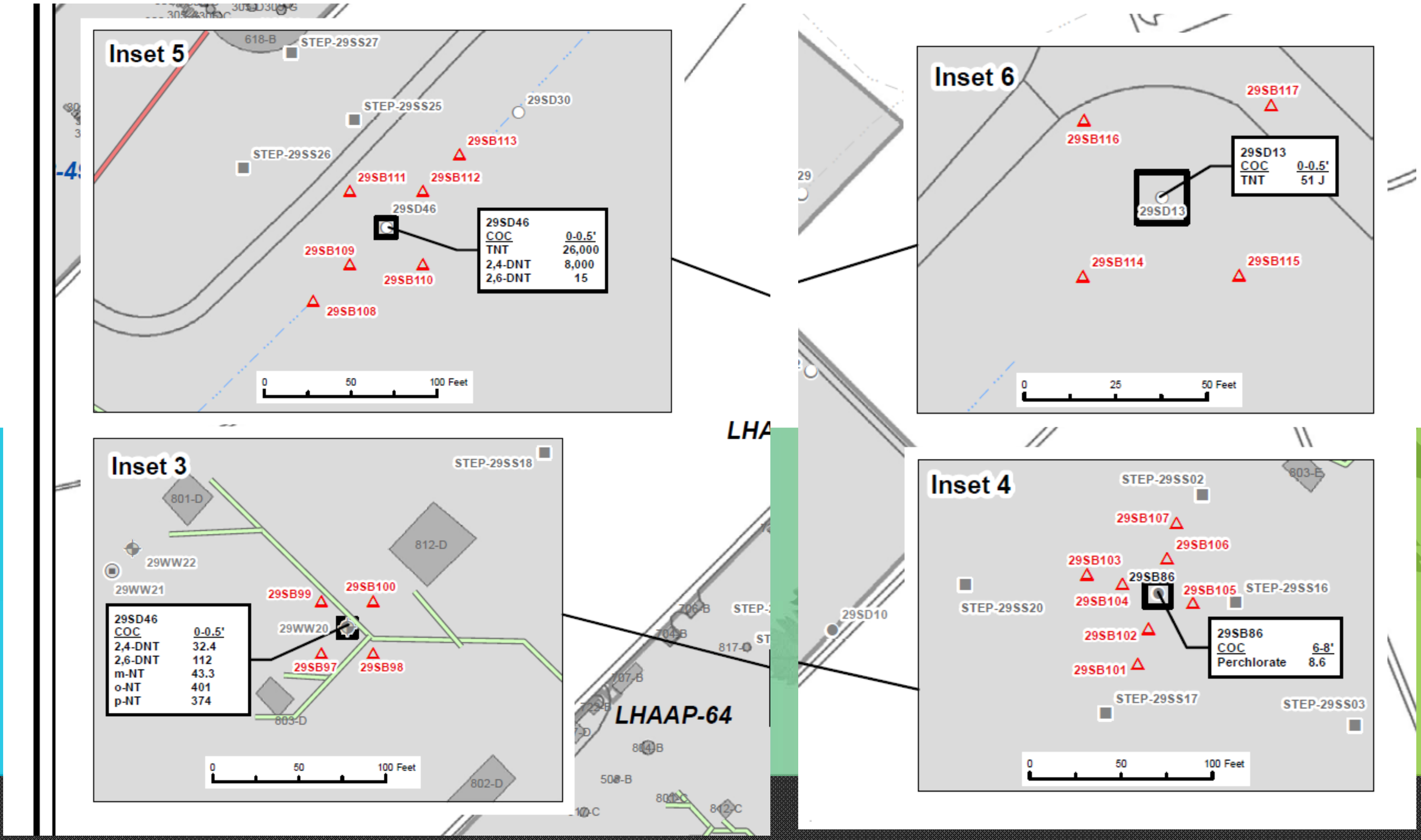
Status of Environmental Sites (cont)

- LHAAP-29 Former TNT Production Area



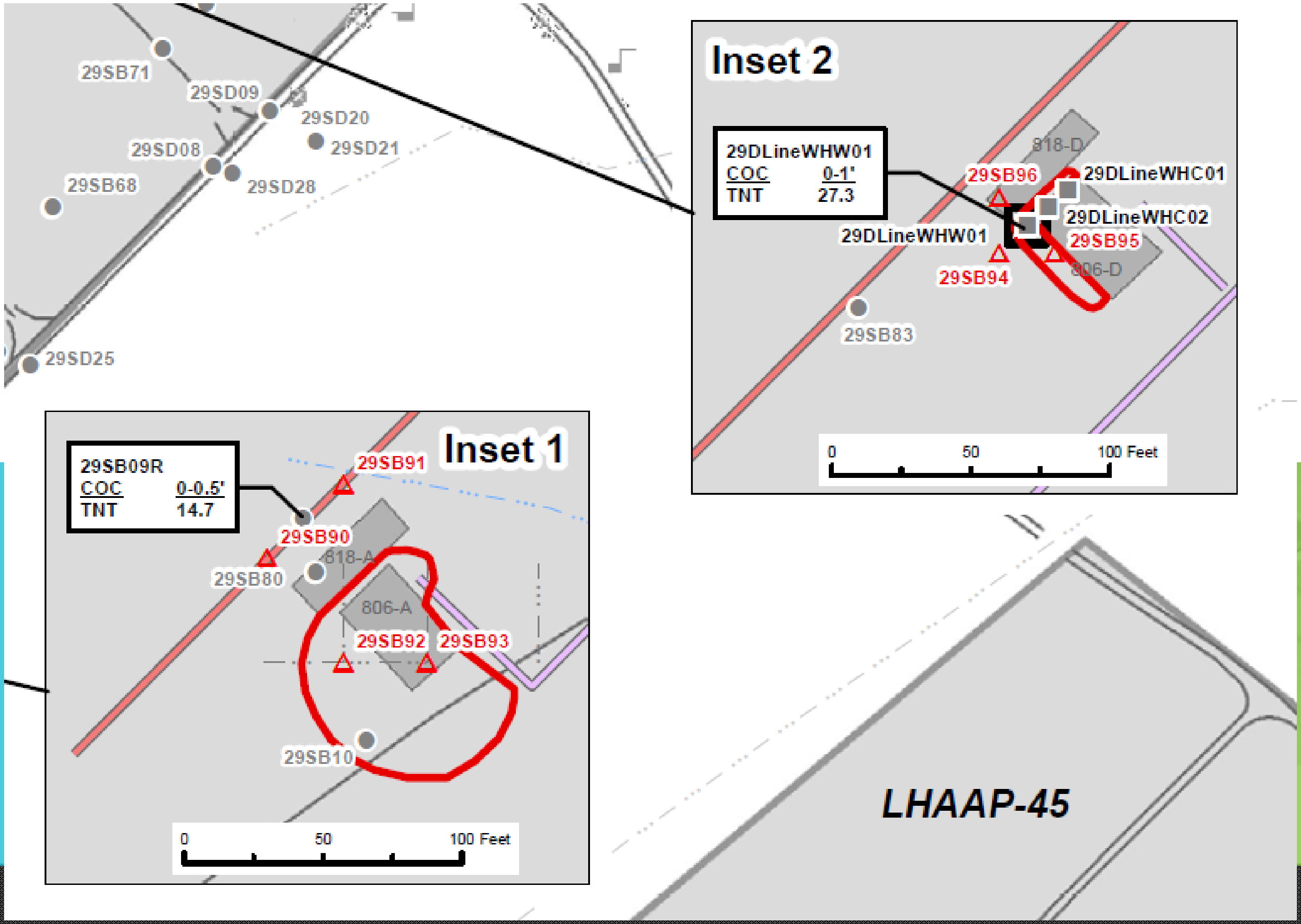
Status of Environmental Sites (cont)

- LHAAP-29 Former TNT Production Area- Planned Soil Sampling



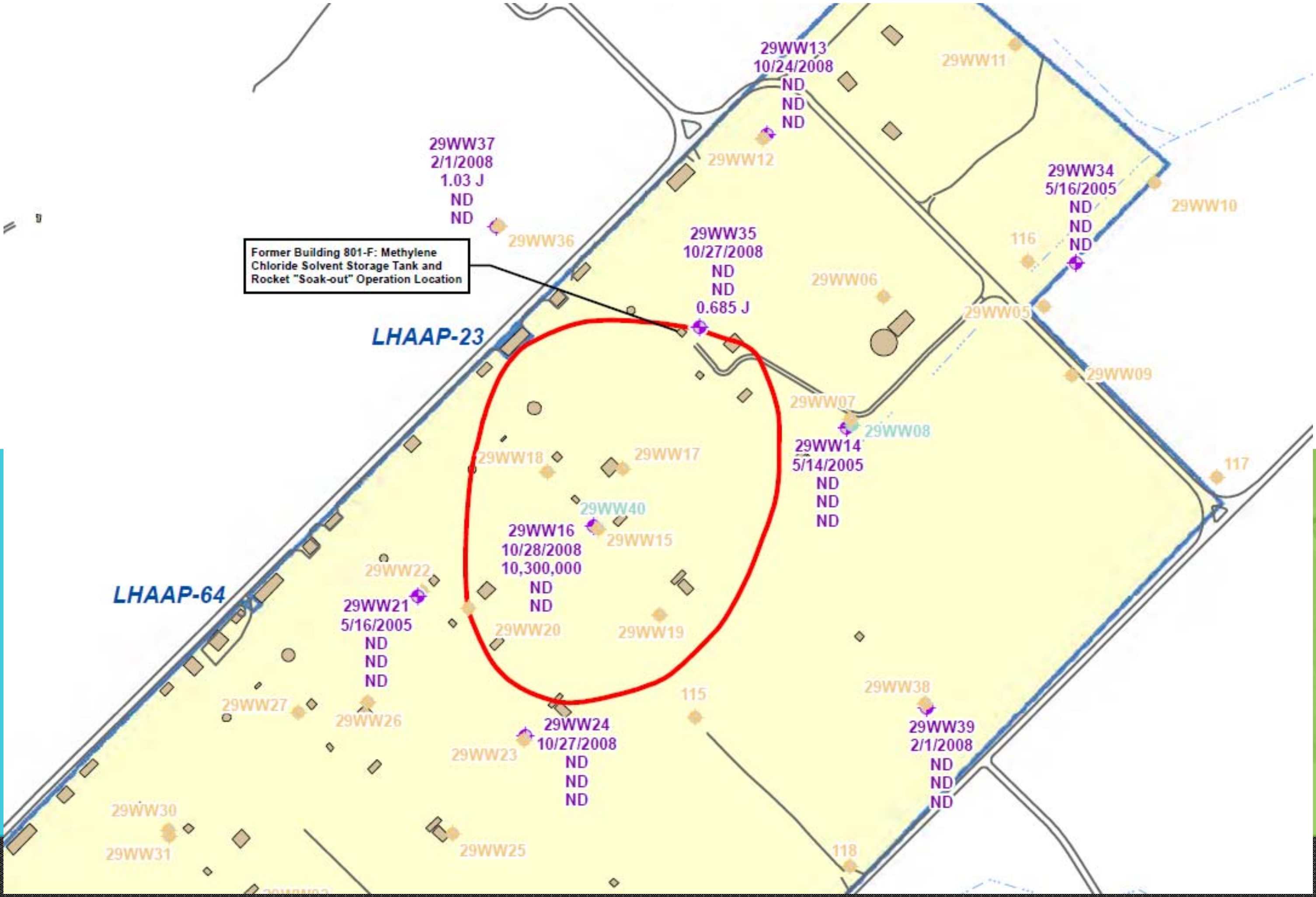
Status of Environmental Sites (cont)

- LHAAP-29 Former TNT Production Area- Planned Soil Sampling (cont)



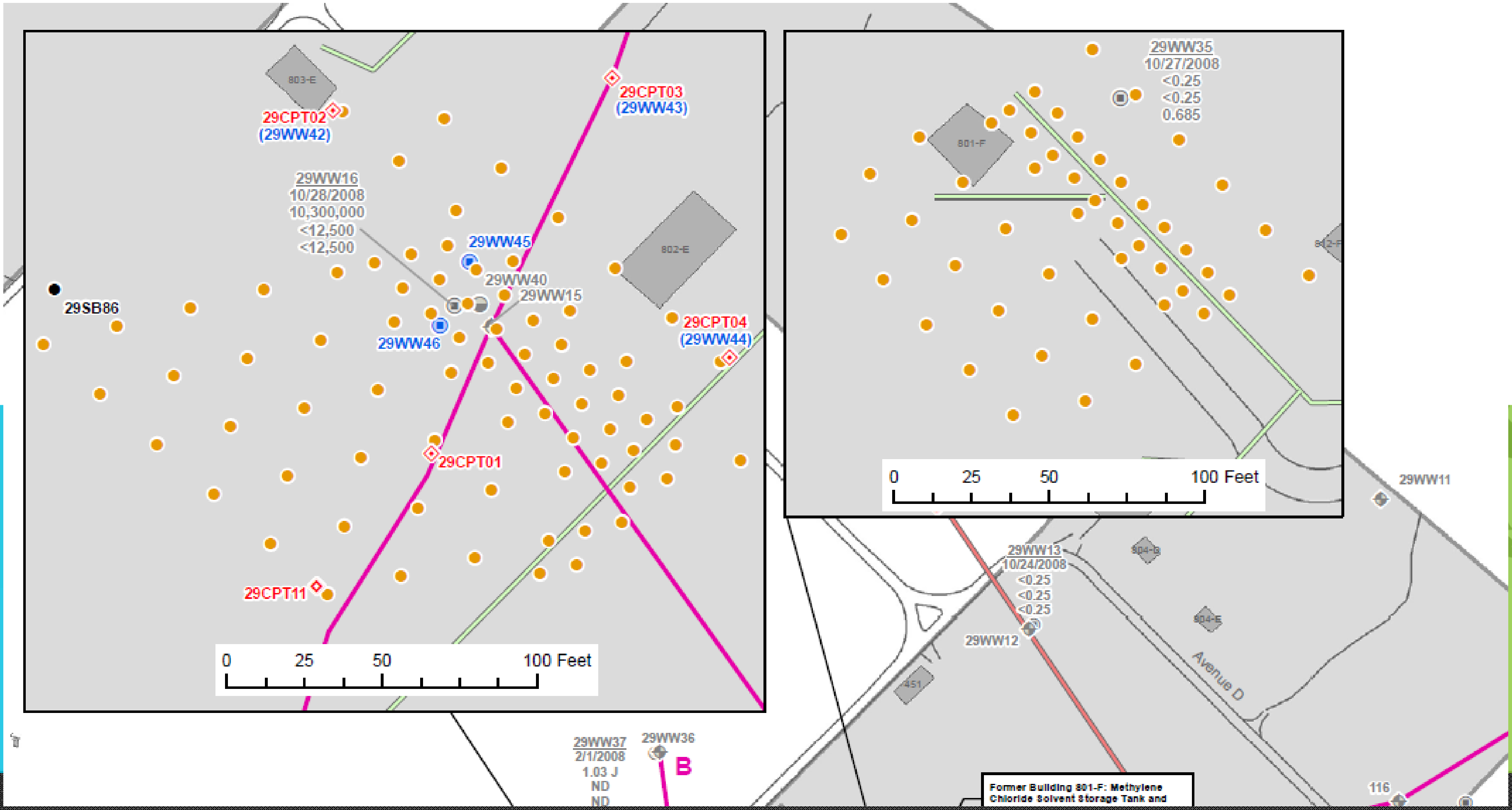
Status of Environmental Sites (cont)

– LHAAP-29 Former TNT Production Area- Methylene Chloride in Intermediate GW



Status of Environmental Sites (cont)

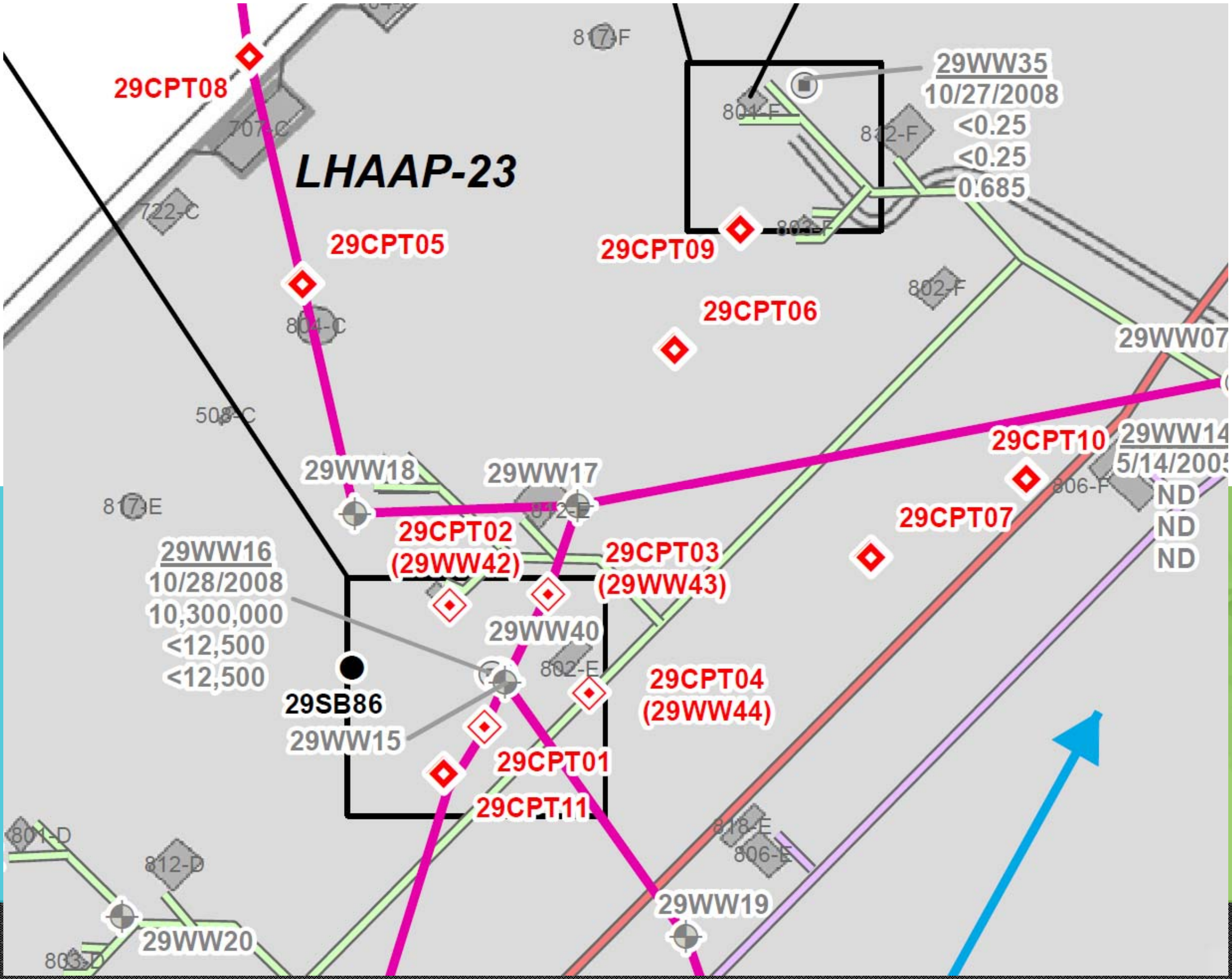
- LHAAP-29 Former TNT Production Area- Planned Soil Gas/Soil Sampling



AECOM

Status of Environmental Sites (cont)

– LHAAP-29 Former TNT Production Area- Planned Cone Penetrometer Testing



Status of Environmental Sites (cont)

- LHAAP-18/24 and LHAAP-29 – Treatability Testing
  - LHAAP-18/24
    - Electrical Resistivity Testing (test the amount of electric current needed to heat the soil or mobilize groundwater and ions if heating or electrokinetics is suitable and cost effective
    - In-Situ Microcosm Testing (test the effectiveness of natural degradation and In-Situ Bioremediation using Bio-traps and Stable Isotope Probing)
    - Bench Scale Microcosm Testing (similar to what we completed at LHAAP-58 to determine if bacteria respiring perchlorate and VOCs are present and demonstrate bioaugmentation will work for the site)
    - Emulsified Zero Valent Iron Microcosm Testing (determine the optimum ZVI to soil ratio to degrade contaminants

Status of Environmental Sites (cont)

- Treatability Testing (cont)
  - LHAAP- 29
    - Electrical Resistivity Testing (test the amount of electric current needed to heat the soil or mobilize groundwater and ions if heating or electrokinetics is suitable and cost effective
    - In-Situ Microcosm Testing (test the effectiveness of natural degradation and In-Situ Bioremediation using Bio-traps and Stable Isotope Probing)
    - Aquifer Pumping Test (test to determine aquifer flow characteristics for inclusion in remedy cost calculations)

Status of Environmental Sites (cont)

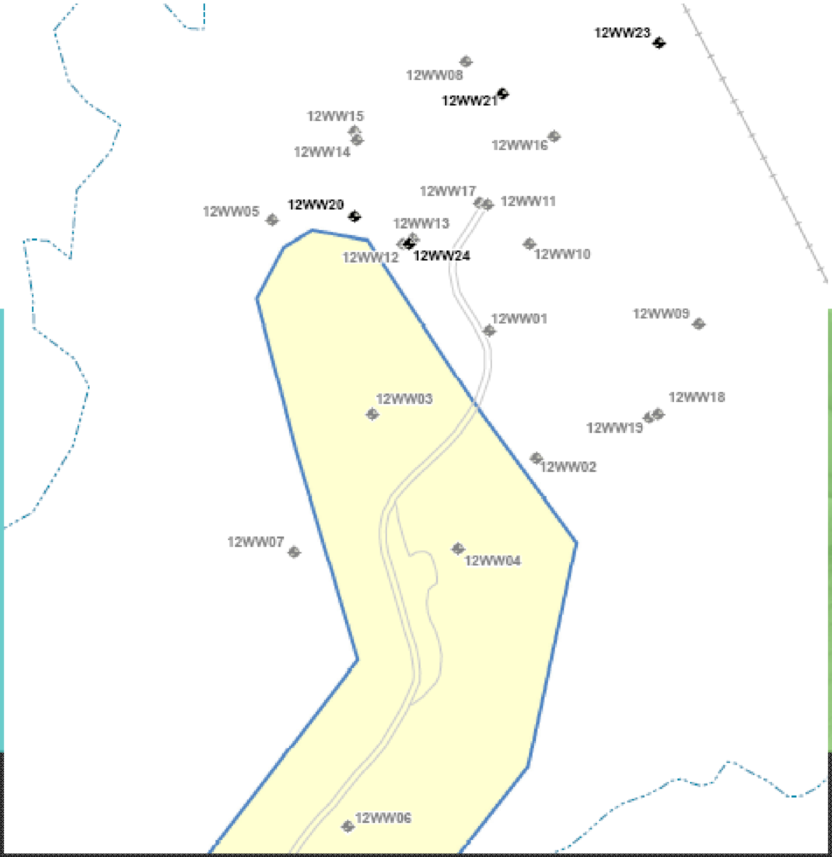
- Monitored Natural Attenuation Sites – close to 1st Annual Report for each of these sites, a more detailed update will be provided at the next RAB
    - LHAAP-46 – Plant Area 2
    - LHAAP-35B (37) – Chemical Laboratory
    - LHAAP-50 – Former Sump Water Tank
    - LHAAP-58 – Shops Area
    - LHAAP-67 – Aboveground Storage Tank Farm

Status of Environmental Sites (cont)

- LHAAP-03 - Record of Decision, Remedial Design/Remedial Action Work Plan On-hold Due to Dispute
- LHAAP-04 - Record of Decision, Remedial Design/Remedial Action Work Plan On-hold Due to Dispute
- LHAAP-16 - Record of Decision, Remedial Design/Remedial Action Work Plan On-hold Due to Dispute
- LHAAP-17 - Record of Decision, Remedial Design/Remedial Action Work Plan On-hold Due to Dispute
- LHAAP-47 - Record of Decision, Remedial Design/Remedial Action Work Plan On-hold Due to Dispute
- LHAAP-001-R-01 - Record of Decision, Remedial Design/Remedial Action Work Plan On-hold Due to Dispute LHAAP-003-R-01 - Record of Decision, Remedial Design/Remedial Action Work Plan On-hold Due to Dispute

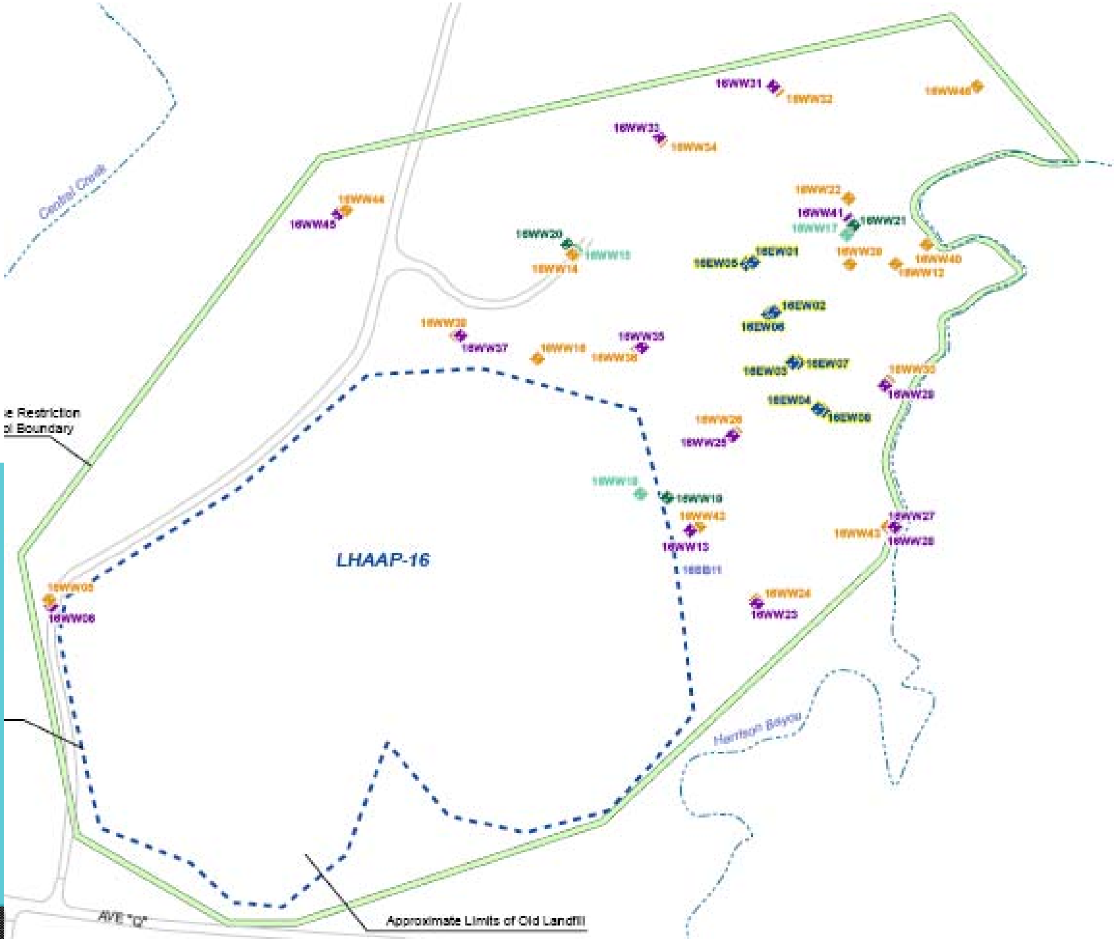
Status of Environmental Sites (cont)

- LHAAP-12 – Landfill 12
  - Completing Operations and Maintenance (mowing, signs, repairing sparse vegetation or subsidence areas)
  - Annual sampling completed in December
  - Addressing several areas of sparse vegetation (installing erosion control matting with seed embedded)



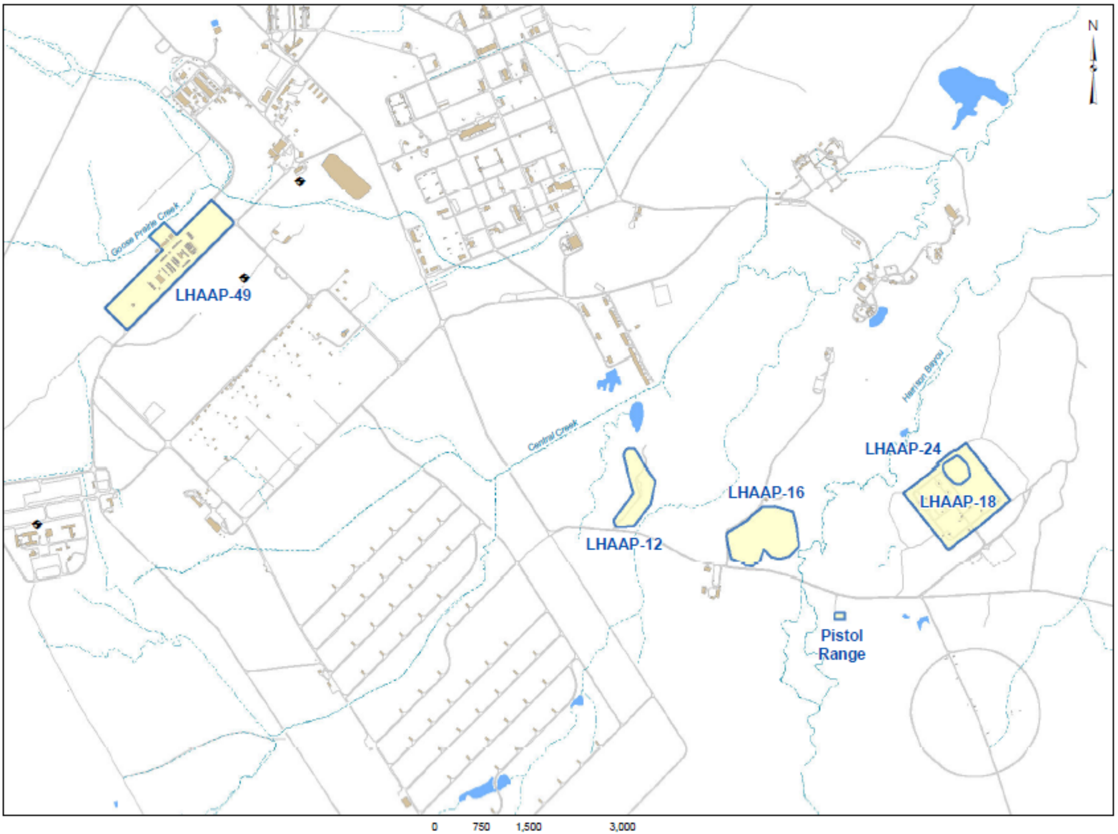
Status of Environmental Sites (cont)

- LHAAP-16 – Landfill 16
  - Performing on-going maintenance and extraction of groundwater



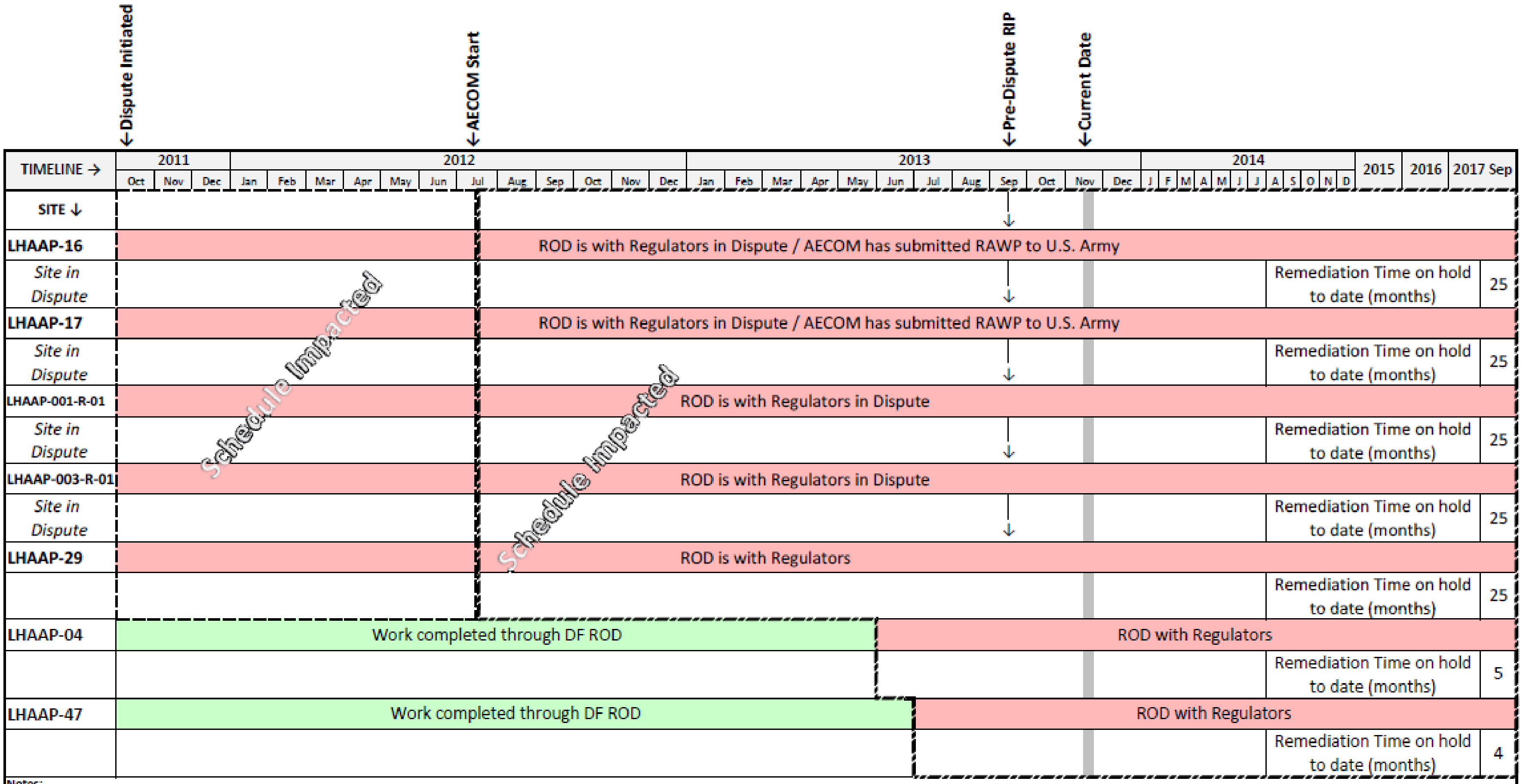
Status of Environmental Sites (cont)

- CERCLA Five-Year Review Process for Multiple Sites
  - Review completed for LHAAP-12, LHAAP-16, LHAAP-18, LHAAP-24, LHAAP-49, and LHAAP-004-R-01
  - Report finalization in progress



Dispute Status

Sites at which Work has Ceased Pending Resolution of the Dispute



SITE ↓	Status	Remediation Time on hold to date (months)
LHAAP-16 Site in Dispute	ROD is with Regulators in Dispute / AECOM has submitted RAWP to U.S. Army	25
LHAAP-17 Site in Dispute	ROD is with Regulators in Dispute / AECOM has submitted RAWP to U.S. Army	25
LHAAP-001-R-01 Site in Dispute	ROD is with Regulators in Dispute	25
LHAAP-003-R-01 Site in Dispute	ROD is with Regulators in Dispute	25
LHAAP-29	ROD is with Regulators	25
LHAAP-04	Work completed through DF ROD ROD with Regulators	5
LHAAP-47	Work completed through DF ROD ROD with Regulators	4

Notes:

AECOM	AECOM Technical Services, Inc.	PP	Proposed Plan
EE/CA	Engineering Evaluation/Cost Analysis	PSI	Post-Screening Investigation
FFS	Focused Feasibility Study	ROD	Record of Decision
LHAAP	Longhorn Army Ammunition Plant		

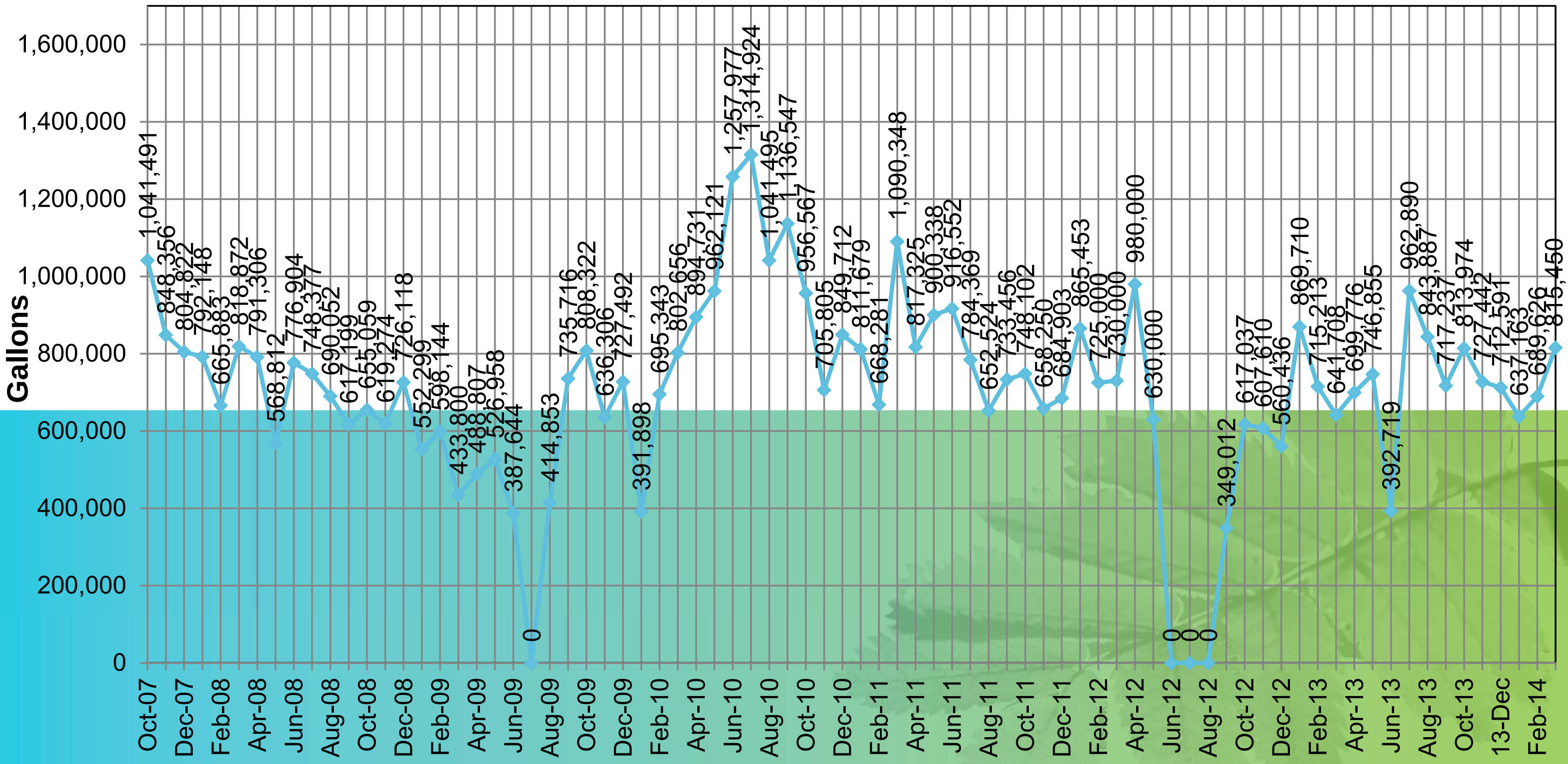
L:\work\60256135 LONGHORN Firm Fixed Price\1.0 Project Management\2.2 Six Month Tracker\Dispute

Groundwater Treatment Plant Operations and Management

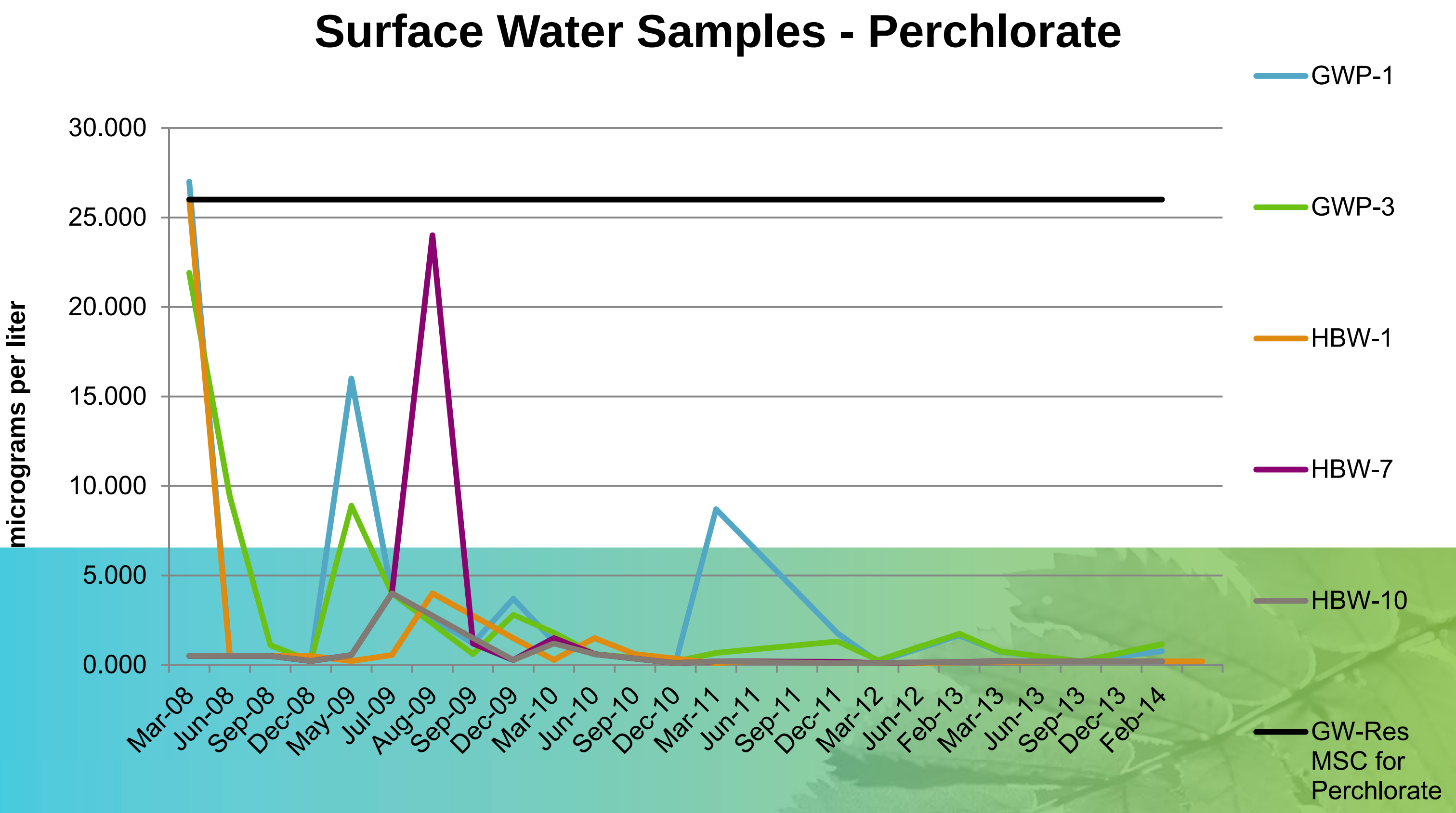
- The Groundwater Treatment Plant continues to operate to contain the plume at LHAAP-18/24 and LHAAP-16.
- Water continues to be returned to LHAAP-18/24 or into Harrison Bayou, depending on the amount of water in the bayou.
- Compliance monitoring continues per existing sampling plan.
- Maintenance and repairs of wells, pumps, tanks, and ancillary equipment is on-going.

GWTP O&M (cont)

Figure ES-3
Water Treated Monthly from October 2007 through March 2014



Surface Water Sample Results



GPW – Goose Prairie Creek

HBW – Harrison Bayou

Upcoming Fieldwork, Meetings, and Documents

1. Continue quarterly groundwater sampling for monitoring networks at LHAAP-46, 50, 58, 67, in addition to semi-annual compliance sampling at LHAAP-18/24
2. Final Completion Reports in progress for LHAAP-37, 46, 50, 58, 67
3. LHAAP-18/24 and LHAAP-29 – Report current activities leading to a Proposed Plan and Record of Decision for each site
4. Sites where work has ceased pending dispute resolution:
    1. LHAAP-03
    2. LHAAP-04
    3. LHAAP-47
    4. LHAAP-16
    5. LHAAP-17
    6. LHAAP-29
    7. LHAAP-001-R-01
    8. LHAAP-003-R-01

Additional DNAPL Information

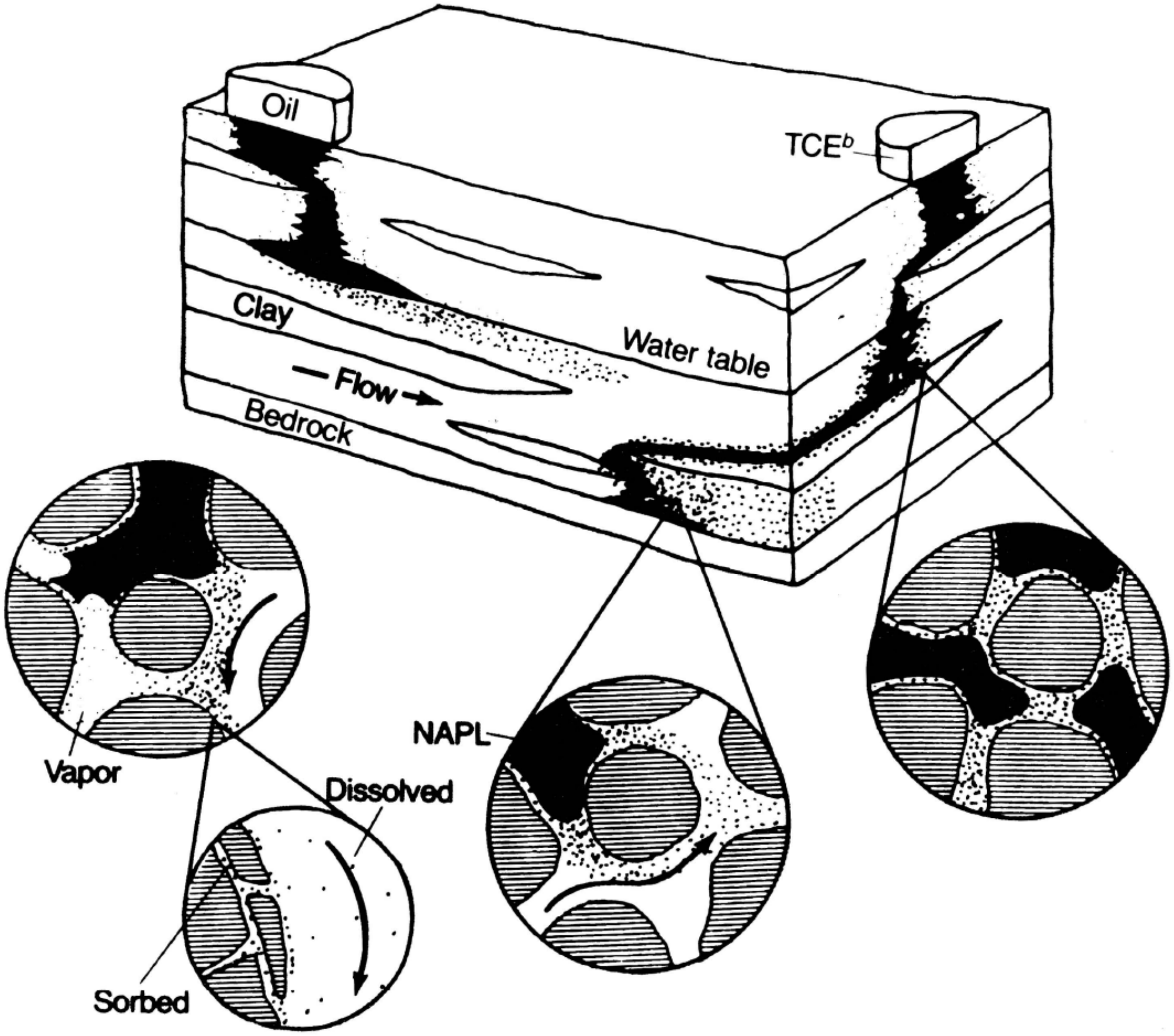


Figure 2.1 Schematic illustration of a DNAPL and a LNAPL in a porous medium, showing geologic and pore scales. A low-permeability clay layer deflects the DNAPL. DNAPL dissolution causes a plume (from Mackay and Cherry, 1989).

Additional DNAPL Information (cont)

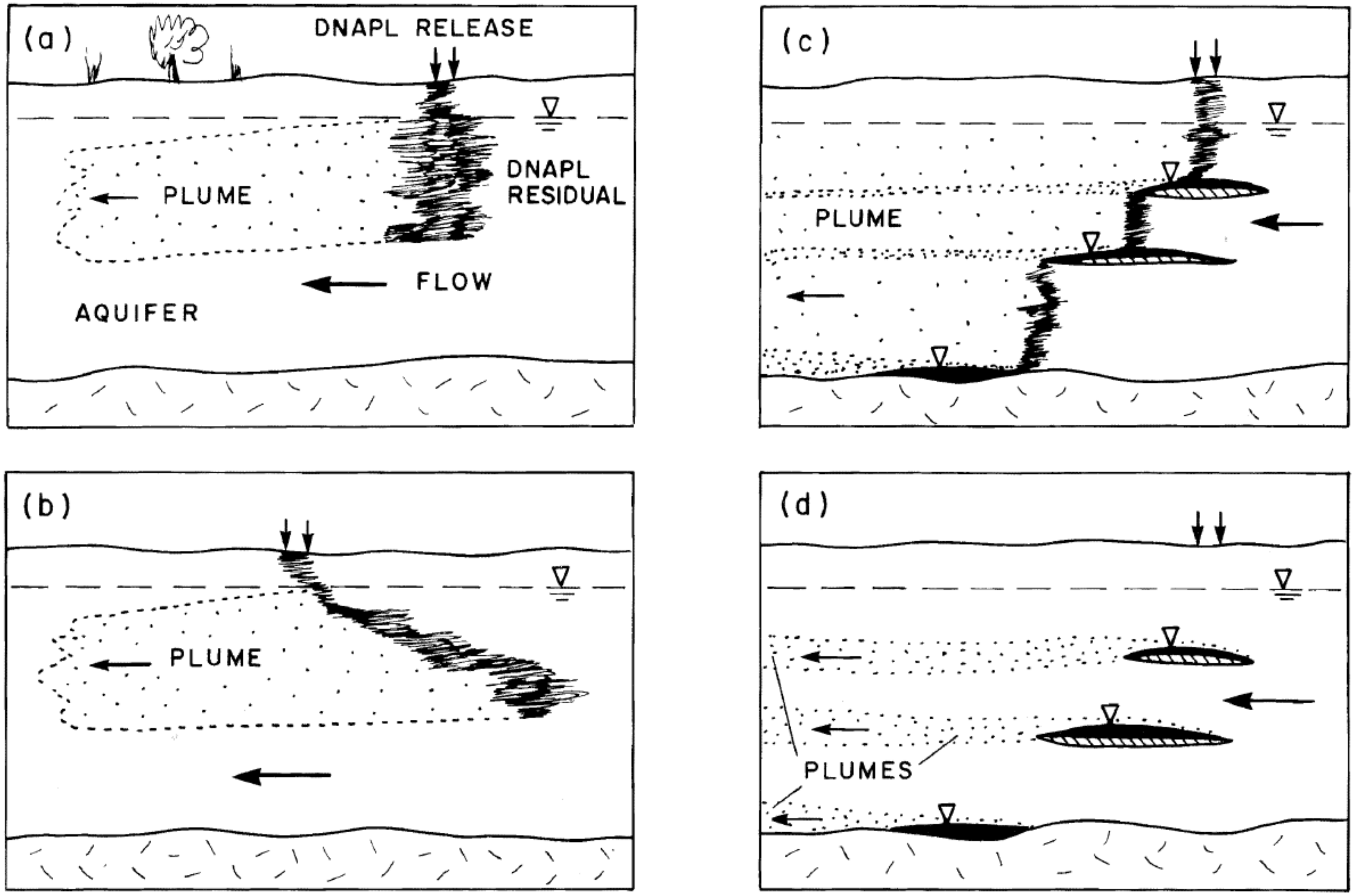
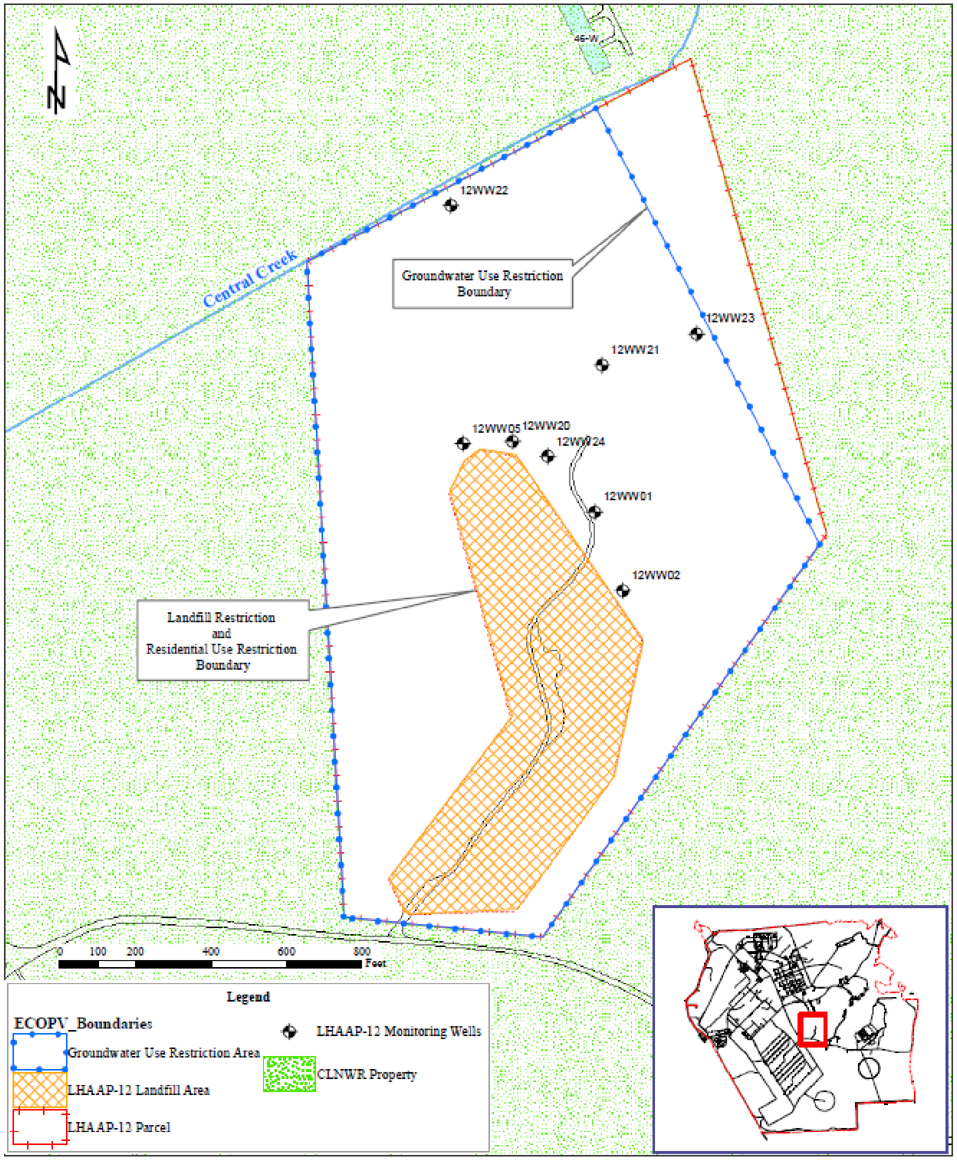


Figure 2.5 Conceptual scenarios for a DNAPL in the groundwater zone in granular aquifers: a) partial penetration; b) partial penetration with offset; c) full penetration with offset; and d) same as part c, but at a later stage after DNAPL residual has disappeared due to dissolution in flowing groundwater. (Pankow and Cherry, 1996)

ECP V and VI

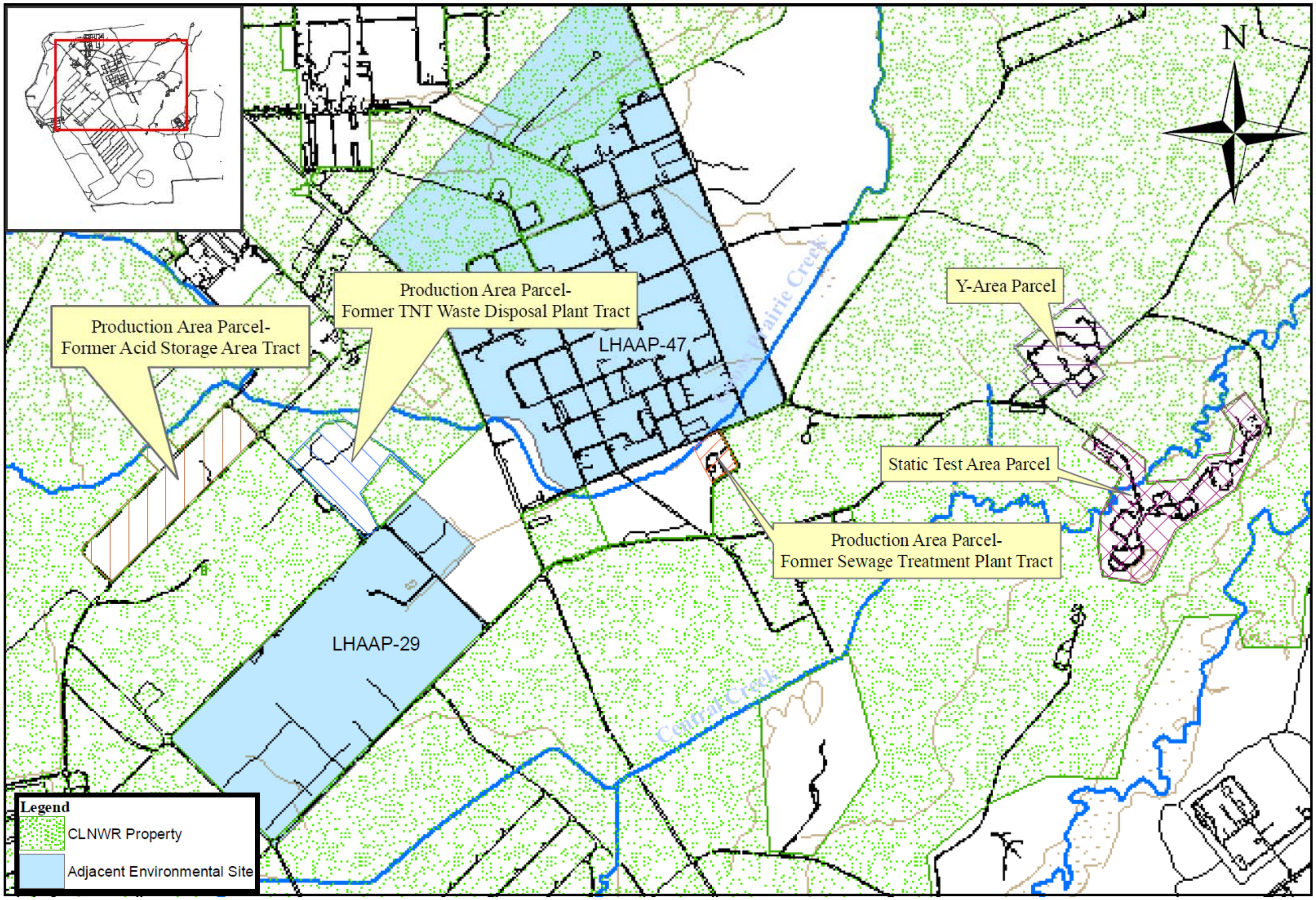


LONGHORN ARMY AMMUNITION PLANT

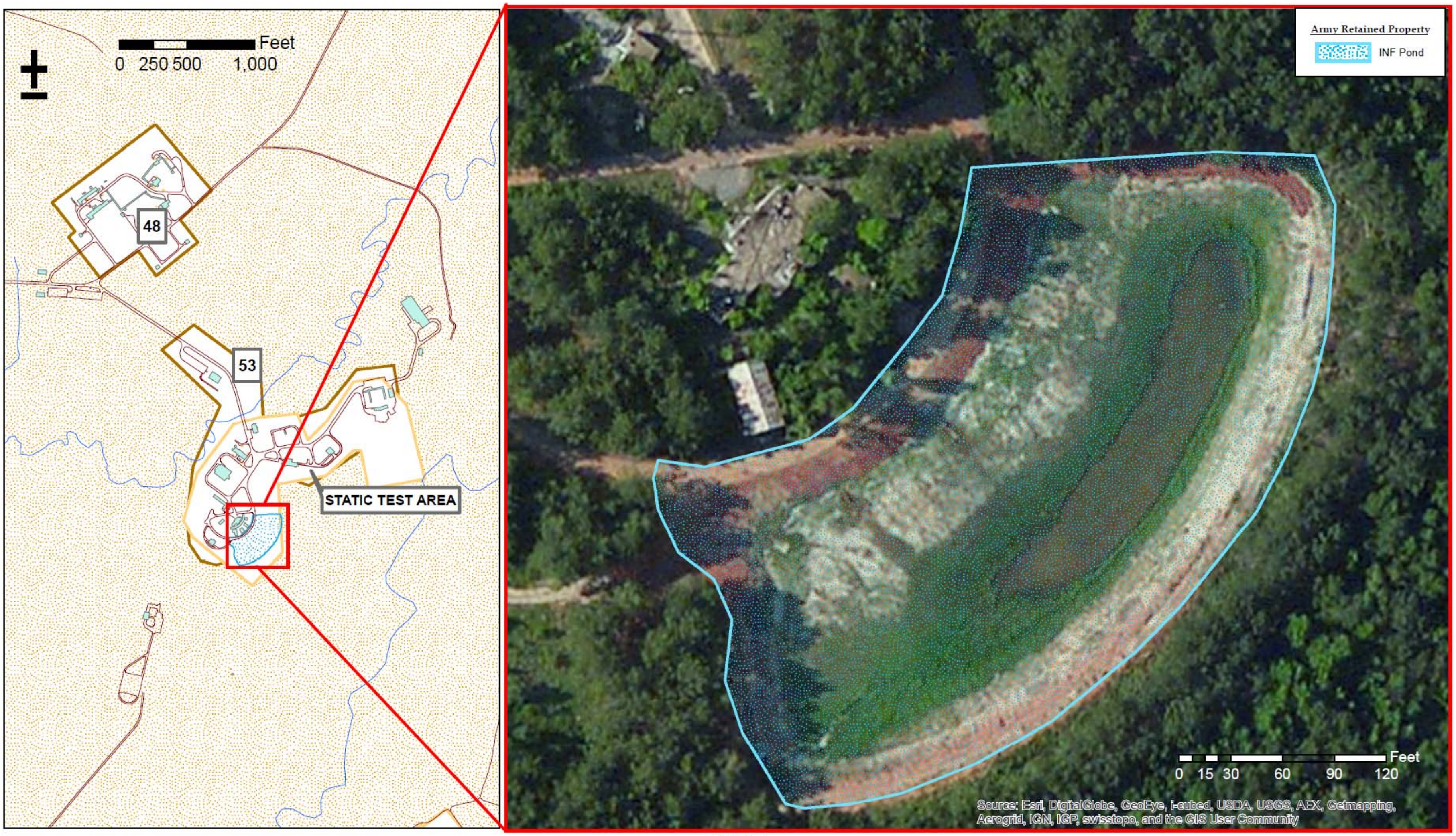
ENVIRONMENTAL CONDITION OF PROPERTY (ECOP) V

FIGURE 2. Location of Proposed Transfer Property and Land Use Control Boundaries

ECP V and VI (cont)



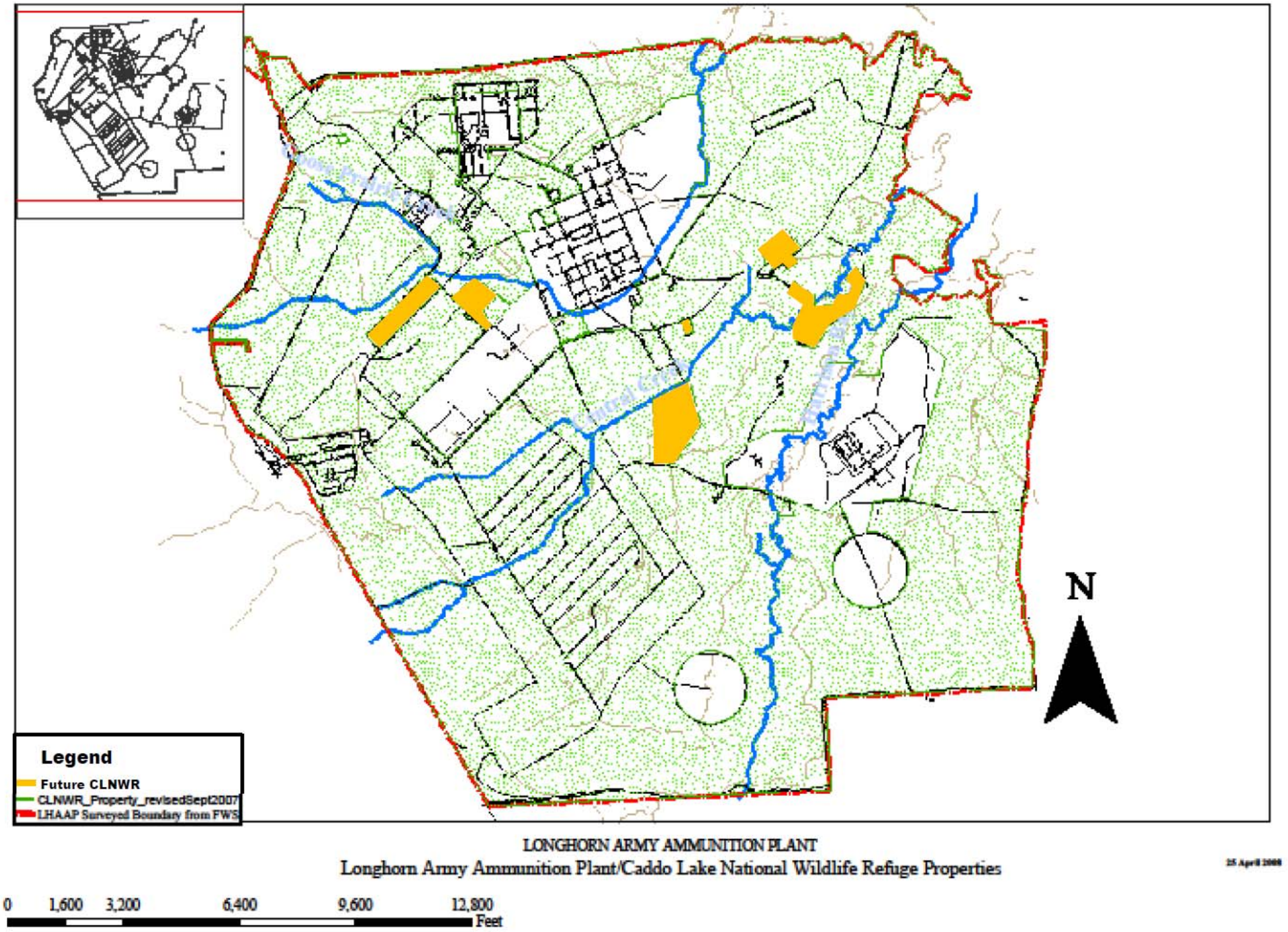
ECP V and VI (cont)



Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

FIGURE 2
LONGHORN ARMY AMMUNITION PLANT
Army Retained - INF Pond

ECP V and VI (cont)



LONGHORN ARMY AMMUNITION PLANT

Longhorn Army Ammunition Plant/Caddo Lake National Wildlife Refuge Properties

Back-up Slides

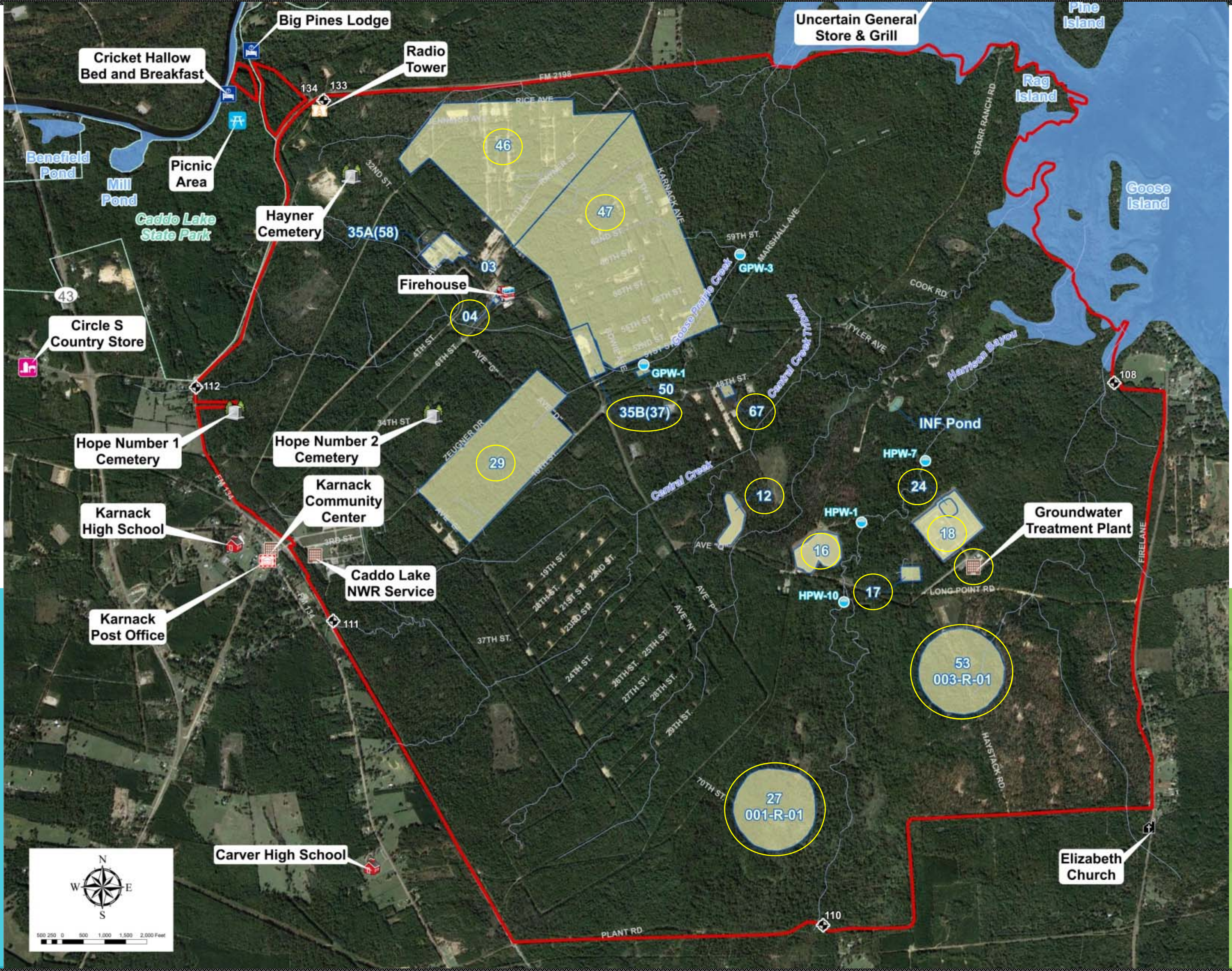
Bio Plug Study at LHAAP 35B (37)

- See separate slide presentation

Longhorn Army Ammunition Plant Restoration Advisory Board Tour
May 15, 2014

AECOM Environment

Tour Meets at Refuge Offices Parking Lot – May 15, 3pm



Tour Stop 1 – Groundwater Treatment Plant (GWTP)

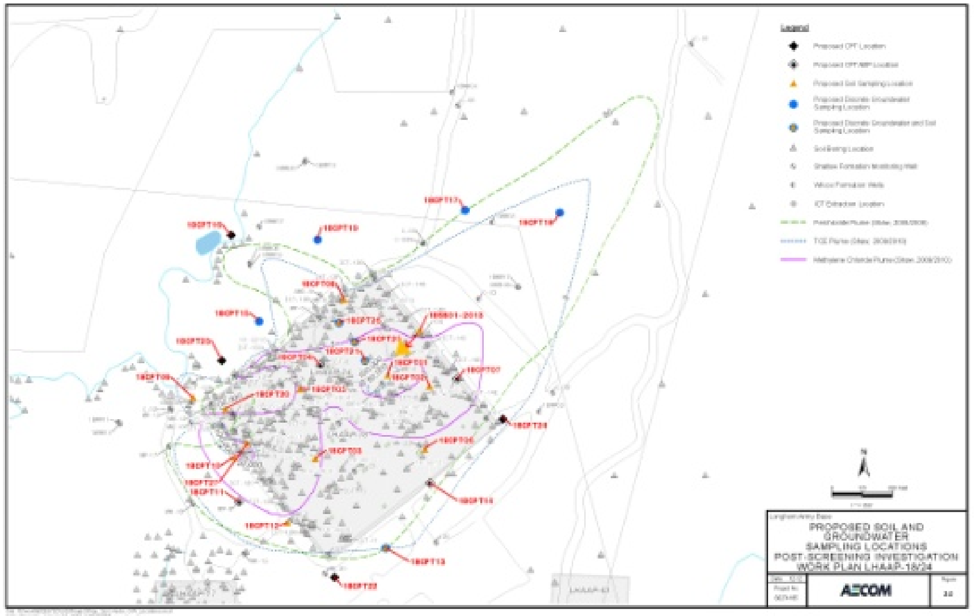
- History
  - Installed as part of an early interim remedial action in 1997 to treat groundwater from sites LHAAP-18/24
    - Modified to treat for perchlorate
    - Modified to accept contaminated groundwater from LHAAP-16 landfill
- Current Status
  - Continue to complete Operations and Maintenance with daily, weekly, monthly, quarterly water and periodic air sampling, replacement of equipment and process materials and chemicals as needed
- Upcoming Activities
  - Continue compliance sampling and Operations and Maintenance as needed, the plant is effective at removing contaminants from groundwater

Tour Stop 2 – LHAAP-18/24 Unlined Evaporation Pond and Burning Grounds No. 3

- History
  - The area was used for disposal of solid and liquid waste from plant processes including explosive/pyrotechnic waste, perchlorate and solvent waste by open burning, incineration, evaporation, and burial
  - Burning Ground No. 03 operated between 1955-1998
  - The Unlined Evaporation Pond operated between 1963-1984
  - The Air-Curtain Destructor was installed in 1979, and removed in 2003
  - Interim remedies include trenches and extraction wells along with a GWTP and soil removal and thermal treatment
- Current Status
  - Completing field activities including Cone Penetrometer Technology/Membrane Interface Probe (CPT/MIP) evaluation to isolate DNAPL
  - Direct push soil and groundwater sampling and monitoring well installation (in-progress)
  - Compliance sampling continues

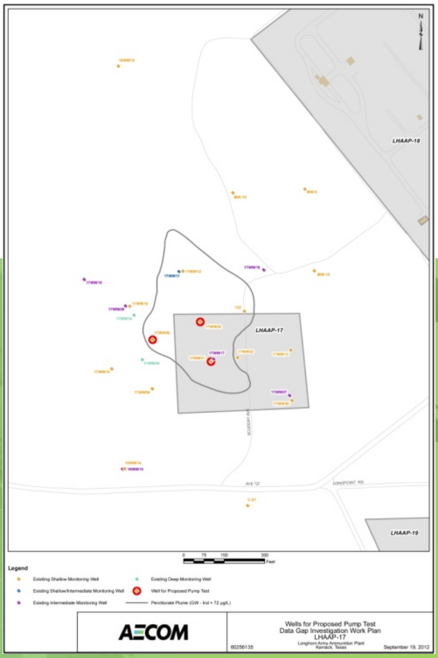
Tour Stop 2 – LHAAP-18/24 (cont)

- Upcoming Activities
  - Continue Semi-Annual Sampling
  - Continue Operations and Maintenance of wells, pumps, and extraction system
  - Finalize Feasibility Study leading to a Proposed Plan and Record of Decision for the final remedy (planned for this summer/fall)
  - Implement the final remedy to address VOCs, perchlorate, and metals in groundwater



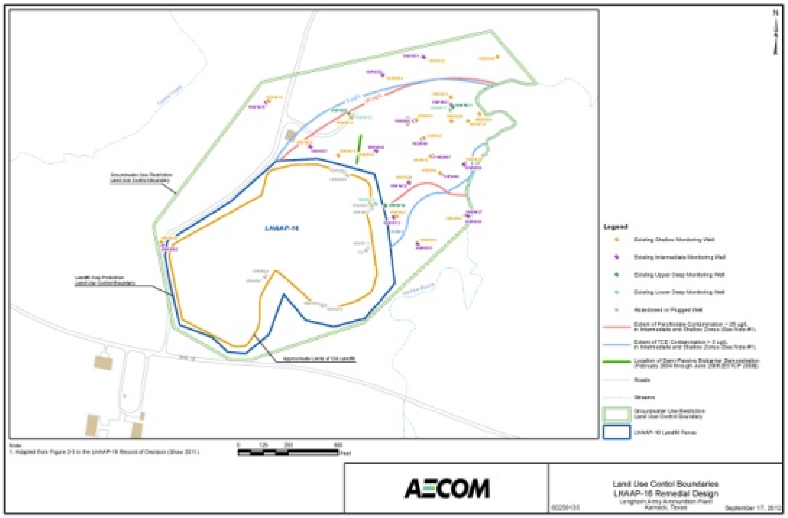
Tour Stop 3 – LHAAP-17 (Burning Ground No. 2/Flashing Area)

- History
  - Used as a burning ground from 1959 through 1980
  - Used as a flashing area to decontaminate recoverable metal byproducts until 1980
  - Numerous investigations were conducted between 1982 and 2009 to identify potential contamination
- Current Status
  - Draft Final ROD on hold pending dispute resolution
- Upcoming Activities (once the dispute is resolved)
  - Soil sampling to quantify volume of soil contaminated with explosives, dioxins, and barium for removal
  - Limited aquifer testing for groundwater remedies for groundwater contaminated with VOCs and perchlorate



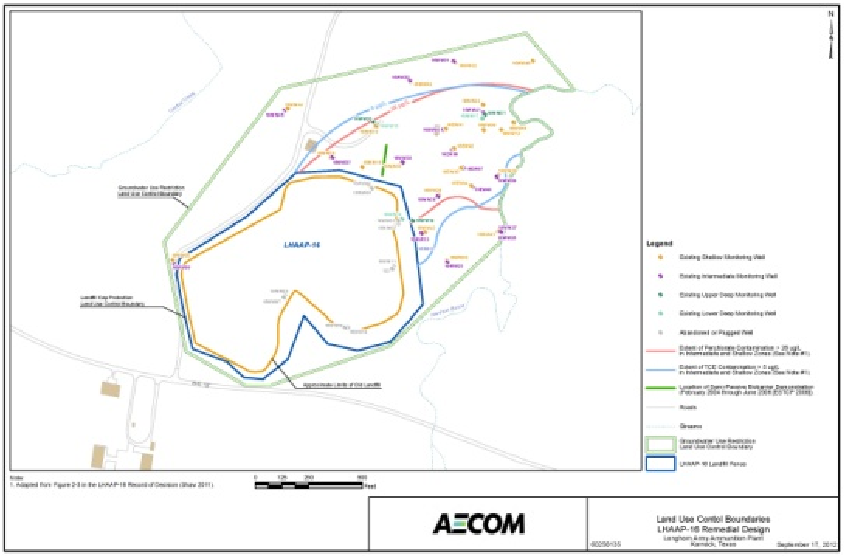
Tour Stop 4 – LHAAP-16 (Landfill 16)

- History
  - Formerly operated as a landfill from the 1940s until the 1980s
  - Construction of a cap as part of an early interim remedial action was completed in 1998
  - Previous investigations identified groundwater impacted with chlorinated volatile organic compounds, perchlorate, and metals, and a groundwater extraction system was installed as a treatability study in 1996 and 1997 to prevent the plume from moving to Harrison Bayou
- Current Status (O&M continues, Draft Final ROD on-hold pending dispute resolution)



Tour Stop 4 – LHAAP-16 (cont)

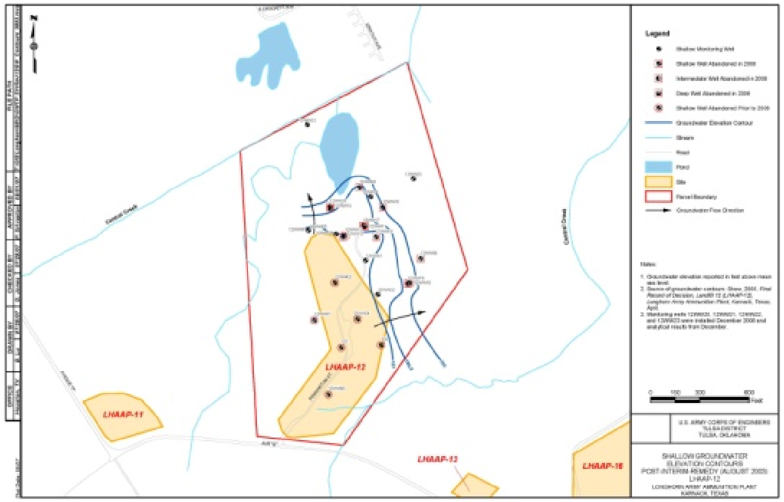
- Upcoming Activities
  - Operations and Maintenance of the existing landfill cap and groundwater extraction system will continue
  - Elements of the final remedy will include:
    - Installation of two (2) biobarriers in the shallow groundwater, one adjacent to the landfill and the other near Harrison Bayou
    - In-situ bioremediation in the most contaminated portion of the shallow and intermediate groundwater zones in conjunction with phased shut down of the existing groundwater extraction system
    - Monitored Natural Attenuation of both the shallow and intermediate groundwater zones



Tour Stop 5 – LHAAP-12 (Old Landfill)

- History
  - Operating landfill from 1963 till March 1994
  - Construction of a cap as part of an early interim remedial action was completed in 1998
  - The final remedy included land use controls and monitored natural attenuation for a small TCE plume in groundwater as stated in the Final Record of Decision in 2006
  - Final Remedy in Place has been achieved for LHAAP-12

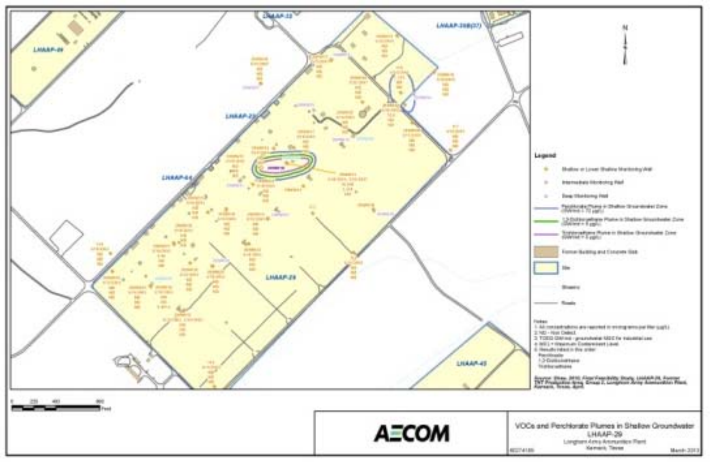
- Upcoming Activities
  - Continue with Monitoring and Operations and Maintenance



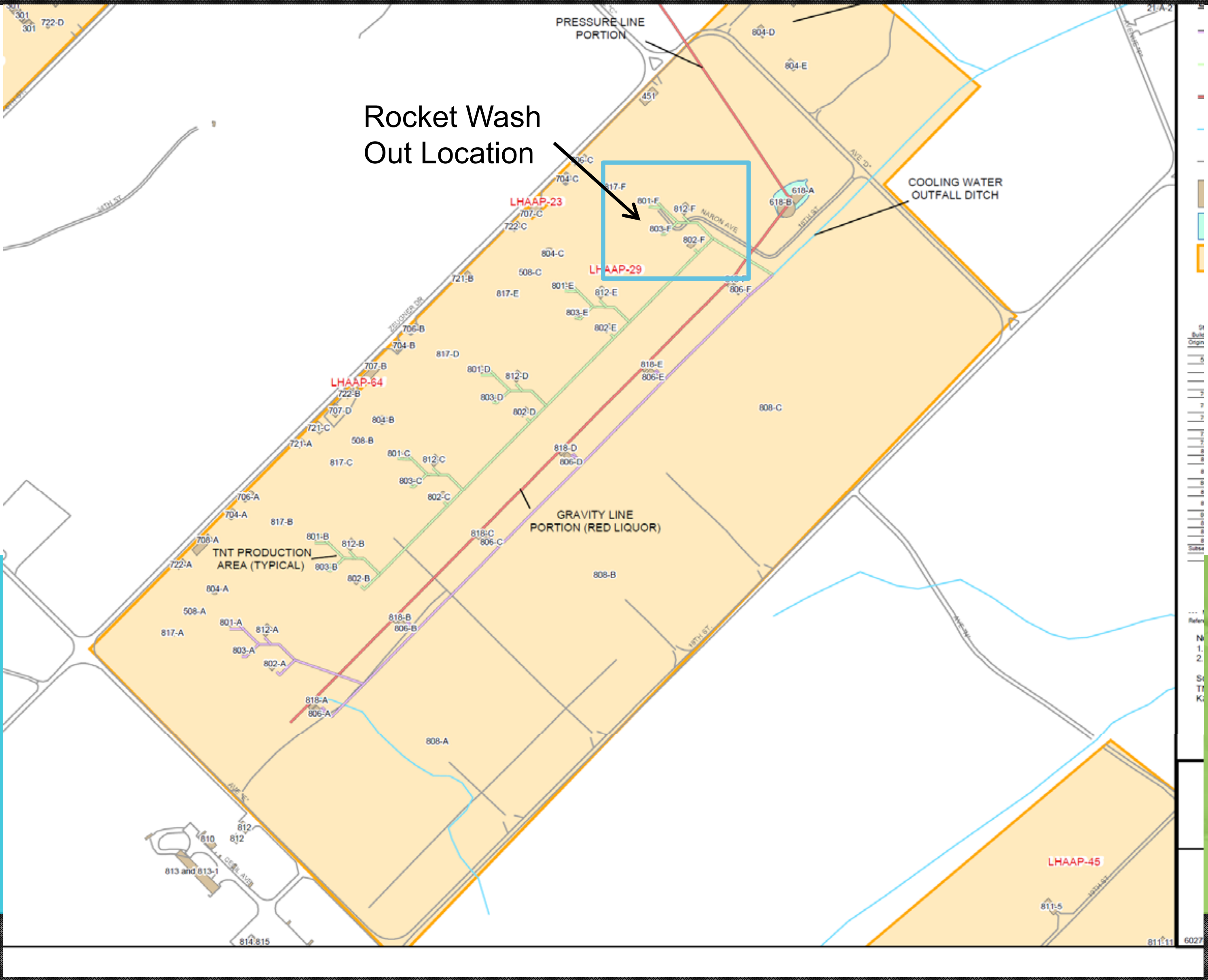
Tour Stop 6 – LHAAP-29 (Former TNT Production Area)

- History
  - LHAAP-29 was used as a TNT manufacturing facility from October 1942 to August 1945.
  - The facility was inactive from August 1945 through 1959, after which time most of the buildings and aboveground storage tanks were removed
  - From 1959 to the mid-1970s a portion of the site was used to perform solvent baths for out-of-specification rocket motors resulting in Methylene Chloride contamination
  - Contaminants of Concern: TNT, DNT, and perchlorate in soil and explosive compounds, VOCs, perchlorate, and metals in groundwater.

- Current Status
  - Army completing field activities this summer to refine the size of DNAPL plume that may result in a change in the remedy selected in the Draft Final ROD



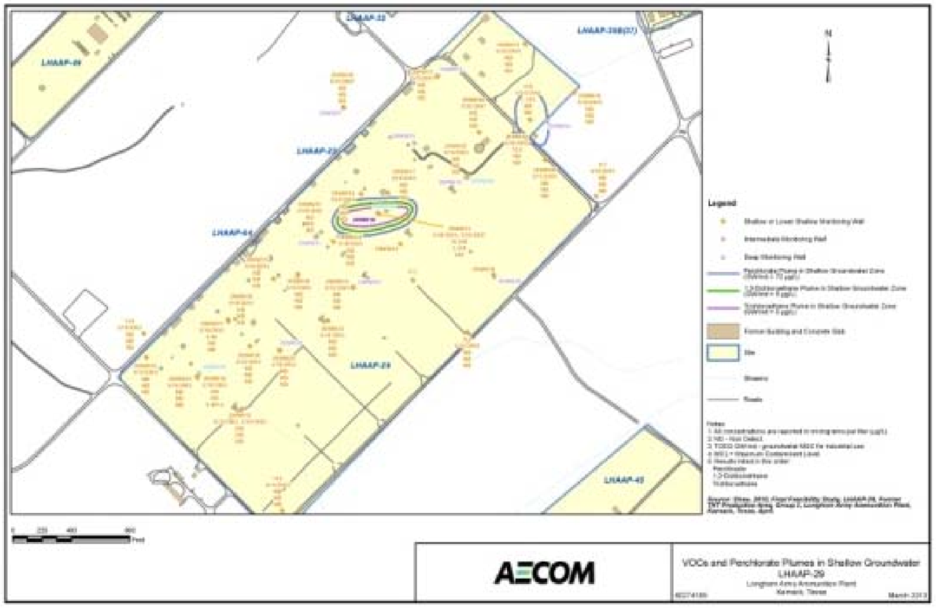
Tour Stop 6 – LHAAP-29 (Former TNT Production Area)



Rocket Wash
Out Location

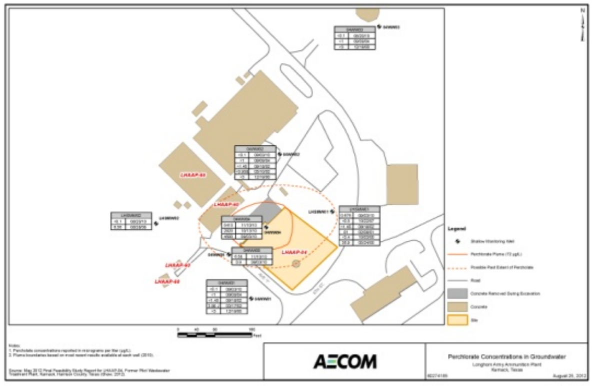
Tour Stop 6 – LHAAP-29 (cont)

- Upcoming Activities
  - Complete soil gas/soil survey to evaluate volatile organic compounds in shallow zone soil within the Methylene Chloride plume area and in the former Building 801-F area
  - Conduct additional soil sampling
  - Conduct limited treatability study data collection



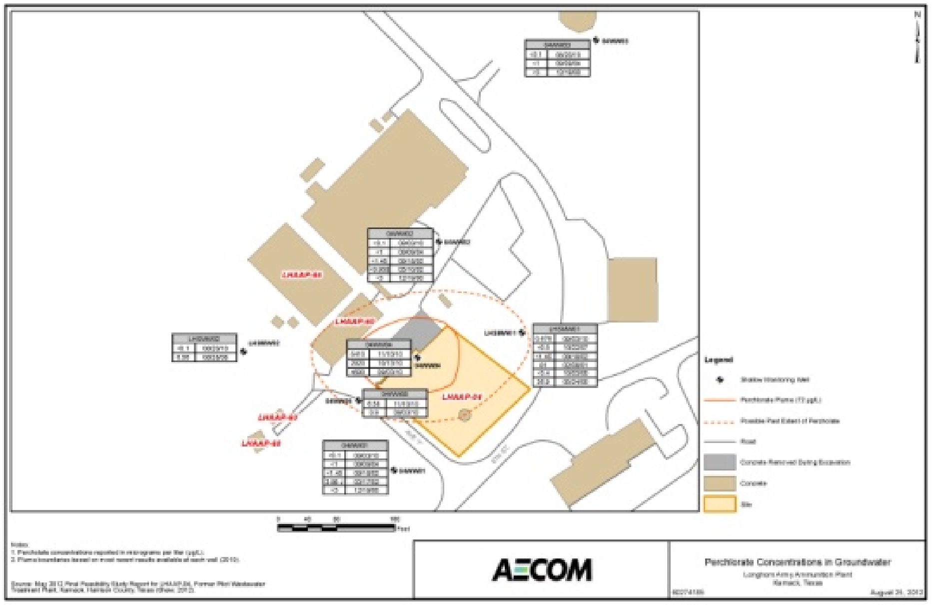
Tour Stop 7 – LHAAP-04 (Pilot Wastewater Treatment)

- History
  - Wastewater treatment operations began in 1984
  - Demolition of the Former Pilot Wastewater Treatment Facility structure, tanks, piping, and the disposal of the associated wastes were completed in the summer of 1997
  - Source soil was addressed by the Army under a CERCLA Removal Action in 2009 with regulator review and concurrence
  - Monitoring well 04WW04 was installed after the removed soil was complete. Groundwater from this monitoring well had perchlorate concentrations exceeding the groundwater industrial level. Monitoring well 04WW05 was installed down gradient and no perchlorate was detected above the groundwater industrial level
- Current Status
  - Draft Final ROD on-hold due to dispute



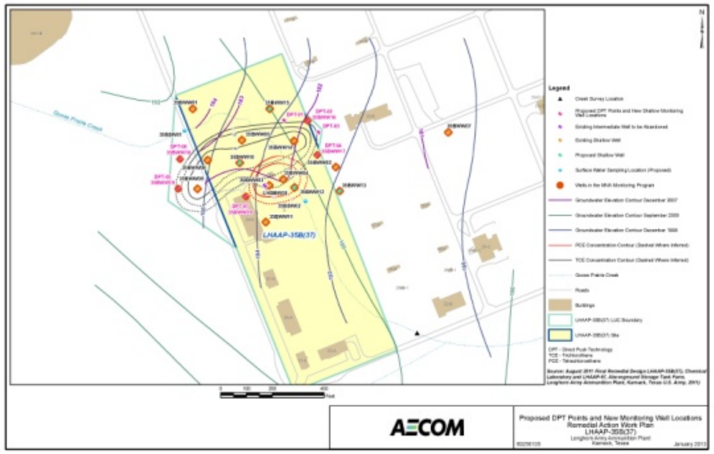
Tour Stop 7 – LHAAP-04 (cont)

- Future Work
  - In-situ Bioremediation of groundwater in a ‘hot spot’ area for perchlorate in the vicinity of monitoring well 04WW04
  - Monitored Natural Attenuation and Long-Term Monitoring for a select number of wells
  - 5 Year Reviews to evaluate whether the remedy remains protective of human health and the environment



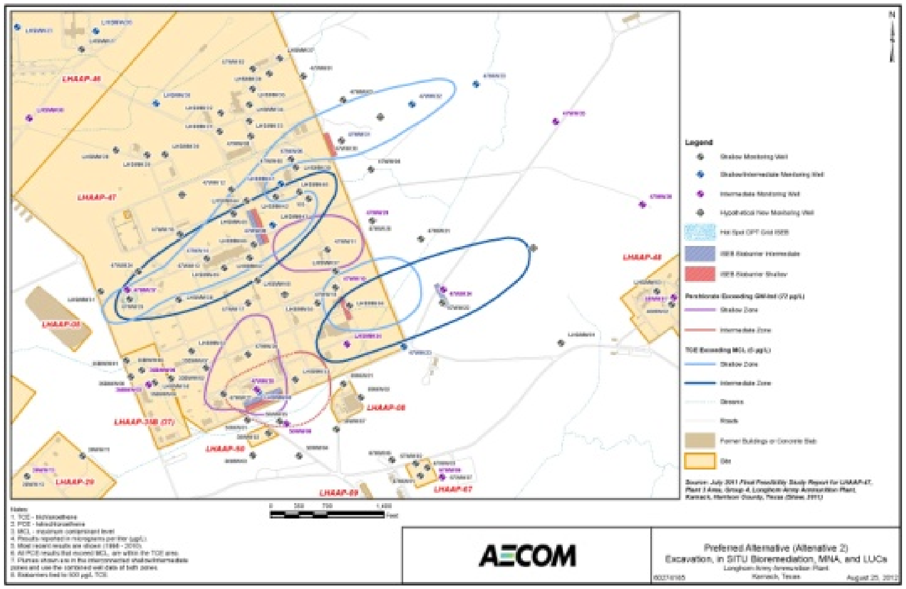
Tour Stop 8 – LHAAP-37 (Chemical Lab Waste Pad)

- History
  - A former chemical laboratory
  - Field investigations conducted between 1998 and 2007 identified groundwater contamination, with no significant contamination in the soils
  - Bio-plug demonstration initiated in February 2012 to treat VOCs underway
- Current Status
  - MNA Remedy in Place to be implemented after the Bio-Plug Demonstration
- Upcoming Activities
  - Finish Bio-Plug
  - Complete MNA monitoring and evaluation



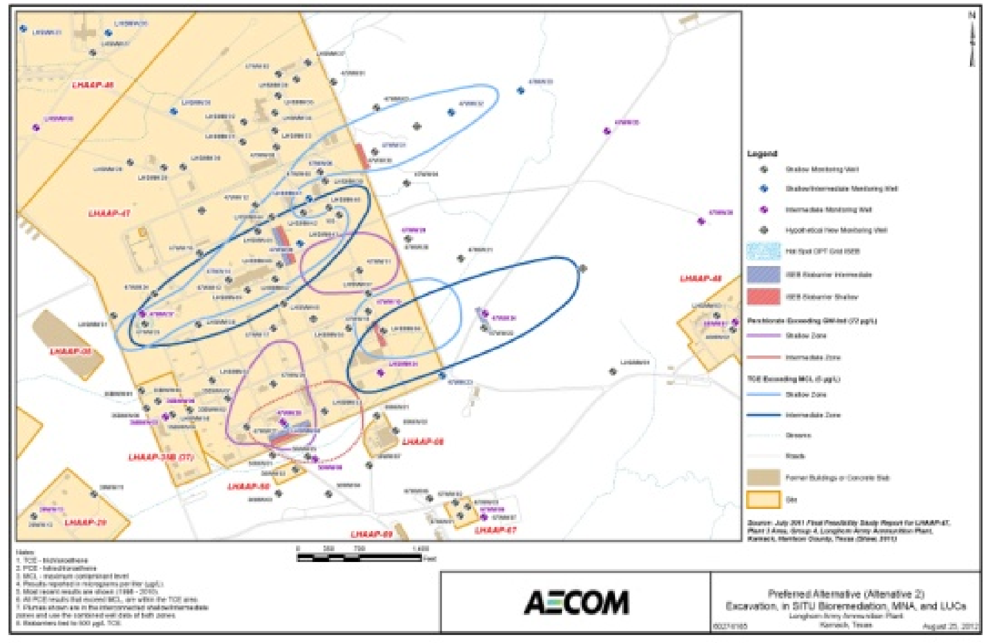
Tour Stop 9 – LHAAP-47 (Plant 3 Area)

- History
  - 275 acres
  - Soil contaminated with perchlorate, and groundwater contaminated with VOCs and perchlorate
  - Began operations in December 1954 until the early 1980s
  - Plastic liner material was placed around Building 25C in November 1999 to prevent soil migration of perchlorate to surface water
- Current Status
  - Draft Final ROD on-hold due to dispute



Tour Stop 9 – LHAAP-47 (cont)

- Upcoming Activities
  - Excavation of ~9,000 cubic yards of contaminated soil and off-site disposal
  - Groundwater will be treated in target areas using in-situ bioremediation
  - Bio-barriers (closely spaced ISB injections) will be implemented
  - MNA for areas outside active remedy areas will be implemented
  - Long Term Monitoring will be implemented contributing to an MNA report to confirm that concentrations are declining or to identify if a contingency remedy is required.

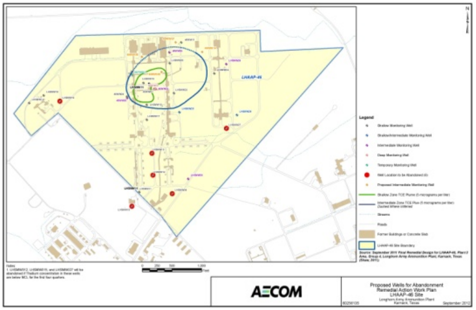


Tour Stop 10 – LHAAP-67 (Former Aboveground Storage Tank Site)

- History
  - Former aboveground storage tank farm (7 tanks)
    - These tanks contained No. 2 fuel oil, kerosene, and solvents
  - Field investigations were completed between 1998 and 2007. Shallow groundwater requires monitoring for VOCs as part of MNA remedy
- Current Status
  - Remedial Action Completion Report in Progress
- Upcoming Activities
  - Complete Monitored Natural Attenuation monitoring, develop annual report

Tour Stop 11 – LHAAP-46 (Plant Area 2)

- History
  - Plant Area 2 is approximately 190 acres and pyrotechnic and illumination devices were produced here through 1997
  - Field investigations were completed between 1991 and 2008 identified VOCs in groundwater requiring action
- Current Status
  - Remedial Action Completion Report in Progress
- Upcoming Activities
  - Complete quarterly monitoring resulting in a MNA report identifying if MNA is working and/or proposing a contingency remedy



Tour Stop 12 – LHAAP-58 and LHAAP-03 Shops Area and Paint Shop

- History
  - Final remedy LHAAP-58:
    - Eastern Plume: In-situ Bioremediation, MNA, LUCs
    - Western Plume: MNA, LUCs
    - Contaminants of concern: VOCs
  - Final Remedy LHAAP-03:
    - Soil Removal Action for ~60 cubic yards of soil
    - Contaminants of concern: Arsenic

- LHAAP-58 Status – Monitoring MNA and ISB/bioaugmentation
- LHAAP-03 – Draft Final ROD on-hold due to dispute

Thank you

Groundwater Treatment Plant - Treated Groundwater Volumes

The amount of groundwater treated is determined by measuring the number of gallons of treated water returned to LHAAP-18/24, released to the INF Pond, or discharged to Harrison Bayou.

Treated Water Data
(in gallons)

Oct-07	Nov-07	Dec-07	Jan-08	Feb-08	Mar-08	Apr-08	May-08	Jun-08	Jul-08	Aug-08	Sep-08
1,041,491	848,356	804,822	792,148	665,883	818,872	791,306	568,812	776,904	748,377	690,052	617,199

Oct-08	Nov-08	Dec-08	Jan-09	Feb-09	Mar-09	Apr-09	May-09	Jun-09	Jul-09	Aug-09	Sep-09
655,059	619,274	726,118	552,299	598,144	433,800	488,807	526,958	387,644	0	414,853	735,716

Oct-09	Nov-09	Dec-09	Jan-10	Feb-10	Mar-10	Apr-10	May-10	Jun-10	Jul-10	Aug-10	Sep-10
808,322	636,306	727,492	391,898	695,343	802,656	894,731	962,121	1,257,977	1,314,924	1,041,495	1,136,547

Oct-10	Nov-10	Dec-10	Jan-11	Feb-11	Mar-11	Apr-11	May-11	Jun-11	Jul-11	Aug-11	Sep-11
956,567	705,805	849,712	811,679	668,281	1,090,348	817,325	900,338	916,552	784,369	652,524	733,456

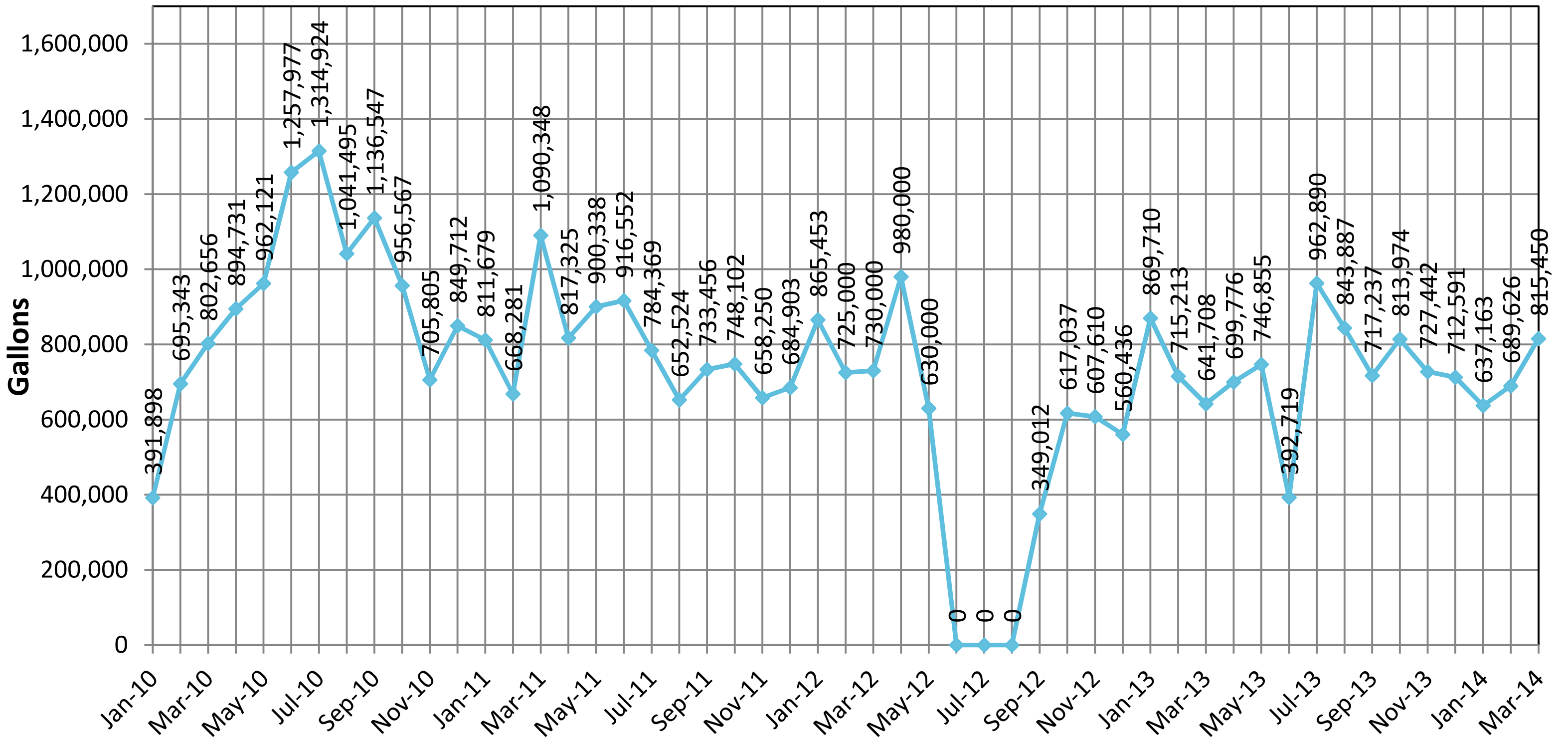
Oct-11	Nov-11	Dec-11	Jan-12	Feb-12	Mar-12	Apr-12	May-12	Jun-12	Jul-12	Aug-12	Sep-12
748,102	658,250	684,903	865,453	725,000*	730,000*	980,000*	630,000*	0	0	0	349,012

Oct-12	Nov-12	Dec-12	Jan-13	Feb-13	Mar-13	Apr-13	May-13	Jun-13	Jul-13	Aug-13	Sep-13
617,037	607,610	560,436	869,710	751,213	641,708	699,776	746,885	392,719	962,890	843,887	717,237

Oct-13	Nov-13	Dec-13	Jan-14	Feb-14	Mar-14
813,974	727,442	712,591	637,163	689,626	815,450

* Indicates estimate

Figure ES-3
Water Treated Monthly from January 2010 through March 2014

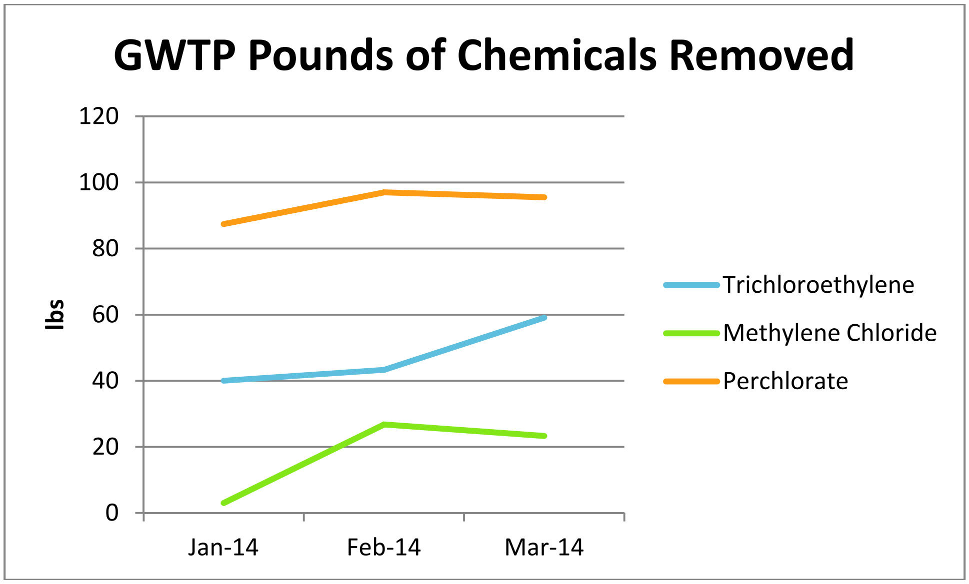


The pounds of chemicals removed for the 1st Quarter of 2014 can be found below and are calculated by the following formula:

$$\frac{(\text{Concentration } [\mu g/L] \times \text{Volume [gallons]} \times 3.785 \text{ [liters per gallon]})}{(453{,}600{,}000\ \mu g \text{ per pound})}$$

Pounds of Chemicals Removed From LHAAP-18/24, 1st Quarter 2014

	Trichloroethylene	Methylene Chloride	Perchlorate
Jan-14	40	3	87.4
Feb-14	43.3	26.77	97
Mar-14	59.1	23.3	95.5



Harrison Bayou and Goose Prairie Creek – Perchlorate Data

Surface water samples are collected quarterly from each location in Harrison Bayou and Goose Prairie Creek unless the creek sampling location is dry.

Historic Surface Water Sample Data
(in micrograms per liter)

Quarter	**3rd**	**4th**	**1st**	**2nd**	**3rd**	**4th**	**1st**	**2nd**	**3rd**	**4th**	**1st**
Creek Sample ID	**Jul 1999**	**Sep 1999**	**Feb 2000**	**Apr 2000**	**Aug 2000**	**Dec 2000**	**Feb 2001**	**Apr 2001**	**July 2001**	**Oct 2001**	**Jan 2002**
GPW-1	<1.0U	-	4	<4.0 U	<4.0 U	<4.0 U	-	2.65	<4.0 U	<4.0 U	<4.0 U
GPW-3	<1.0U	<4.0 U	17	8	<4.0 U	<4.0 U	-	2.28	<4.0 U	<4.0 U	<4.0 U
HBW-1	-	<80.0 U	310	23	-	-	<4.0 U	-	<4.0 U	<4.0 U	<4.0 U
HBW-7	-	<8.0 U	370	110	-	-	<4.0 U	-	<4.0 U	<4.0 U	<4.0 U
HBW-10	-	<8.0 U	905	650	<4.0 U	-	<4.0 U	-	<4.0 U	-	-

Quarter	**2nd**	**3rd**	**4th**	**1st**	**2nd**	**3rd**	**3rd**	**4th**	**2nd**	**3rd**	**4th**
Creek Sample ID	**June 2002**	**Sept 2002**	**Dec 2002**	**Feb 2003**	**June 2003**	**Aug 2003**	**July 2004**	**Dec 2006**	**May 2007**	**Aug 2007**	**Dec 2007**
GPW-1	<4.0 U	<4.0 U	18.3	18.6	59.9	-	2.25	-	<1.0 U	<1.0 U	10.7
GPW-3	<4.0 U	<4.0 U	5.49	12.6	14.7	-	2.2	-	<1.0 U	<1.0 U	7.48
HBW-1	<4.0 U	<4.0 U	<4.0 U	-	<4.0 U	99.3	<0.2U	<1.0 U	<1.0 U	122	<1.0 U
HBW-7	<4.0 U	<4.0 U	<4.0 U	-	<4.0 U	<4.0 U	<0.2U	<1.0 U	<1.0 U	1.02	<1.0 U
HBW-10	<4.0 U	<4.0 U	<4.0 U	-	<4.0 U	-	<0.2U	<1.0 U	<1.0 U	<1.0 U	<1.0 U

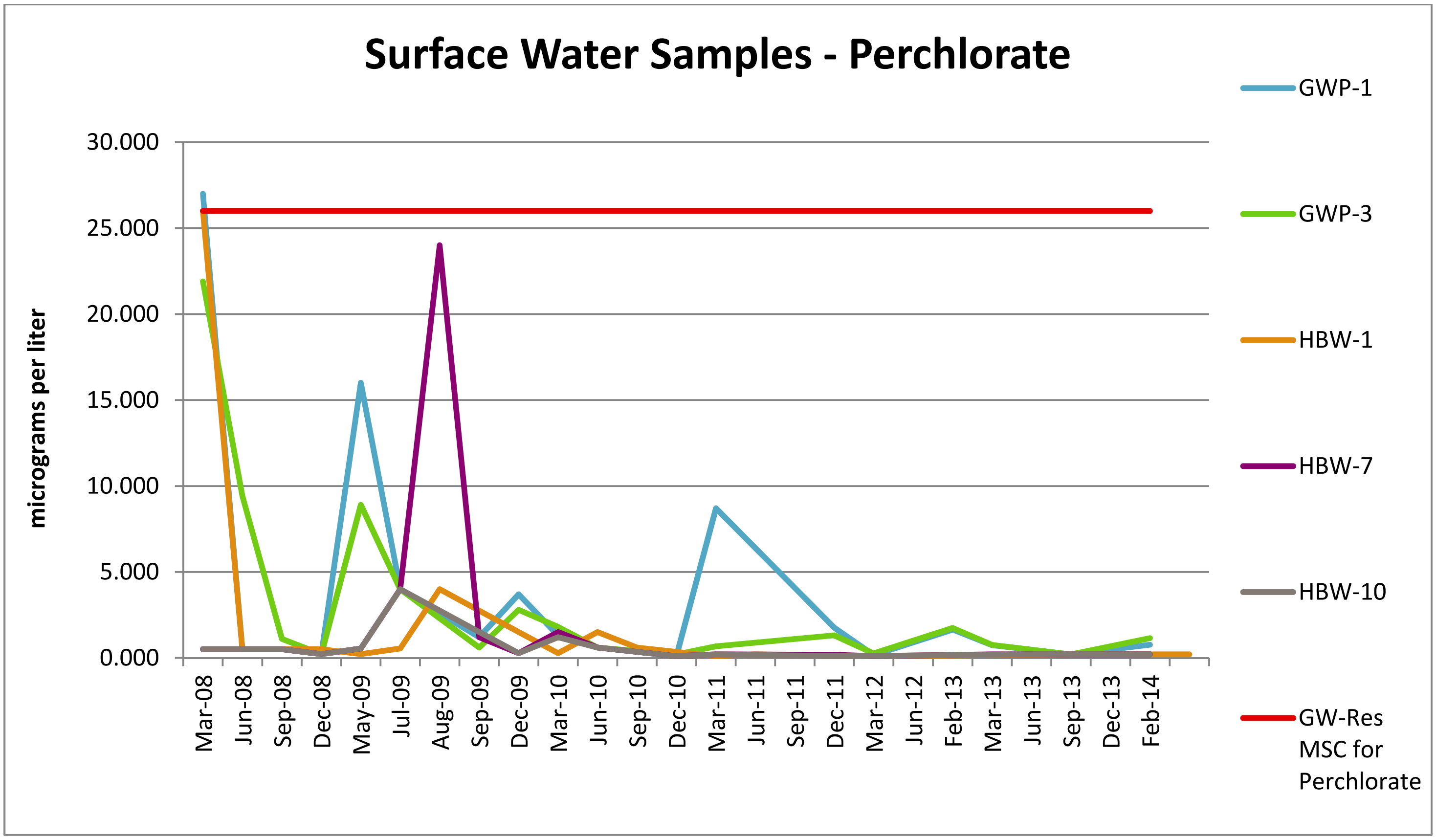
Quarter	**1st**	**2nd**	**3rd**	**4th**	**2nd**	**3rd**	**3rd**	**3rd**	**4th**	**1st**	**2nd**
Creek Sample ID	**Mar 2008**	**Jun 2008**	**Sep 2008**	**Dec 2008**	**May 2009**	**Jul 2009**	**Aug 2009**	**Sep 2009**	**Dec 2009**	**Mar 2010**	**Jun 2010**
GPW-1	27	<0.5U	<0.5U	<0.22U	16	<4U	NS	<1.2U	3.7	1.3J	<0.6U
GPW-3	21.9	9.42	1.1	<0.22U	8.9	<4U	NS	<0.6U	2.8	1.8J	<0.6U
HBW-1	<0.5U	<0.5U	<0.5U	<0.22U	<0.55U	<4U	NS	<1.5U	<0.275U	1.5U	<0.6U
HBW-7	<0.5U	<0.5U	<0.5U	<0.22U	<0.55U	<4U	24	<1.2U	<0.275U	1.5U	<0.6U
HBW-10	<0.5U	<0.5U	<0.5U	<0.22U	<0.55U	<4U	NS	<1.5U	<0.275U	1.2U	<0.6U

Quarter	**3rd**	**4th**	**1st**	**2nd**	**3rd**	**4th**	**1st**	**2nd**	**3rd**	**4th**	**1st**
Creek Sample ID	**Sep 2010**	**Dec 2010**	**Mar 2011**	**Jun 2011**	**Sep 2011**	**Dec 2011**	**Mar 2012**	**Jun 2012**	**Not Applicable**	**Jan & Feb 2013**	**Mar 2013**
GPW-1	dry	<0.1U	8.7	dry	dry	1.76	0.163J	dry	NC	1.65	0.735
GPW-3	dry	0.199J	0.673	dry	dry	1.31	0.261	dry	NC	1.74	0.754
HBW-1	dry	<0.1U	<0.2U	dry	dry	<0.1U	0.1U	dry	NC	<0.2U	<0.2U
HBW-7	dry	<0.1U	<0.2U	dry	dry	0.171J	0.1U	dry	NC	<0.2U	<0.2U
HBW-10	dry	<0.1U	<0.2U	dry	dry	<0.1U	0.1U	dry	NC	<0.2U	<0.2U

Quarter	**2nd**	**3rd**	**4th**	**1st**
Creek Sample ID	**Jun 2013**	**Sept 2013**	**Dec 2013**	**Feb 2014**
GPW-1	dry	<0.2 U	dry	0.766
GPW-3	dry	<0.2 U	dry	1.15
HBW-1	<0.2U	<0.2 U	dry	<0.2U
HBW-7	<0.2U	<0.2 U	dry	0.201J
HBW-10	<0.2U	<0.2 U	dry	<0.2U

Notes:

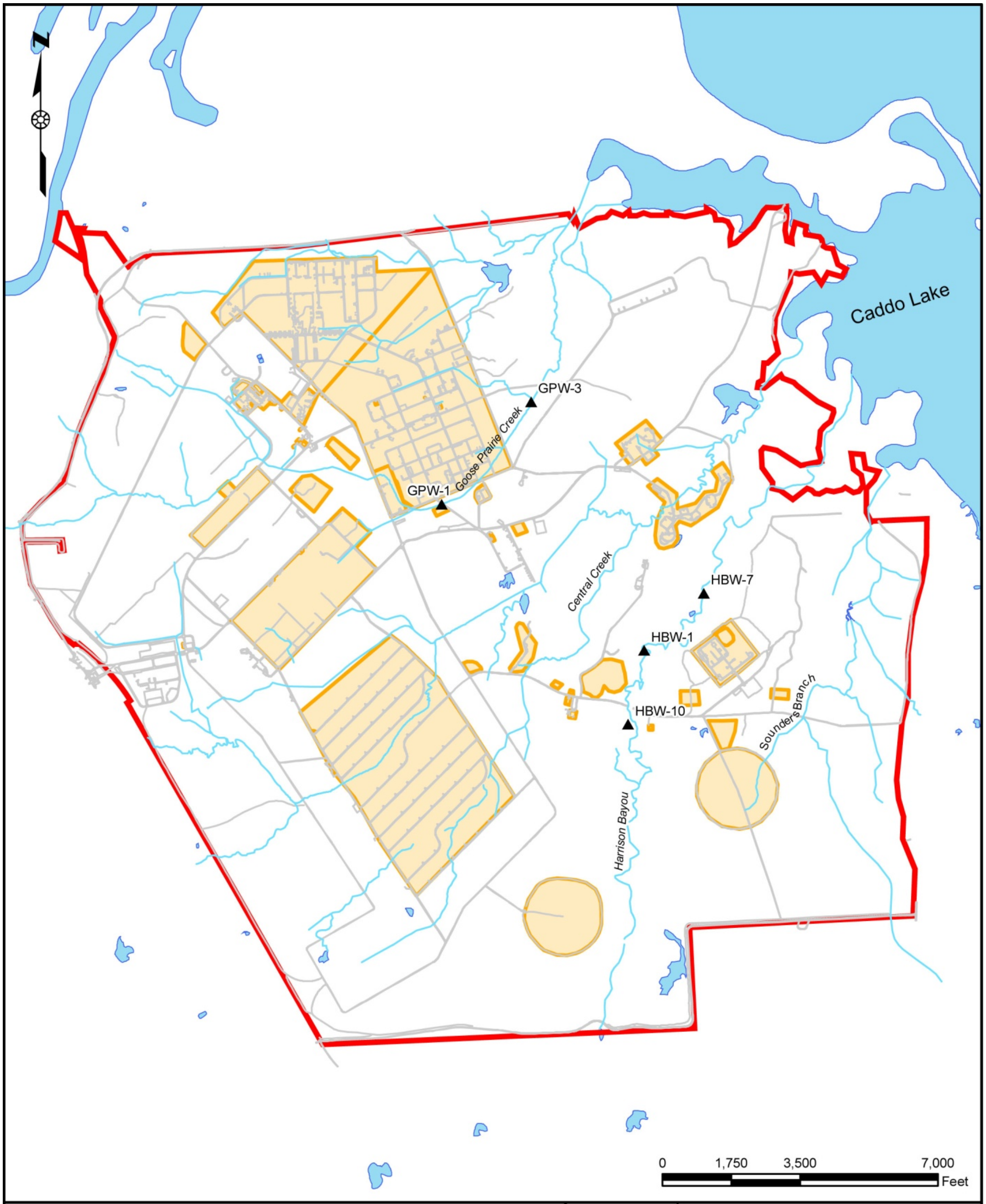
NC	Not Collected
NS	Not Sampled
dry	Sampling location was dry
-	No historical data available



Notes:

Perchlorate Screening Criteria - TCEQ GW_{Ing} (micrograms per liter) 51

Longhorn Army Ammuntion Plant Map with Creek Sampling Locations.



Legend

- ▲ Surface Water Sampling Location
- — Stream
- — Road
- ▨ Site
- 🟦 Lake

U.S. ARMY CORPS OF ENGINEERS
TULSA DISTRICT
TULSA, OKLAHOMA

SURFACE WATER SAMPLING LOCATION

LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS

Photos of Goose Prarie Creek and Harrison Bayou sampling locations


GPW-1


GPW-2


HBW-1


HBW-7


HBW-10

LHAAP PERIMETER WELLS

Background

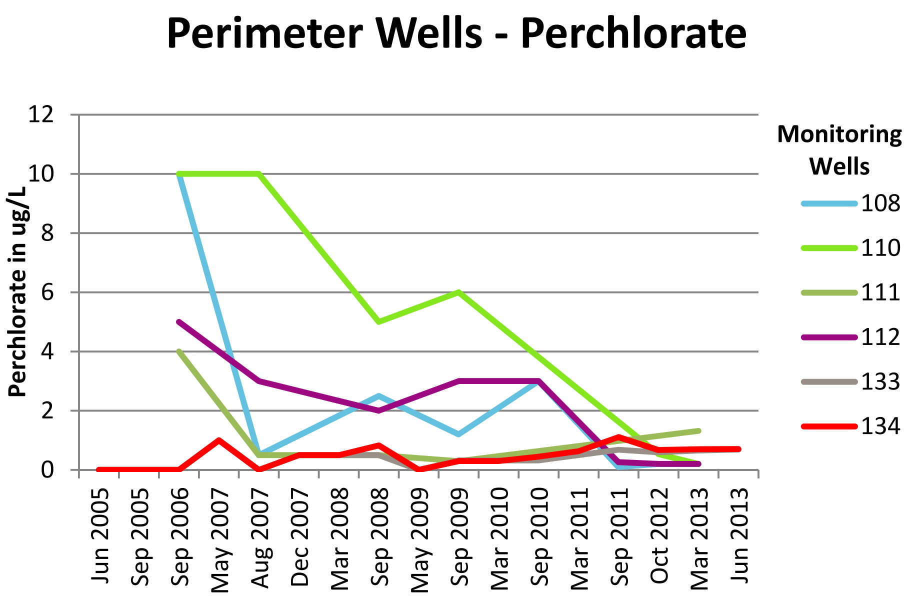
There are six perimeter wells which can be found surrounding the LHAAP site. It is assumed that the perimeter sampling areas have not been impacted by contamination.

Well ID	Screen Depth (ft bgs)
108	5.5 - 20.5
110	5 - 20
111	5.4 - 20.4
112	5.25 - 20.25
133	64.5 - 84.5
134	90 -110

Well Specifications

Monitoring wells 110, 111, and 112 were installed upgradient (or uphill) of groundwater movement. Well 108 is located downgradient (or downhill) of groundwater movement. Monitoring wells 133 and 134 were installed downgradient in order to sample groundwater.

Perimeter Perchlorate Data in micrograms per Liter (µg/L)



Well ID	Jun 2005	Sep 2005	Sep 2006	May 2007	Aug 2007	Dec 2007	Mar 2008	Sep 2008	May 2009
108	Dry	Dry	10 U	Dry	0.5 U	Dry	Dry	2.5 U	Dry
110	Dry	Dry	10 U	Dry	10 U	Dry	Dry	5.0 U	Dry
111	Dry	Dry	4 U	Dry	0.5 U	Dry	Dry	0.5 U	Dry
112	Dry	Dry	5 U	Dry	3 U	Dry	Dry	2.0 U	Dry
133	0.541	0.597	1.08	1 U	1.09	0.5 U	0.5 U	0.5 U	0.47 J
134	0.881	0.725	0.708 J	1 U	0.949 J	0.5 U	0.5 U	0.829U	0.04 J

Well ID	Sep 2009	Mar 2010	Sep 2010	Mar 2011	Sep 2011	Oct 2012	Mar 2013	Jun 2013	May 2014
108	1.2U	Dry	3U	Dry	0.1U	0.2U	0.2U	Dry	In-progress
110	6U	Dry	Dry	Dry	Dry	0.535	0.2U	Dry	In-progress
111	0.3U	Dry	Dry	Dry	Dry	Dry	1.32	Dry	In-progress
112	3U	Dry	3U	Dry	0.26	0.2U	0.2U	Dry	In-progress
133	0.32	Dry	0.32	Dry	0.68	0.598	0.655	0.685	In-progress
134	0.3U	0.3 U	0.45	0.636	1.11	0.671	0.698	0.706	In-progress

Subject:	**Final Minutes, Monthly Managers' Meeting, Longhorn Army Ammunition Plant (LHAAP)**
Location of Meeting:	**Teleconference – 866-203-6896, passcode 1759304791**
Date of Meeting:	**October 14, 2014 – 10:00 AM**

Attendees:

Army BRAC:	Rose Zeiler
EPA:	Rich Mayer, Kent Becher (USGS Liaison), Barry Forsythe (USFWS Liaison)
TCEQ:	April Palmie, Dale Vodak
USACE:	Aaron Williams
AECOM:	Dave Wacker, Gretchen McDonnell, Marwan Salameh
AEC:	Robin Paul
USFWS:	Paul Bruckwicki

Welcome **AECOM**

Action Items

AECOM

- Provide update for nutrient data and trend analysis and FBR activities/optimization. **Complete –** Nutrient data provided during the meeting.
- Send proposed LUC boundaries to agencies for review upon definition. **Complete** for sites 46 and 67. **Pending** for sites 37, 50, and 58.
- Provide schedule for LHAAP-67 vault decommissioning work. **Complete.**
- Add current field activities to the website calendar. **Complete.** The process is in place to have the website updated as activities are scheduled.
- Review as-builts of the LHAAP-29 area available from USFWS. **Pending.** Will be conducted with the next RAB meeting visit.
- Begin preparing Action Memorandums for LHAAP-16 and LHAAP-47. Army will provide further guidance on format. **Pending.**
- Examine the level of effort required to develop a comprehensive geospatial database of all information for LHAAP (lab data, boring logs, well construction reports, etc.) that will make review easier. **Pending.**
- To support agency evaluation of the proposed LHAAP-46 LUC boundary, provide to the agencies: 1) most recent sampling results for LHSMW24 and LHSMW27; 2) an evaluation of whether LHSMW24 and LHSMW27 are fully-penetrating wells; and, 3) the list of wells included in the groundwater monitoring plan for LHAAP-46. **Complete.**
- Provide the LHAAP-12 April 2007 well abandonment and installation report to the MMM group by SendFiles. **Complete.**
- Develop revised 1,4-dioxane sampling memo and sampling plan for next event. **Pending.**

Army

- Confer with AECOM on development of an electronic database. **Remove.**
- Identify if Bioplug study at LHAAP-37 will continue or be completed this year. **Complete.**

EPA

- Provide an update on the status of EPA's development of perchlorate action levels. **Remove.** Could be another year until the new perchlorate model is developed.

- Identify the path forward required for review/signature of Action Memorandums to provide appropriate agency concurrence for implementation of groundwater remedies in the absence of signed RODs, such as LHAAP-16 and LHAAP-47. **Pending.** Mr. Mayer stated EPA's current position is that they will not provide any comment or concurrence on an Action Memorandum. Dr. Zeiler stated that EPA silence would likely be construed as non-concurrence, which may prevent work from proceeding in this situation where Army is trying to move forward with work that is part of a dispute.
- Develop/coordinate with Army on a schedule for surface water drainage sampling. **Postponed until next spring.**

TCEQ

- Identify the path forward required for review/signature of Action Memorandums to provide appropriate agency concurrence for implementation of groundwater remedies in the absence of signed RODs, such as LHAAP-16 and LHAAP-47. **Pending.** Ms. Palmie stated that she would have nothing to present until a final mechanism for moving forward is determined and urged EPA to reconsider. Mr. Mayer stated he would determine whether there is any mechanism under which EPA could provide some kind of concurrence.

AEC

USFWS

Defense Environmental Restoration Program (DERP) PBR Update AECOM

- Upcoming document submissions to regulators (see Document and Issue Tracking table)

Item 1 (GWTP Quarterly Report) – 2nd Quarter 2014 report is planned for submittal by the end of the month.

AECOM had submitted a proposal for optimization of the current GWTP sampling plan. To request agency approval of these changes, AECOM proposed that the changes to the air sampling program would be captured in a memorandum, and proposed changes to other GWTP sampling would be captured in the quarterly GWTP reports, but a formal update of the sampling plan would be done later, in conjunction with the final ROD. The major proposed change is reduction in the frequency of air monitoring. Mr. Wacker stated that AECOM can remove that from the overall optimization plan if it is inappropriate to combine the GWTP water sampling and air sampling.

Ms. Palmie stated that the optimization plan submitted did not reference the original plan or point to the sections of the original plan that were being proposed for modification, which makes the reader unable to track where the changes are being made. A redline version of the current sampling plan would be required so the changes can be evaluated, and any changes from the 2006 plan should be captured.

Mr. Wacker stated that, since the air monitoring component is separate from the plan for the remainder of the sampling, AECOM would like to proceed with making the air monitoring changes separately, without an update of the sampling plan.

Dr. Zeiler stated that her understanding of the regulators' request for the redline was to incorporate changes into the approved plan and not to subject the whole document to review and revision which would be more appropriate after a signed ROD. She stated that Army and AECOM would take an action item to discuss the path forward for submitting proposed changes to the GWTP sampling requirements.

Item 2 (LHAAP-18/24 Revised FS) – Field effort is complete with the exception of well development which will be conducted within the next two weeks. Data is being examined and the report being generated.

Item 3 (Completion Reports/Remedial Action Operation Reports)

LHAAP-50 RACR – Draft anticipated for submittal to agencies on 10/17/14.
LHAAP-58 RACR – Draft anticipated for submittal to agencies on 10/24/14.
LHAAP-37 RACR – A response to TCEQ's comment on the installation of additional DPTs and a well will be provided by 10/31/14.
LHAAP-67 - LUC boundary survey completed last week. Waiting for survey plat to move forward with completing the Appendix A LUC boundary survey and recordation documents. The document will proceed to draft final status when the Appendix A materials are incorporated.
LHAAP-46 - LUC boundary survey will be completed today, and we'll be waiting for survey plat to move forward with completing the Appendix A LUC boundary survey and recordation documents.

LHAAP-46 and LHAAP-67 RAO reports are working toward agency submittal on 10/24/14, although there may be some slip in that schedule.

Item 4 (Monthly Managers' Meeting) – Next MMM scheduled for 10AM, Thursday, November 20th at the Army Trailer.

Item 5 (LHAAP-29 Amended RI/FS) – Aquifer testing and Bio-Trap work is still underway to wrap up the field effort. Because the Bio-Traps residence period must begin after the aquifer testing, it is likely that the report document will not be submitted until after the holidays. Dr. Zeiler, Ms. Palmie and Mr. Mayer all confirmed this schedule was suitable. Mr. Wacker stated that delineation of the LHAAP-29 DNAPL western extent has been completed with no contaminants being detected in the groundwater sample from 29CPT18, so the extent remains quite small compared to historical plume estimations.

Item 6 (LHAAP-17 PDI WP, LHAAP-16 RD WP, LHAAP-03 RD/RAWP, LHAAP-04 RD, LHAAP-47 RD) – Placeholder for sites on hold due to dispute. See additional discussion under EPA's and TCEQ's action items, above.

Item 7 (RAB/Website) – Next RAB scheduled for Thursday, November 20th at 6PM. Focus will be 18/24 and 29 completed efforts and data. Preliminary results of the 18/24 treatability study results were provided with today's meeting materials as an email with attachments. The MMM group was asked to review the material prior to the RAB. Dr. Zeiler emphasized that these results are preliminary and that the content for the RAB would be a briefing on the preliminary results only, not a discussion of proposed remedy selections based on this data.

Item 8 (GWTP O&M) – Normal maintenance is on-going. ICT repair/replacement is in progress. See additional discussion of proposed GWTP sampling plan optimization under Item 1, above.

Item 9 (Admin Record Update) – AR Update for the 3rd quarter is being prepared and is scheduled for submittal to Army by the end of the month.

Item 10 – (Nutrient Issue for HB and INF) – Mr. Salameh provided a preview of the GWTP nutrient data will be coming to the group today. The historical nutrient data available for the GWTP (since

December 2005) has been reviewed. Concentrations of ammonia nitrogen and total phosphorus have increased over time since 2010 with average ammonia nitrogen concentrations increasing from ~2 mg/L to ~6 mg/L, and average total phosphorus concentrations increasing from ~0.5 mg/L to 1.5-2 mg/L. Since the May-September 2012 system shutdown, the trends have been going down for both nutrients. The average ammonia nitrogen concentration was 5.4 mg/L after the shutdown versus 6.1 mg/L for the two years prior to the shutdown; total phosphorus was 0.96 mg/L after the shutdown versus ~1 mg/L for the two years prior to the shutdown.

Correlations were found between low nutrient levels and observed increases in treated water perchlorate concentrations (indicating reduced FBR performance). The ammonia nitrogen effect on FBR performance appears more pronounced than total phosphorus. Below 4 mg/L ammonia nitrogen, FBR performance appears to deteriorate. For total phosphorus, concentrations less than 0.5 mg/L appear to impair FBR performance. Based on this information, Mr. Salameh recommended that ammonia nitrogen be maintained at or above 4 mg/L and ortho-Phosphate at or above 0.5 mg/L.

Finally, the distribution of release of treated groundwater for the last two years was determined to be 39% by-volume to Harrison Bayou, with the remainder applied to the surface of the site with the sprinkler array.

Item 11 – (CRP/CIP) – No update.

Item 12 (LHAAP-12 RAO Report 2013) – The report is scheduled for submittal to Army for a review of revisions tomorrow.

Item 13 (1,4-Dioxane Sampling) – AECOM's laboratory is prepared to conduct 8270 SIM method for 1,4-dioxane and, in fact, analyzed the August samples split with EPA utilizing this method. A memo covering the next round of sampling tentatively sc heduled for late November/early December is forthcoming. Mr. Mayer provided an initial review of EPA 1,4-dioxane sampling results which indicated no samples exceeding 36 µg/L, and no 1,4-dioxane at LHAAP-29. Of interest, TCE was detected in 29WW16. No impacts whatsoever found in the Caddo Lake Water Supply Corporation public water supply wells. The EPA data has not been validated but has undergone "data review". A final data report from EPA is pending. Also discussed earlier in meeting under AECOM Action Items.

Defense Environmental Restoration Program (DERP) PBR Update (continued) AECOM

- Upcoming field work – Discussed earlier in meeting. Now being added to the website as work is scheduled.
- Monthly data – validated data report attached to the October MMM agenda
- Groundwater Treatment Plant – discussed earlier in meeting.

MMRP Update Army

- Update – no update

Other Environmental Restoration Army

- Vault at LHAAP-67 – The water sample from the vault tested negative for the presence of all analytes. Demolition is planned for next week Tuesday through Thursday. The current plan is to remove the vault completely if it extends 5' or less below the ground surface, or remove the portion of the structure less than 5' below ground surface if the vault is deeper than that.
- Site 37 Bioplug – July sampling results report was transmitted to the agencies last month. To summarize, Army review indicated contaminant reduction results did not appear to be

sufficiently positive to continue the study and that the injections done as part of the remedy may be contributing to movement of contaminants. USACE Center of Expertise review agreed with those conclusions. Army decided not to extend the term of the study and the contractor has been informed.

  - Final sampling will be conducted in October 2014, a final report will be prepared and the system will be removed. The contractor has stated that the aquifer will return to natural conditions by August of 2015, and perhaps within a few months. TCE increased sharply at 35BWW09 in the last sampling round. The October sampling results will be reviewed with that in mind. Ms. Palmie asked that the final report state the injection volumes for each individual point, and Ms. Paul asked that the request be sent to her in an email for forwarding. Mr. Mayer and Ms. Palmie stated they had no objections to discontinuing the study and removing the system.
  - After the final sampling event in October 2014, EPA and TCEQ will be asked to provide formal written concurrence with removal of the Bioplug system.
- Surface water sampling approach – Details of surface water sampling plans will be included in the RACRs for each site. Ms. Palmie and Mr. Mayer stated that this approach was acceptable.
- Quarterly Reporting and Requirements
  - GWTP Evaluation - air monitoring report submitted
  - Surface Water/Perimeter Well Quarterly Update – will be updated before the next RAB. The new master sampling plan for Longhorn is planned for transmittal to the agencies next week.
  - Administrative Record Update – CDs for the 1st and 2nd quarter 2014 updates have been tranmitted. Mr. Wacker stated that searching the AR on the website may be easier than working with the AR CDs. Mr. Becher asked why contaminant plume maps were not provided for LHAAP-16 and LHAAP-18/24. Mr. Williams stated that the plumes have changed significantly from the last time a comprehensive sampling event, so these sites would need to have a comprehensive sampling event before a current plume map could be generated and posted to the website.
- Annual Reporting
  - LUC Management Plan Update (due September 2014) – Waiting to update until at least the LUC boundaries for LHAAP-46 and LHAAP-67 are available.
  - CRP/CIP Revision (Biennial) and questionnaire October 2015

Programmatic Issues **RMZ/RM/AP**

- Status of Dispute – The EPA Administrator has apparently been briefed on staff's latest review of the dispute and is contemplating the decision at this time.
- Interim Path Forward – Discussed earlier in the meeting.

USFWS Update **RMZ/PB**

- Environmental Restoration Issues with Transfer Schedule Impact - none
- USFWS Comments on Documents – no issues

Schedule Next Managers' Meeting – 10AM, Thursday, November 20th at the Army Trailer.

New Action Items

AECOM

- Provide results from 1,4-dioxane sampling.
- Provide the current GWTP sampling plan to the participants.

- Develop with Army the path forward for submitting proposed changes to GWTP sampling requirements.
- Provide new master groundwater sampling plan.

EPA

- Provide results from 1,4-dioxane sampling.

TCEQ

- Submit request to AEC for injection volumes for each individual point from LHAAP-37 Bioplug Study.

Adjourn

Attachments: LHAAP Data Validated September 2014
-GWTP Influent and Effluent
-LHAAP-18/24 Post-Screening Investigation Sampling
-LHAAP-46 Quarterly MNA Groundwater Monitoring Event
-LHAAP-50 Remedial Action Field Work Sampling
-LHAAP-67 Quarterly MNA Groundwater Monitoring Event
-Quarterly Perimeter Well Sampling

ACRONYM LIST

AEC	**United States Army Environmental Command**
AECOM	**AECOM Technology Services, Inc.**
AP	**April Palmie**
AR	**Administrative Record**
bgs	**below ground surface**
BRAC	**Base Realignment and Closure**
CRP/CIP	**Community Relations Plan/Community Involvement Plan**
DERP	**Defense Environmental Restoration Program**
DNAPL	**Dense Non-Aqueous Phase Liquid**
DPT	**Direct Push Technology**
EPA	**United States Environmental Protection Agency**
FBR	**Fluidized Bed Reactor**
FS	**Feasibility Study**
GWTP	**Ground Water Treatment Plant**
HB	**Harrison Bayou**
ICT	**Interceptor-Collector Trench**
INF	**Intermediate-Range Nuclear Forces**
LHAAP	**Longhorn Army Ammunition Plant**
LUC	**Land Use Control**
mg/L	**milligram per liter**
MMM	**Monthly Managers' Meeting**
MMRP	**Military Munitions Response Program**
O&M	**Operation and Maintenance**
PB	**Paul Bruckwicki**
PBR	**Performance-Based Remediation**
PDI	**Pre-Design Investigation**

RAB	**Restoration Advisory Board**
RACR	**Remedial Action Completion Report**
RAO	**Remedial Action Operation**
RAWP	**Remedial Action Work Plan**
RD	**Remedial Design**
RI	**Remedial Investigation**
RM	**Rich Mayer**
RMZ	**Rose M. Zeiler**
ROD	**Record of Decision**
SIM	**Selected Ion Monitoring**
TCE	**Trichloroethene**
TCEQ	**Texas Commission on Environmental Quality**
USACE	**United States Army Corps of Engineers**
USFWS	**United States Fish and Wildlife Service**
USGS	**United States Geological Service**
WP	**Work Plan**
µg/L	**microgram per liter**

LHAAP Data Validated
September 2014

GWTP Influent and Effluent

Weekly, Biweekly, and Monthly - June through August 2014

Ammonia (350.1)
VOC (8260B)
Ortho-Phosphate (365.2)
Inorganic Anions (9056)
Total Organic Carbon (415.1)
Metals (6010C)
Metals (6020A)
Perchlorate (6850)
Hexavalent Chromium (7196A)

Perimeter Wells *Annual Sampling - June 2014*

Perchlorate (6850)

Site 18/24 *PSI Work Plan Field Work - May and June 2014*

VOC (8260B)
Perchlorate (6850)
Percent Solids (D2216-90)
Total Organic Carbon (LYDKHN)

Site 46 *Quarterly MNA Sampling - July 2014*

Alkalinity (310.2)
Phosphorus (365.4)
Total Organic Carbon (415.1)
Metals (6010C)
Metals (6020A)
Inorganic Anions (9056)
Dissolved Gases (RSK-175)
Sulfide (SM4500-S)
VOC (8260B)

Site 50 *Remedial Action Field Work - July 2014*

VOC (8260B)
Perchlorate (6850)

Site 67 *Quarterly MNA Sampling - July 2014*

Total Carbon (415.1)
VOC (8260B)
Sulfide (SM4500-S)
Inorganic Anions (9056)
Dissolved Gases (RSK-175)
Ferrous Iron (SM3500FE)

LHAAP GWTP Effluent - Weekly Sampling
June - August 2014

Location ID: **Sample Date:**	**Units**	**Daily Maximum Conc**	**LH18/24-SP650-6180-GRAB** **6/02/2014**	**LH18/24-SP650-6182-GRAB** **6/9/2014**	**LH18/24-SP650-6184-GRAB** **6/16/2014**	**LH18/24-SP650-6186-GRAB** **6/23/2014**	**LH18/24-SP650-6188-GRAB** **6/30/2014**	**LH18/24-SP650-6190-GRAB** **7/7/2014**	**LH18/24-SP650-6193-GRAB** **7/14/2014**	**LH18/24-SP650-6194-GRAB** **7/21/2014**	**LH18/24-SP650-6196-GRAB** **7/28/2014**	**LH18/24-SP650-6198-GRAB** **8/4/2014**
ID Location:			GWTP – Collected from a spigot on the discharge of effluent TK-650. Sampled Weekly.	GWTP – Collected from a spigot on the discharge of effluent TK-650. Sampled Weekly.	GWTP – Collected from a spigot on the discharge of effluent TK-650. Sampled Weekly.	GWTP – Collected from a spigot on the discharge of effluent TK-650. Sampled Weekly.	GWTP – Collected from a spigot on the discharge of effluent TK-650. Sampled Weekly.	GWTP – Collected from a spigot on the discharge of effluent TK-650. Sampled Weekly.	GWTP – Collected from a spigot on the discharge of effluent TK-650. Sampled Weekly.	GWTP – Collected from a spigot on the discharge of effluent TK-650. Sampled Weekly.	GWTP – Collected from a spigot on the discharge of effluent TK-650. Sampled Weekly.	GWTP – Collected from a spigot on the discharge of effluent TK-650. Sampled Weekly.
Ammonia (350.1)												
AMMONIA AS N	mg/L		4.09	5.24	6.77	5.58	5.45	5.18	5.79	4.29	5.57	2.87
Ortho-phosphate (365.2)												
ORTHO-PHOSPHATE	mg/L		0.492	0.776	1.11	0.84	0.689	0.972	0.784	0.451	0.993	0.492
TOC (415.1)												
TOTAL ORGANIC CARBON (TOC)	mg/L		27.2	66.8	85.4	59	39.5	28	23.9	47.9	59.8	19.7
Perchlorate (6850)												
PERCHLORATE	ug/L	13	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U

mg/L - Milligrams per liter

ug/L - Micrograms per liter

U - Undetected: The analyte was analyzed for, but not detected.

LHAAP GWTP Effluent - Biweekly Sampling
June - August 2014

Location ID: Sample Date:	Units	Daily Maximum Conc	LH18/24-SP650-6181-COMP 6/9/2014	LH18/24-SP650-6181-GRAB 6/9/2014	LH18/24-SP650-6187-COMP 6/30/2014	LH18/24-SP650-6187-GRAB 6/30/2014	LH18/24-SP650-6192-COMP 7/14/2014	LH18/24-SP650-6192-GRAB 7/14/2014	LH18/24-SP650-6195-COMP 7/28/2014	LH18/24-SP650-6195-GRAB 7/28/2014
ID Location:			GWTP – Collected from holding jar accumulating aliquots of discharge from a TK-650 effluent spigot every few hours. Sampled Biweekly.	GWTP – Collected from a spigot on the discharge of effluent TK-650 Sampled Biweekly.	GWTP – Collected from holding jar accumulating aliquots of discharge from a TK-650 effluent spigot every few hours. Sampled Biweekly.	GWTP – Collected from a spigot on the discharge of effluent TK-650 Sampled Biweekly.	GWTP – Collected from holding jar accumulating aliquots of discharge from a TK-650 effluent spigot every few hours. Sampled Biweekly.	GWTP – Collected from a spigot on the discharge of effluent TK-650 Sampled Biweekly.	GWTP – Collected from holding jar accumulating aliquots of discharge from a TK-650 effluent spigot every few hours. Sampled Biweekly.	GWTP – Collected from a spigot on the discharge of effluent TK-650 Sampled Biweekly.
Metals (6010C)										
SELENIUM	mg/L	0.012	<0.01 U	<0.01 U	<0.01 U	<0.01 U	<0.01 U	<0.01 U	<0.01 U	<0.01 U
Metals (6020A)										
LEAD	mg/L	0.0046	<0.001 U	<0.001 U	<0.001 U	<0.001 U	<0.001 U	0.000543 J	<0.001 U	0.000531 J
SILVER	mg/L	0.003	<0.001 U	<0.001 U	<0.001 U	<0.001 U	<0.001 U	<0.001 U	<0.001 U	<0.001 U
Perchlorate (6850)										
PERCHLORATE	ug/L	13	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U	<0.2 U
Hexavalent Chromium (7196A)										
HEXAVALENT CHROMIUM	mg/L	0.124	<0.01 U	<0.01 U	<0.01 U	<0.01 U	<0.01 U	<0.01 U	<0.01 U	<0.01 U
Volatile Organic Compounds (8260B)										
1,1,1,2-TETRACHLOROETHANE	ug/L		NA	<0.5 U	NA	<0.5 U	NA	<0.5 U	NA	<0.5 U
1,1,1-TRICHLOROETHANE	ug/L	7230	NA	<0.5 U	NA	<0.5 U	NA	<0.5 U	NA	<0.5 U
1,1,2,2-TETRACHLOROETHANE	ug/L		NA	<0.4 U	NA	<0.4 U	NA	<0.4 U	NA	<0.4 U
1,1,2-TRICHLOROETHANE	ug/L	216.9	NA	<0.5 U	NA	<0.5 U	NA	<0.5 U	NA	<0.5 U
1,1-DICHLOROETHANE	ug/L	14032	NA	<0.25 U	NA	<0.25 U	NA	<0.25 U	NA	<0.25 U
1,1-DICHLOROETHENE	ug/L	253	NA	<1 UJ	NA	<1 U	NA	<1 U	NA	<1 U
1,1-DICHLOROPROPENE	ug/L		NA	<0.5 U	NA	<0.5 U	NA	<0.5 U	NA	<0.5 U
1,2,3-TRICHLOROBENZENE	ug/L		NA	<0.3 U	NA	<0.3 U	NA	<0.3 U	NA	<0.3 U
1,2,3-TRICHLOROPROPANE	ug/L		NA	<1 UJ	NA	<1 UJ	NA	<1 U	NA	<1 U
1,2,4-TRICHLOROBENZENE	ug/L		NA	<0.4 U	NA	<0.4 U	NA	<0.4 U	NA	<0.4 U
1,2,4-TRIMETHYLBENZENE	ug/L		NA	<0.5 U	NA	<0.5 U	NA	<0.5 U	NA	<0.5 U
1,2-DIBROMO-3-CHLOROPROPANE	ug/L		NA	<2 UJ	NA	<2 UJ	NA	<2 U	NA	<2 U
1,2-DIBROMOETHANE	ug/L		NA	<0.5 U	NA	<0.5 U	NA	<0.5 U	NA	<0.5 U
1,2-DICHLOROBENZENE	ug/L		NA	<0.25 U	NA	<0.25 U	NA	<0.25 U	NA	<0.25 U
1,2-DICHLOROETHANE	ug/L	181	NA	<0.5 U	NA	<0.5 U	NA	<0.5 U	NA	<0.5 U
1,2-DICHLOROPROPANE	ug/L	5	NA	<0.4 U	NA	<0.4 U	NA	<0.4 U	NA	<0.4 U
1,3,5-TRIMETHYLBENZENE	ug/L		NA	<0.5 U	NA	<0.5 U	NA	<0.5 U	NA	<0.5 U
1,3-DICHLOROBENZENE	ug/L		NA	<0.5 U	NA	<0.5 U	NA	<0.5 U	NA	<0.5 U
1,3-DICHLOROPROPANE	ug/L		NA	<0.4 U	NA	<0.4 U	NA	<0.4 U	NA	<0.4 U
1,4-DICHLOROBENZENE	ug/L		NA	<0.25 U	NA	<0.25 U	NA	<0.25 U	NA	<0.25 U
2,2-DICHLOROPROPANE	ug/L		NA	<0.5 U	NA	<0.5 U	NA	<0.5 U	NA	<0.5 U
2-BUTANONE	ug/L		NA	<5 U	NA	<5 UJ	NA	<5 U	NA	2.54 J
2-CHLOROTOLUENE	ug/L		NA	<0.25 UJ	NA	<0.25 U	NA	<0.25 U	NA	<0.25 U
2-HEXANONE	ug/L		NA	<5 UJ	NA	<5 UJ	NA	<5 U	NA	<5 U
4-CHLOROTOLUENE	ug/L		NA	<0.5 UJ	NA	<0.5 U	NA	<0.5 U	NA	<0.5 U
4-METHYL-2-PENTANONE	ug/L		NA	<5 U	NA	<5 UJ	NA	<5 U	NA	<5 U
ACETONE	ug/L	2395	NA	4.11 J	NA	3.33 UJ	NA	3.4 J	NA	2.87 J
BENZENE	ug/L	181	NA	<0.25 U	NA	<0.25 U	NA	<0.25 U	NA	<0.25 U
BROMOBENZENE	ug/L		NA	<0.25 U	NA	<0.25 U	NA	<0.25 U	NA	<0.25 U
BROMOCHLOROMETHANE	ug/L		NA	<0.4 U	NA	<0.4 U	NA	<0.4 U	NA	<0.4 U
BROMODICHLOROMETHANE	ug/L		NA	<0.5 U	NA	<0.5 U	NA	<0.5 U	NA	<0.5 U
BROMOFORM	ug/L		NA	<1 U	NA	<1 U	NA	<1 U	NA	<1 U
BROMOMETHANE	ug/L		NA	<1 U	NA	<1 U	NA	<1 UJ	NA	<1 U
CARBON DISULFIDE	ug/L		NA	<1 U	NA	<1 U	NA	<1 U	NA	<1 U
CARBON TETRACHLORIDE	ug/L	181	NA	<0.5 U	NA	<0.5 U	NA	<0.5 U	NA	<0.5 U
CHLOROBENZENE	ug/L	47180	NA	<0.25 U	NA	<0.25 U	NA	<0.25 U	NA	<0.25 U
CHLOROETHANE	ug/L		NA	<1 U	NA	<1 U	NA	<1 U	NA	<1 U
CHLOROFORM	ug/L	3615	NA	<0.25 U	NA	<0.25 U	NA	<0.25 U	NA	<0.25 U
CHLOROMETHANE	ug/L		NA	<1 U	NA	<1 U	NA	<1 UJ	NA	<1 U
CIS-1,2-DICHLOROETHENE	ug/L		NA	1.22	NA	1.97	NA	3.71	NA	2.42
CIS-1,3-DICHLOROPROPENE	ug/L		NA	<0.5 U	NA	<0.5 U	NA	<0.5 U	NA	<0.5 U
DIBROMOCHLOROMETHANE	ug/L		NA	<0.5 U	NA	<0.5 U	NA	<0.5 U	NA	<0.5 U
DIBROMOMETHANE	ug/L		NA	<0.5 U	NA	<0.5 U	NA	<0.5 U	NA	<0.5 U
DICHLORODIFLUOROMETHANE	ug/L		NA	<0.5 U	NA	<0.5 U	NA	<0.5 U	NA	<0.5 U
ETHYLBENZENE	ug/L	57025	NA	<0.5 U	NA	<0.5 U	NA	<0.5 U	NA	<0.5 U
HEXACHLOROBUTADIENE	ug/L		NA	<0.5 U	NA	<0.5 U	NA	<0.5 U	NA	<0.5 U
ISOPROPYLBENZENE	ug/L		NA	<0.5 U	NA	<0.5 U	NA	<0.5 U	NA	<0.5 U
M,P-XYLENE	ug/L	83.6	NA	<1 U	NA	<1 U	NA	<1 U	NA	<1 U
METHYLENE CHLORIDE	ug/L	1699	NA	<0.5 U	NA	<0.5 U	NA	<0.5 U	NA	<0.5 U
NAPHTHALENE	ug/L		NA	<0.4 UJ	NA	<0.4 U	NA	<0.4 U	NA	<0.4 U
N-BUTYLBENZENE	ug/L		NA	<0.5 U	NA	<0.5 U	NA	<0.5 U	NA	<0.5 U
N-PROPYLBENZENE	ug/L		NA	<0.25 U	NA	<0.25 U	NA	<0.25 U	NA	<0.25 U
O-XYLENE	ug/L	83.6	NA	<0.5 U	NA	<0.5 U	NA	<0.5 U	NA	<0.5 U
P-ISOPROPYLTOLUENE	ug/L		NA	<0.5 U	NA	<0.5 U	NA	<0.5 U	NA	<0.5 U
SEC-BUTYLBENZENE	ug/L		NA	<0.5 U	NA	<0.5 U	NA	<0.5 U	NA	<0.5 U
STYRENE	ug/L	5987	NA	<0.25 U	NA	<0.25 U	NA	<0.25 U	NA	<0.25 U
TERT-BUTYLBENZENE	ug/L		NA	<0.5 U	NA	<0.5 U	NA	<0.5 U	NA	<0.5 U
TETRACHLOROETHENE	ug/L	180.7	NA	<0.5 U	NA	<0.5 U	NA	<0.5 U	NA	<0.5 U
TOLUENE	ug/L	4189	NA	<0.5 U	NA	<0.5 U	NA	<0.5 U	NA	<0.5 U
TRANS-1,2-DICHLOROETHENE	ug/L		NA	<0.5 U	NA	<0.5 U	NA	<0.5 U	NA	<0.5 U
TRANS-1,3-DICHLOROPROPENE	ug/L		NA	<1 U	NA	<1 U	NA	<1 U	NA	<1 U
TRICHLOROETHENE	ug/L	181	NA	1.46	NA	1.16	NA	1.32	NA	1
TRICHLOROFLUOROMETHANE	ug/L		NA	<0.5 U	NA	<0.5 U	NA	<0.5 U	NA	<0.5 U
VINYL CHLORIDE	ug/L	72	NA	<0.5 U	NA	<0.5 U	NA	<0.5 U	NA	<0.5 U
Inorganic Anions (9056)										
CHLORIDE	mg/L		620	597	508	511	570	586	507	490
SULFATE	mg/L		61.6	59.8	35.2	36.1	26	18.4	23.9	21.3

J - Estimated: The analyte was positively identified, the quantitation is an estimation due to discrepancies in meeting certain analyte-specific quality control criteria.

N/A - not analyzed

U - Undetected: The analyte was analyzed for, but not detected.

UJ - The analyte was not detected; however, the result is estimated due to discrepancies in meeting certain analyte-specific quality control criteria.

ug/L - micrograms per liter

mg/L- milligrams per liter

LHAAP GWTP Effluent - Montly Sampling
June - August 2014

Location ID: **Sample Date:**	**Units**	**Daily Maximum Conc**	**LH18/24-SP650-6189-GRAB** **7/7/2014**
ID Location:			GWTP – Collected from a spigot on the discharge of effluent TK-650. Sampled Monthly.
Metals (6010C)			
ALUMINUM	mg/L	1.644	<0.1 U
IRON	mg/L	2.395	0.203
SELENIUM	mg/L	0.012	<0.01 U
Metals (6020A)			
ANTIMONY	mg/L		0.000913 J
ARSENIC	mg/L	0.772	0.00144 J
BARIUM	mg/L	2	0.0658
CADMIUM	mg/L	0.0034	<0.0006 U
CHROMIUM	mg/L	0.752	0.00827
COBALT	mg/L	11.495	0.0022
LEAD	mg/L	0.0046	<0.001 U
MANGANESE	mg/L	15.494	0.05
NICKEL	mg/L	0.184	0.00694 J
SILVER	mg/L	0.012	<0.001 U
THALLIUM	mg/L		<0.0002 U
VANADIUM	mg/L	3.592	0.00057 J
ZINC	mg/L	0.31	0.0557

mg/L- Milligrams per liter

J - Estimated: The analyte was positively identified, the quantitation is an estimation due to discrepancies in meeting certain analyte-specific quality control criteria.

U - Undetected: The analyte was analyzed for, but not detected.

LHAAP GWTP Influent - Monthly Sampling
June - August 2014

Location ID: **Sample Date:**	**Units**	**LH18/24-SP140-7189-GRAB** **7/7/2014**
ID Location:		GWTP – Collected from a spigot on the discharge of influent TK-140 Sampled Monthly.
Perchlorate (6850)		
PERCHLORATE	ug/L	16100
Volatile Organic Compounds (8260B)		
1,1,1,2-TETRACHLOROETHANE	ug/L	<50 U
1,1,1-TRICHLOROETHANE	ug/L	<50 U
1,1,2,2-TETRACHLOROETHANE	ug/L	<40 U
1,1,2-TRICHLOROETHANE	ug/L	<50 U
1,1-DICHLOROETHANE	ug/L	<25 U
1,1-DICHLOROETHENE	ug/L	120 J
1,1-DICHLOROPROPENE	ug/L	<50 U
1,2,3-TRICHLOROBENZENE	ug/L	<30 U
1,2,3-TRICHLOROPROPANE	ug/L	<100 U
1,2,4-TRICHLOROBENZENE	ug/L	<40 U
1,2,4-TRIMETHYLBENZENE	ug/L	<50 U
1,2-DIBROMO-3-CHLOROPROPANE	ug/L	<200 U
1,2-DIBROMOETHANE	ug/L	<50 U
1,2-DICHLOROBENZENE	ug/L	<25 U
1,2-DICHLOROETHANE	ug/L	83 J
1,2-DICHLOROPROPANE	ug/L	<40 U
1,3,5-TRIMETHYLBENZENE	ug/L	<50 U
1,3-DICHLOROBENZENE	ug/L	<50 U
1,3-DICHLOROPROPANE	ug/L	<40 U
1,4-DICHLOROBENZENE	ug/L	<25 U
2,2-DICHLOROPROPANE	ug/L	<50 U
2-BUTANONE	ug/L	<500 UJ
2-CHLOROTOLUENE	ug/L	<25 U
2-HEXANONE	ug/L	<500 U
4-CHLOROTOLUENE	ug/L	<50 U
4-METHYL-2-PENTANONE	ug/L	<500 U
ACETONE	ug/L	<500 UJ
BENZENE	ug/L	<25 U
BROMOBENZENE	ug/L	<25 U
BROMOCHLOROMETHANE	ug/L	<40 U
BROMODICHLOROMETHANE	ug/L	<50 U
BROMOFORM	ug/L	<100 U
BROMOMETHANE	ug/L	<100 U
CARBON DISULFIDE	ug/L	<100 U
CARBON TETRACHLORIDE	ug/L	<50 U
CHLOROBENZENE	ug/L	<25 U
CHLOROETHANE	ug/L	<100 U
CHLOROFORM	ug/L	30.2 J
CHLOROMETHANE	ug/L	<100 U

LHAAP GWTP Influent - Monthly Sampling
June - August 2014

Location ID: **Sample Date:**	**Units**	**LH18/24-SP140-** **7189-GRAB** **7/7/2014**
ID Location:		GWTP – Collected from a spigot on the discharge of influent TK-140 Sampled Monthly.
CIS-1,2-DICHLOROETHENE	ug/L	5690
CIS-1,3-DICHLOROPROPENE	ug/L	<50 U
DIBROMOCHLOROMETHANE	ug/L	<50 U
DIBROMOMETHANE	ug/L	<50 U
DICHLORODIFLUOROMETHANE	ug/L	<50 U
ETHYLBENZENE	ug/L	<50 U
HEXACHLOROBUTADIENE	ug/L	<50 U
ISOPROPYLBENZENE	ug/L	<50 U
M,P-XYLENE	ug/L	<100 U
METHYLENE CHLORIDE	ug/L	7550
NAPHTHALENE	ug/L	<40 U
N-BUTYLBENZENE	ug/L	<50 U
N-PROPYLBENZENE	ug/L	<25 U
O-XYLENE	ug/L	<50 U
P-ISOPROPYLTOLUENE	ug/L	<50 U
SEC-BUTYLBENZENE	ug/L	<50 U
STYRENE	ug/L	<25 U
TERT-BUTYLBENZENE	ug/L	<50 U
TETRACHLOROETHENE	ug/L	55.6 J
TOLUENE	ug/L	<50 U
TRANS-1,2-DICHLOROETHENE	ug/L	<50 U
TRANS-1,3-DICHLOROPROPENE	ug/L	<100 U
TRICHLOROETHENE	ug/L	11400
TRICHLOROFLUOROMETHANE	ug/L	<50 U
VINYL CHLORIDE	ug/L	63.2 J

J - Estimated: The analyte was positively identified, the quantitation is an estimation due to discrepancies in meeting certain analyte-specific quality control criteria.

U - Undetected: The analyte was analyzed for, but not detected.
UJ - The analyte was not detected; however, the result is estimated due to discrepancies in meeting certain analyte-specific quality control criteria.
ug/L - micrograms per liter

LHAAP Perimeter Wells - Annual Sampling
June 2014

Location ID: **Sample Date:**	**Units**	**MCL/ MSC**	**PW108-061714** **6/17/2014**	**PW110-061714** **6/17/2014**	**PW112-061714** **6/17/2014**	**PW133-061714** **6/17/2014**	**PW134-061714** **6/17/2014**
ID Location:			LHAAP Perimeter - ENE, near creek. Sampled annually.	LHAAP Perimeter – SSE. Sampled annually.	LHAAP Perimeter – WNW. Sampled annually.	LHAAP Perimeter - NW. Sampled annually.	LHAAP Perimeter - NW. Sampled annually.
Perchlorate (6850)							
PERCHLORATE	ug/L	72	<0.2 U	<0.2 U	0.458	0.887	0.989

ug/L- Micrograms per liter

U - Undetected: The analyte was analyzed for, but not detected.

LHAAP-18/24 PSI Work Plan Field Work
May/June 2014

Location ID: **Sample Date:**	**Units**	**MCL/ MSC**	**1824MW21MCSM060514** **5/6/2014**	**1824MW2EZVI050514** **5/5/2014**	**18CPTACD01(13-14)140514** **5/14/2014**	**18CPTACD01(23-24)140514** **5/14/2014**	**18CPTACD01(34-35)140514** **5/14/2014**	**18CPTACD01(46-47)140514** **5/14/2014**	**18CPTACD02(4.5-5.5)130514** **5/13/2014**	**18CPTACD02(4.5-5.5)130514DUP** **5/13/2014**	**18CPTACD02(17-18)130514** **5/13/2014**	**18CPTACD02(22-23)130514** **5/13/2014**	**18CPTACD02(29-30)130514** **5/13/2014**
Location Description:			Baseline analytical for treatability study soil collected from near MW21.	Baseline analytical for treatability study soil collected from near MW2.	ACD Area. MIP verification soil sampling.	ACD Area. MIP verification soil sampling.	ACD Area. MIP verification soil sampling.	ACD Area. MIP verification soil sampling.	ACD Area. MIP verification soil sampling.	ACD Area. MIP verification soil sampling.	ACD Area. MIP verification soil sampling.	ACD Area. MIP verification soil sampling.	ACD Area. MIP verification soil sampling.
Perchlorate (6850)													
PERCHLORATE	ug/kg	7200	NA	NA	3.79 J	17.2	70900	488	<2.42 U	<2.34	39100	77300	5670
Volatile Organic Compounds (8260B)													
1,1,1,2-TETRACHLOROETHANE	ug/kg	11000	<101 U	<108 U	<1.16 U	<1.13 U	<4.54 U	<1.23 U	<1.19 U	<1.16 U	<139 U	<130 U	<1.22 U
1,1,1-TRICHLOROETHANE	ug/kg	20000	<101 U	<108 U	<1.16 U	<1.13 U	<4.54 U	<1.23 U	<1.19 U	<1.16 U	<139 U	<130 U	<1.22 U
1,1,2,2-TETRACHLOROETHANE	ug/kg	1400	<101 U	<108 U	<1.16 UJ	<1.13 UJ	<4.54 U	<1.23 U	<1.19 U	<1.16 U	<139 U	<130 U	<1.22 U
1,1,2-TRICHLOROETHANE	ug/kg	500	<101 U	<108 U	<1.16 U	<1.13 U	<4.54 U	<1.23 U	<1.19 U	<1.16 U	<139 U	<130 U	<1.22 U
1,1-DICHLOROETHANE	ug/kg	1000000	<202 U	<216 U	<2.32 U	<2.26 U	<9.08 U	<2.46 U	<2.38 U	<2.32 U	<278 U	<260 U	<2.44 U
1,1-DICHLOROETHENE	ug/kg	700	<101 U	368 J	<1.16 U	<1.13 U	<4.54 U	<1.23 U	<1.19 U	<1.16 U	<139 U	126 J	3.86 J
1,1-DICHLOROPROPENE	ug/kg	290	<101 U	<108 U	<1.16 U	<1.13 U	<4.54 U	<1.23 U	<1.19 U	<1.16 U	<139 U	<130 U	<1.22 U
1,2,3-TRICHLOROBENZENE	ug/kg	31000	<101 U	<108 U	<1.16 U	<1.13 U	<4.54 U	<1.23 U	<1.19 U	<1.16 U	<139 U	<130 U	<1.22 U
1,2,3-TRICHLOROPROPANE	ug/kg	4.1	<202 U	<216 U	<2.32 UJ	<2.26 UJ	<9.08 U	<2.46 U	<2.38 U	<2.32 U	<278 U	<260 U	<2.44 U
1,2,4-TRICHLOROBENZENE	ug/kg	7000	<101 U	<108 U	<1.16 U	<1.13 U	<4.54 U	<1.23 U	<1.19 U	<1.16 U	<139 U	<130 U	<1.22 U
1,2,4-TRIMETHYLBENZENE	ug/kg	510000	<101 U	<108 U	<1.16 UJ	<1.13 UJ	<4.54 U	<1.23 U	<1.19 U	<1.16 U	<139 U	<130 U	<1.22 U
1,2-DIBROMO-3-CHLOROPROPANE	ug/kg	20	<406 U	<432 U	<4.64 UJ	<4.54 UJ	<18.2 U	<4.92 U	<4.78 U	<4.64 U	<556 U	<520 U	<4.86 U
1,2-DIBROMOETHANE	ug/kg	5	<101 U	<108 U	<1.16 U	<1.13 U	<4.54 U	<1.23 U	<1.19 U	<1.16 U	<139 U	<130 U	<1.22 U
1,2-DICHLOROBENZENE	ug/kg	60000	<101 U	<108 U	<1.16 UJ	<1.13 UJ	<4.54 U	<1.23 U	<1.19 U	<1.16 U	<139 U	<130 U	<1.22 U
1,2-DICHLOROETHANE	ug/kg	500	<101 U	<108 U	<1.16 U	8.76	19.3 J	1.12 J	<1.19 J	<1.16 U	92.1 J	303 J	<1.22 U
1,2-DICHLOROPROPANE	ug/kg	500	<101 U	<108 U	<1.16 U	<1.13 U	<4.54 U	<1.23 U	<1.19 U	<1.16 U	<139 U	<130 U	<1.22 U
1,3,5-TRIMETHYLBENZENE	ug/kg	510000	<101 U	<108 U	<1.16 UJ	<1.13 UJ	<4.54 U	<1.23 U	<1.19 U	<1.16 U	<139 U	<130 U	<1.22 U
1,3-DICHLOROBENZENE	ug/kg	310000	<101 U	<108 U	<1.16 UJ	<1.13 UJ	<4.54 U	<1.23 U	<1.19 U	<1.16 U	<139 U	<130 U	<1.22 U
1,3-DICHLOROPROPANE	ug/kg	2900	<101 UJ	<108 U	<1.16 U	<1.13 U	<4.54 U	<1.23 U	<1.19 U	<1.16 U	<139 U	<130 U	<1.22 U
1,4-DICHLOROBENZENE	ug/kg	7500	<101 U	<108 U	<1.16 UJ	<1.13 UJ	<4.54 U	<1.23 U	<1.19 U	<1.16 U	<139 U	<130 U	<1.22 U
2,2-DICHLOROPROPANE	ug/kg	4200	<101 U	<108 U	<1.16 U	<1.13 U	<4.54 U	<1.23 U	<1.19 U	<1.16 U	<139 U	<130 U	<1.22 U
2-BUTANONE	ug/kg	6100000	<506 U	<540 U	<5.78 UJ	<5.66 UJ	<22.6 U	<6.16 U	<5.98 U	<5.80 U	<694 U	<650 U	<6.08 U
2-CHLOROTOLUENE	ug/kg	200000	<101 U	<108 U	<1.16 UJ	<1.13 UJ	<4.54 U	<1.23 U	<1.19 U	<1.16 U	<139 U	<130 U	<1.22 U
2-HEXANONE	ug/kg	610000	<506 U	<540 U	<5.78 U	<5.66 U	<22.6 U	<6.16 U	<5.98 U	<5.80 U	<694 U	<650 U	<6.08 U
4-CHLOROTOLUENE	ug/kg	200000	<101 U	<108 U	<1.16 UJ	<1.13 UJ	<4.54 U	<1.23 U	<1.19 U	<1.16 U	<139 U	<130 U	<1.22 U
4-METHYL-2-PENTANONE	ug/kg	820000	<506 U	<540 U	<5.78 U	<5.66 U	<22.6 U	<6.16 U	<5.98 U	<5.80 U	<694 U	<650 U	<6.08 U
ACETONE	ug/kg	920000	676 J	<1080 U	31.3 J	28.7 J	<45.4 U	12.8 J	7.11 J	6.32 J	<1390 J	<1300 U	<12.2 U
BENZENE	ug/kg	500	<101 U	<108 U	<1.16 U	<1.13 U	<4.54 U	<1.23 U	<1.19 U	<1.16 U	<139 U	<130 U	<1.22 U
BROMOBENZENE	ug/kg	200000	<101 U	<108 U	<1.16 UJ	<1.13 UJ	<4.54 U	<1.23 U	<1.19 U	<1.16 U	<139 U	<130 U	<1.22 U
BROMOCHLOROMETHANE	ug/kg	410000	<202 U	<216 U	<2.32 U	<2.26 U	<9.08 U	<2.46 U	<1.19 U	<2.32 U	<278 U	<260 U	<2.44 U
BROMODICHLOROMETHANE	ug/kg	460	<101 U	<108 U	<1.16 U	<1.13 U	<4.54 U	<1.23 U	<2.38 U	<1.16 U	<139 U	<240 J	<1.22 U
BROMOFORM	ug/kg	3600	<101 U	<108 U	<1.16 U	<1.13 U	<4.54 U	<1.23 U	<1.19 U	<1.16 U	<139 U	<130 U	<1.22 U
BROMOMETHANE	ug/kg	14000	<202 U	<216 U	<2.32 U	<2.26 U	<9.08 U	<2.46 U	<1.19 U	<2.32 U	<278 U	<260 U	<2.44 U
CARBON DISULFIDE	ug/kg	1000000	<101 U	<108 U	<1.16 U	2.23 J	<4.54 U	<1.23 U	<1.19 U	<1.16 U	<139 U	<130 U	<1.22 U
CARBON TETRACHLORIDE	ug/kg	500	<101 U	<108 U	<1.16 U	<1.13 U	<4.54 U	<1.23 U	<1.19 U	<1.16 U	<139 U	<130 U	<1.22 U
CHLOROBENZENE	ug/kg	10000	<101 U	<108 U	<1.16 U	<1.13 U	<4.54 U	<1.23 U	<1.19 U	<1.16 U	<139 U	<130 U	<1.22 U
CHLOROETHANE	ug/kg	4100000	<202 U	<216 U	<2.32 U	<2.26 U	<9.08 U	<2.46 U	<2.38 U	<2.32 U	<278 U	<260 U	<2.44 U
CHLOROFORM	ug/kg	100000	<101 U	<108 U	0.685 J	0.941 J	9.45 J	<1.23 U	0.636 J	1.34 J	<139 J	<130 U	0.662 J
CHLOROMETHANE	ug/kg	22000	<406 U	<432 U	<4.64 U	<4.54 U	<18.2 U	<4.92 U	<4.78 U	<4.64 U	<556 U	<520 U	<4.86 U
CIS-1,2-DICHLOROETHENE	ug/kg	7000	122 J	17600	1.04 J	10.7	249	8.21	19.1	4.87 J	2790 J	2570 J	2.93 J
CIS-1,3-DICHLOROPROPENE	ug/kg	530	<101 U	<108 U	<1.16 U	<1.13 U	<4.54 U	<1.23 U	<1.19 U	<1.16 U	<139 U	<130 U	<1.22 U
DIBROMOCHLOROMETHANE	ug/kg	3400	<101 U	<108 U	<1.16 U	<1.13 U	<4.54 U	<1.23 U	<1.19 U	<1.16 U	<139 U	<130 U	<1.22 U

LHAAP-18/24 PSI Work Plan Field Work
May/June 2014

Location ID: **Sample Date:**	**Units**	**MCL/ MSC**	**1824MW21MCSM060514** **5/6/2014**	**1824MW2EZVI050514** **5/5/2014**	**18CPTACD01 (13-14)140514** **5/14/2014**	**18CPTACD01 (23-24)140514** **5/14/2014**	**18CPTACD01 (34-35)140514** **5/14/2014**	**18CPTACD01 (46-47)140514** **5/14/2014**	**18CPTACD02 (4.5-5.5)130514** **5/13/2014**	**18CPTACD02 (4.5-5.5)130514DUP** **5/13/2014**	**18CPTACD02 (17-18)130514** **5/13/2014**	**18CPTACD02 (22-23)130514** **5/13/2014**	**18CPTACD02 (29-30)130514** **5/13/2014**
Location Description:			Baseline analytical for treatability study soil collected from near MW21.	Baseline analytical for treatability study soil collected from near MW2.	ACD Area. MIP verification soil sampling.	ACD Area. MIP verification soil sampling.	ACD Area. MIP verification soil sampling.	ACD Area. MIP verification soil sampling.	ACD Area. MIP verification soil sampling.	ACD Area. MIP verification soil sampling.	ACD Area. MIP verification soil sampling.	ACD Area. MIP verification soil sampling.	ACD Area. MIP verification soil sampling.
DIBROMOMETHANE	ug/kg	38000	<101 U	<108 U	<1.16 U	<1.13 U	<4.54 U	<1.23 U	<1.19 U	<1.16 U	<139 U	<130 U	<1.22 U
DICHLORODIFLUOROMETHANE	ug/kg	2000000	<202 U	<216 U	<2.32 U	<2.26 U	<9.08 U	<2.46 U	<2.38 U	<2.32 U	<278 U	<260 U	<2.44 U
ETHYLBENZENE	ug/kg	70000	<101 U	112 J	<1.16 U	<1.13 U	<4.54 U	<1.23 U	<1.19 U	<1.16 U	<139 U	<130 U	<1.22 U
HEXACHLOROBUTADIENE	ug/kg	2000	<101 U	<108 U	<1.16 UJ	<1.13 UJ	<4.54 U	<1.23 U	<1.19 U	<1.16 U	<139 U	<130 U	<1.22 U
ISOPROPYLBENZENE	ug/kg	1000000	<101 U	<108 U	<1.16 U	<1.13 U	<4.54 U	<1.23 U	<1.19 U	<1.16 U	<139 U	<130 U	<1.22 U
M,P-XYLENE	ug/kg	1000000	<101 U	<108 U	<1.16 U	<1.13 U	<4.54 U	<1.23 U	<1.19 U	<1.16 U	<139 U	<130 U	<1.22 U
METHYLENE CHLORIDE	ug/kg	500	<202 U	<216 U	6.1	5.54 J	642	6.6	16.6	10.6	64900	126000	26.3
NAPHTHALENE	ug/kg	200000	<101 U	<108 U	<1.16 UJ	<1.13 UJ	<4.54 U	<1.23 U	<1.19 U	<1.16 U	<139 U	<130 U	<1.22 U
N-BUTYLBENZENE	ug/kg	410000	<101 U	<108 U	<1.16 UJ	<1.13 UJ	<4.54 U	<1.23 U	<1.19 U	<1.16 U	<139 U	<130 U	<1.22 U
N-PROPYLBENZENE	ug/kg	410000	<101 U	<108 U	<1.16 UJ	<1.13 UJ	<4.54 U	<1.23 U	<1.19 U	<1.16 U	<139 U	<130 U	<1.22 U
O-XYLENE	ug/kg	1000000	<101 U	<108 U	<1.16 U	<1.13 U	<4.54 U	<1.23 U	<1.19 U	<1.16 U	<139 U	<130 U	<1.22 U
P-ISOPROPYLTOLUENE	ug/kg	1000000	<101 U	<108 U	<1.16 UJ	<1.13 UJ	<4.54 U	<1.23 U	<1.19 U	<1.16 U	<139 U	<130 U	<1.22 U
SEC-BUTYLBENZENE	ug/kg	410000	<101 U	<108 U	<1.16 UJ	<1.13 UJ	<4.54 U	<1.23 U	<1.19 U	<1.16 U	<139 U	<130 U	<1.22 U
STYRENE	ug/kg	10000	<101 U	57.9 J	<1.16 U	<1.13 U	<4.54 U	<1.23 U	<1.19 U	<1.16 U	<139 U	<130 U	<1.22 U
TERT-BUTYLBENZENE	ug/kg	410000	<101 U	<108 U	<1.16 UJ	<1.13 UJ	<4.54 U	<1.23 U	<1.19 U	<1.16 U	<139 U	<130 U	<1.22 U
TETRACHLOROETHENE	ug/kg	500	<101 U	69.2 J	<1.16 UJ	<1.13 UJ	<4.54 U	<1.23 U	<1.19 U	<1.16 U	<139 U	<130 U	<1.22 U
TOLUENE	ug/kg	100000	<101 U	<108 U	<1.16 U	<1.13 U	<4.54 U	<1.23 U	<1.19 U	<1.16 U	<139 U	<130 U	<1.22 U
TRANS-1,2-DICHLOROETHENE	ug/kg	10000	<101 U	<108 U	<1.16 U	<1.13 U	<4.54 U	<1.23 U	<1.19 U	<1.16 U	<139 U	<130 U	0.814 J
TRANS-1,3-DICHLOROPROPENE	ug/kg	2900	<101 U	<108 U	<1.16 U	<1.13 U	<4.54 U	<1.23 U	<1.19 U	<1.16 U	<139 U	<130 U	<1.22 U
TRICHLOROETHENE	ug/kg	500	1270	6650	1.5 J	0.801 J	697	6.96	5.72 J	1.03 J	7530	18500 J	25.1
TRICHLOROFLUOROMETHANE	ug/kg	3100000	<202 U	<216 U	<2.32 U	<2.26 U	<9.08 U	<2.46 U	<2.38 U	<2.32 U	<278 U	<260 U	<2.44 U
VINYL CHLORIDE	ug/kg	200	<202 U	<216 U	<2.32 U	<2.26 U	<9.08 U	<2.46 U	<2.38 U	<2.32 U	<278 U	<260 U	<2.44 U
Percent Solids (D2216-90)													
Solids, Percent	%		80.5	81.7	84.7	83.6	81.6	79.1	81.1	82.8	82.2	83.1	80
Total Organic Carbon (LYDKHN)													
TOTAL ORGANIC CARBON (TOC)	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Blue Highlighting Indicates concentrations above the MCL/MSC

Note: Some samples may have been diluted due to the concentration(s) of one or more analytes exceeding the upper limit of the calibration curve.

J - Estimated: The analyte was positively identified, the quantitation is an estimation due to discrepancies in meeting certain analyte-specific quality control criteria.

MCL/MSC - Maximum Contaminant Limit/Medium-Specific Concentrations

mg/kg - milligrams per kilogram

N/A - not analyzed

U - Undetected: The analyte was analyzed for, but not detected.

UJ - The analyte was not detected; however, the result is estimated due to discrepancies in meeting certain analyte-specific quality control criteria.

ug/kg - micrograms per kilogram

LHAAP-18/24 PSI Work Plan Field Work
May/June 2014

Location ID: **Sample Date:**	**Units**	**MCL/ MSC**	**18CPTACD02 (34-35)130514 5/13/2014**	**18CPTACD03 (26-28)140514 5/14/2014**	**18CPTACD03 (33.5-34.5)140514 5/14/2014**	**18CPTACD03 (39-40)140514 5/14/2014**	**18CPTACD03 (6-7)140514 5/14/2014**	**18CPTACD04 (15-16)130514 5/13/2014**	**18CPTACD04 (22-23)130514 5/13/2014**	**18CPTACD04 (26-28)130514 5/13/2014**	**18CPTACD04 (33.5-34.5)130514 5/13/2014**	**18CPTACD04 (7-8)130514 5/13/2014**	**18CPTACD05 (26-27)020614 6/2/2014**
Location Description:			ACD Area. MIP verification soil sampling.	ACD Area. MIP verification soil sampling.	ACD Area. MIP verification soil sampling.	ACD Area. MIP verification soil sampling.	ACD Area. MIP verification soil sampling.	ACD Area. MIP verification soil sampling.	ACD Area. MIP verification soil sampling.	ACD Area. MIP verification soil sampling.	ACD Area. MIP verification soil sampling.	ACD Area. MIP verification soil sampling.	ACD Area. MIP verification soil sampling.
Perchlorate (6850)													
PERCHLORATE	ug/kg	7200	248	43700	1190	1870	1.91 J	41.1	19900	149000	14300	203	1600
Volatile Organic Compounds (8260B)													
1,1,1,2-TETRACHLOROETHANE	ug/kg	11000	<137 U	<13000 U	<126 U	<115 U	<1.17 U	<131 U	<124 U	<644 U	<128 U	<1.11 U	<130 UJ
1,1,1-TRICHLOROETHANE	ug/kg	20000	<137 U	<13000 U	<126 U	105 J	<1.17 U	<131 U	<124 U	<644 U	<128 U	<1.11 U	<130 UJ
1,1,2,2-TETRACHLOROETHANE	ug/kg	1400	<137 U	<13000 U	<126 U	<115 U	<1.17 U	<131 U	<124 U	<644 U	<128 U	<1.11 U	<130 UJ
1,1,2-TRICHLOROETHANE	ug/kg	500	<137 U	<13000 U	<126 U	<115 U	<1.17 U	<131 U	<124 U	<644 U	<128 U	<1.11 U	<130 UJ
1,1-DICHLOROETHANE	ug/kg	1000000	<274 U	<26000 U	<252 U	<230 U	<2.34 U	<262 U	<248 U	<1290 U	<256 U	<2.22 U	<260 UJ
1,1-DICHLOROETHENE	ug/kg	700	<137 U	<13000 U	<126 U	<115 U	<1.17 U	<131 U	<124 U	<644 U	<128 U	<1.11 U	<130 UJ
1,1-DICHLOROPROPENE	ug/kg	290	<137 U	<13000 U	<126 U	<115 U	<1.17 U	<131 U	<124 U	<644 U	<128 U	<1.11 U	<130 UJ
1,2,3-TRICHLOROBENZENE	ug/kg	31000	<137 U	<13000 U	<126 U	<115 U	<1.17 U	<131 U	<124 U	<644 U	<128 U	<1.11 U	<130 UJ
1,2,3-TRICHLOROPROPANE	ug/kg	4.1	<274 U	<26000 U	<252 U	<230 U	<2.34 U	<262 U	<248 U	<1290 U	<256 U	<2.22 U	<260 UJ
1,2,4-TRICHLOROBENZENE	ug/kg	7000	<137 U	<13000 U	<126 U	<115 U	<1.17 U	<131 U	<124 U	<644 U	<128 U	<1.11 U	<130 UJ
1,2,4-TRIMETHYLBENZENE	ug/kg	510000	<137 U	<13000 U	<126 U	<115 U	<1.17 U	<131 U	<124 U	<644 U	<128 U	<1.11 U	<130 UJ
1,2-DIBROMO-3-CHLOROPROPANE	ug/kg	20	<548 U	<51800 U	<506 U	<460 U	<4.7 U	<522 U	<496 U	<2580 U	<512 U	<4.42 U	<518 UJ
1,2-DIBROMOETHANE	ug/kg	5	<137 U	<13000 U	<126 U	<115 U	<1.17 U	<131 U	<124 U	<644 U	<128 U	<1.11 U	<130 UJ
1,2-DICHLOROBENZENE	ug/kg	60000	<137 U	<13000 U	<126 U	<115 U	<1.17 U	<131 U	<124 U	<644 U	<128 U	<1.11 U	<130 UJ
1,2-DICHLOROETHANE	ug/kg	500	92.1 J	<13000 U	<126 U	<115 U	<1.17 U	118 J	<124 U	<644 U	<128 U	<1.11 U	<130 UJ
1,2-DICHLOROPROPANE	ug/kg	500	<137 U	<13000 U	<126 U	<115 U	<1.17 U	<131 U	<124 U	<644 U	<128 U	<1.11 U	<130 UJ
1,3,5-TRIMETHYLBENZENE	ug/kg	510000	<137 U	<13000 U	<126 U	<115 U	<1.17 U	<131 U	<124 U	<644 U	<128 U	<1.11 U	<130 UJ
1,3-DICHLOROBENZENE	ug/kg	310000	<137 U	<13000 U	<126 U	<115 U	<1.17 U	<131 U	<124 U	<644 U	<128 U	<1.11 U	<130 UJ
1,3-DICHLOROPROPANE	ug/kg	2900	<137 U	<13000 U	<126 U	<115 U	<1.17 U	<131 U	<124 U	<644 U	<128 U	<1.11 U	<130 UJ
1,4-DICHLOROBENZENE	ug/kg	7500	<137 U	<13000 U	<126 U	<115 U	<1.17 U	<131 U	<124 U	<644 U	<128 U	<1.11 U	<130 UJ
2,2-DICHLOROPROPANE	ug/kg	4200	<137 U	<13000 U	<126 U	<115 U	<1.17 U	<131 U	<124 U	<644 U	<128 U	<1.11 U	<130 UJ
2-BUTANONE	ug/kg	6100000	<686 U	<64800 U	<632 U	<574 U	<5.88 U	<654 U	<620 U	<3220 U	<640 U	4.33 J	<648 UJ
2-CHLOROTOLUENE	ug/kg	200000	<137 U	<13000 U	<126 U	<115 U	<1.17 U	<131 U	<124 U	<644 U	<128 U	<1.11 U	<130 UJ
2-HEXANONE	ug/kg	610000	<686 U	<64800 U	<632 U	<574 U	<5.88 U	<654 U	<620 U	<3220 U	<640 U	<5.54 U	<648 UJ
4-CHLOROTOLUENE	ug/kg	200000	<137 U	<13000 U	<126 U	<115 U	<1.17 U	<131 U	<124 U	<644 U	<128 U	<1.11 U	<130 UJ
4-METHYL-2-PENTANONE	ug/kg	820000	<686 U	<64800 U	<632 U	<574 U	<5.88 U	<654 U	<620 U	<3220 U	<640 U	<5.54 U	<648 UJ
ACETONE	ug/kg	920000	933 J	<130000 U	<1260 U	752 J	<11.7 U	776 J	940 J	4000 J	699 J	42.3	<1300 UJ
BENZENE	ug/kg	500	<137 U	<13000 U	<126 U	<115 U	<1.17 U	<131 U	<124 U	<644 U	<128 U	<1.11 U	<130 UJ
BROMOBENZENE	ug/kg	200000	<137 U	<13000 U	<126 U	<115 U	<1.17 U	<131 U	<124 U	<644 U	<128 U	<1.11 U	<130 UJ
BROMOCHLOROMETHANE	ug/kg	410000	<274 U	<26000 U	<252 U	<230 U	<2.34 U	<262 U	<248 U	<1290 U	<256 U	<2.22 U	<260 UJ
BROMODICHLOROMETHANE	ug/kg	460	<137 U	<13000 U	<126 U	<115 U	<1.17 U	<131 U	<124 U	<644 U	<128 U	<1.11 U	<130 UJ
BROMOFORM	ug/kg	3600	<137 U	<13000 U	<126 U	<115 U	<1.17 U	<131 U	<124 U	<644 U	<128 U	<1.11 U	<130 UJ
BROMOMETHANE	ug/kg	14000	<274 U	<26000 U	<252 U	<230 U	<2.34 U	<262 U	<248 U	<1290 U	<256 U	<2.22 U	<260 UJ
CARBON DISULFIDE	ug/kg	1000000	<137 U	<13000 U	<126 U	<115 U	<1.17 U	<131 U	<124 U	<644 U	<128 U	<1.11 U	<130 UJ
CARBON TETRACHLORIDE	ug/kg	500	<137 U	<13000 U	<126 U	<115 U	<1.17 U	<131 U	<124 U	<644 U	<128 U	<1.11 U	<130 UJ
CHLOROBENZENE	ug/kg	10000	<137 U	<13000 U	<126 U	<115 U	<1.17 U	<131 U	<124 U	<644 U	<128 U	<1.11 U	<130 UJ
CHLOROETHANE	ug/kg	4100000	<274 U	<26000 U	<252 U	<230 U	<2.34 U	<262 U	<248 U	<1290 U	<256 U	<2.22 U	<260 UJ
CHLOROFORM	ug/kg	100000	<137 J	<13000 U	<126 U	<115 U	0.954 J	<131 U	<124 U	<644 U	<128 U	<1.11 U	<130 UJ
CHLOROMETHANE	ug/kg	22000	<548 U	<51800 U	<506 U	<460 U	<4.7 U	<522 U	<496 U	<2580 U	<512 U	<4.42 U	<518 UJ
CIS-1,2-DICHLOROETHENE	ug/kg	7000	8730	<13000 U	<126 U	<115 U	22.9	6860	2860	<644 U	<128 U	46.7	<130 UJ
CIS-1,3-DICHLOROPROPENE	ug/kg	530	<137 U	<13000 U	<126 U	<115 U	<1.17 U	<131 U	<124 U	<644 U	<128 U	<1.11 U	<130 UJ
DIBROMOCHLOROMETHANE	ug/kg	3400	<137 U	<13000 U	<126 U	<115 U	<1.17 U	<131 U	<124 U	<644 U	<128 U	<1.11 U	<130 UJ

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Location ID: Sample Date:	Units	MCL/ MSC	18CPTACD02 (34-35)130514 5/13/2014	18CPTACD03 (26-28)140514 5/14/2014	18CPTACD03 (33.5-34.5)140514 5/14/2014	18CPTACD03 (39-40)140514 5/14/2014	18CPTACD03 (6-7)140514 5/14/2014	18CPTACD04 (15-16)130514 5/13/2014	18CPTACD04 (22-23)130514 5/13/2014	18CPTACD04 (26-28)130514 5/13/2014	18CPTACD04 (33.5-34.5)130514 5/13/2014	18CPTACD04 (7-8)130514 5/13/2014	18CPTACD05 (26-27)020614 6/2/2014
Location Description:			ACD Area. MIP verification soil sampling.	ACD Area. MIP verification soil sampling.	ACD Area. MIP verification soil sampling.	ACD Area. MIP verification soil sampling.	ACD Area. MIP verification soil sampling.	ACD Area. MIP verification soil sampling.	ACD Area. MIP verification soil sampling.	ACD Area. MIP verification soil sampling.	ACD Area. MIP verification soil sampling.	ACD Area. MIP verification soil sampling.	ACD Area. MIP verification soil sampling.
DIBROMOMETHANE	ug/kg	38000	<137 U	<13000 U	<126 U	<115 U	<1.17 U	<131 U	<124 U	<644 U	<128 U	<1.11 U	<130 UJ
DICHLORODIFLUOROMETHANE	ug/kg	2000000	<274 U	<26000 U	<252 U	<230 U	<2.34 U	<262 U	<248 U	<1290 U	<256 U	<2.22 U	<260 UJ
ETHYLBENZENE	ug/kg	70000	<137 U	<13000 U	<126 U	<115 U	<1.17 U	78.1 J	<124 U	<644 U	<128 U	<1.11 U	<130 UJ
HEXACHLOROBUTADIENE	ug/kg	2000	<137 U	<13000 U	<126 U	<115 U	<1.17 U	<131 U	<124 U	<644 U	<128 U	<1.11 U	<130 UJ
ISOPROPYLBENZENE	ug/kg	1000000	<137 U	<13000 U	<126 U	<115 U	<1.17 U	<131 U	<124 U	<644 U	<128 U	<1.11 U	<130 UJ
M,P-XYLENE	ug/kg	1000000	<137 U	<13000 U	<126 U	<115 U	<1.17 U	<131 U	<124 U	<644 U	<128 U	<1.11 U	<130 UJ
METHYLENE CHLORIDE	ug/kg	500	449 J	902000	29600	2740	130	1140	18000	110000	2390	45.4	<260 UJ
NAPHTHALENE	ug/kg	200000	<137 U	<13000 U	<126 U	<115 U	<1.17 U	<131 U	<124 U	<644 U	<128 U	<1.11 U	<130 UJ
N-BUTYLBENZENE	ug/kg	410000	<137 U	<13000 U	<126 U	<115 U	<1.17 U	<131 U	<124 U	<644 U	<128 U	<1.11 U	<130 UJ
N-PROPYLBENZENE	ug/kg	410000	<137 U	<13000 U	<126 U	<115 U	<1.17 U	<131 U	<124 U	<644 U	<128 U	<1.11 U	<130 UJ
O-XYLENE	ug/kg	1000000	<137 U	<13000 U	<126 U	<115 U	<1.17 U	<131 U	<124 U	<644 U	<128 U	<1.11 U	<130 UJ
P-ISOPROPYLTOLUENE	ug/kg	1000000	<137 U	<13000 U	<126 U	<115 U	<1.17 U	<131 U	<124 U	<644 U	<128 U	<1.11 U	<130 UJ
SEC-BUTYLBENZENE	ug/kg	410000	<137 U	<13000 U	<126 U	<115 U	<1.17 U	<131 U	<124 U	<644 U	<128 U	<1.11 U	<130 UJ
STYRENE	ug/kg	10000	<137 U	16100 J	401 J	93 J	<1.17 U	<131 U	<124 U	<644 U	<128 U	<1.11 U	<130 UJ
TERT-BUTYLBENZENE	ug/kg	410000	<137 U	<13000 U	<126 U	<115 U	<1.17 U	<131 U	<124 U	<644 U	<128 U	<1.11 U	<130 UJ
TETRACHLOROETHENE	ug/kg	500	<137 U	<13000 U	<126 U	<115 U	<1.17 U	<131 U	<124 U	<644 U	<128 U	<1.11 U	<130 UJ
TOLUENE	ug/kg	100000	<137 U	<13000 U	<126 U	<115 U	<1.17 U	<131 U	<124 U	<644 U	<128 U	<1.11 U	<130 UJ
TRANS-1,2-DICHLOROETHENE	ug/kg	10000	<137 U	<13000 U	<126 U	<115 U	<1.17 U	<131 U	<124 U	<644 U	<128 U	<1.11 U	<130 UJ
TRANS-1,3-DICHLOROPROPENE	ug/kg	2900	<137 U	<13000 U	<126 U	<115 U	<1.17 U	<131 U	<124 U	<644 U	<128 U	<1.11 U	<130 UJ
TRICHLOROETHENE	ug/kg	500	7530	2670000	34500	3370	62.2	2760	8660	31500	10800	10.7	<130 UJ
TRICHLOROFLUOROMETHANE	ug/kg	3100000	<274 U	<26000 U	<252 U	<230 U	<2.34 U	<262 U	<248 U	<1290 U	<256 U	<2.22 U	<260 UJ
VINYL CHLORIDE	ug/kg	200	<274 U	<26000 U	<252 U	<230 U	<2.34 U	<262 U	<248 U	<1290 U	<256 U	<2.22 U	<260 UJ
Percent Solids (D2216-90)													
Solids, Percent	%		80.7	79.6	81.4	88.3	82.8	82	84.2	79.6	79.6	82.4	80.5
Total Organic Carbon (LYDKHN)													
TOTAL ORGANIC CARBON (TOC)	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Blue Highlighting Indicates concentrations above the MCL/MSC

Note: Some samples may have been diluted due to the concentration(s) of one or more analytes exceeding the upper limit of the calibration curve.

J - Estimated: The analyte was positively identified, the quantitation is an estimation due to discrepancies in meeting certain analyte-specific quality control criteria.

MCL/MSC - Maximum Contaminant Limit/Medium-Specific Concentrations

mg/kg - milligrams per kilogram

N/A - not analyzed

U - Undetected: The analyte was analyzed for, but not detected.

UJ - The analyte was not detected; however, the result is estimated due to discrepancies in meeting certain analyte-specific quality control criteria.

ug/kg - micrograms per kilogram

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Location ID: Sample Date:	Units	MCL/ MSC	18CPTACD05 (36-37)020614 6/2/2014	18CPTACD05 (37-38)020614 6/2/2014	18CPTACD05 (7-8)020614 6/2/2014	18CPTACD06 (12-13)090614 6/9/2014	18CPTACD06 (26-27)090614 6/9/2014	18CPTACD06 (35-36)090614 6/9/2014	18CPTACD07 (12-13)020614 6/2/2014	18CPTACD07 (15-16)020614 6/2/2014	18CPTACD07 (27-28)020614 6/2/2014	18CPTACD07 (37-38)020614 6/2/2014	18CPTACD12 (19-20)030614 6/3/2014	18CPTACD12 (32-33)030614 6/3/2014
Location Description:			ACD Area. MIP verification soil sampling.	ACD Area. MIP verification soil sampling.	ACD Area. MIP verification soil sampling.	ACD Area. MIP verification soil sampling.	ACD Area. MIP verification soil sampling.	ACD Area. MIP verification soil sampling.	ACD Area. MIP verification soil sampling.	ACD Area. MIP verification soil sampling.	ACD Area. MIP verification soil sampling.	ACD Area. MIP verification soil sampling.	ACD Area. MIP verification soil sampling.	ACD Area. MIP verification soil sampling.
Perchlorate (6850)														
PERCHLORATE	ug/kg	7200	1.3	<1.3 U	<1.2 U	109	58500	4170	<1.2 UJ	<1.2 UJ	1000 J	5.4 J	41000	9.2
Volatile Organic Compounds (8260B)														
1,1,1,2-TETRACHLOROETHANE	ug/kg	11000	<1.28 U	<136 U	<1.22 U	<1.17 U	<1400 U	<1.15 U	<142 U	<132 UJ	<1260 U	<1.24 U	<260 U	<2460 U
1,1,1-TRICHLOROETHANE	ug/kg	20000	<1.28 U	<136 U	<1.22 U	<1.17 U	<1400 U	<1.15 U	<142 U	<132 UJ	<1260 U	<1.24 U	<260 U	103
1,1,2,2-TETRACHLOROETHANE	ug/kg	1400	<1.28 U	<136 U	<1.22 U	<1.17 U	<1400 U	<1.15 U	<142 U	<132 UJ	<1260 U	<1.24 U	<260 UJ	<2460 UJ
1,1,2-TRICHLOROETHANE	ug/kg	500	<1.28 U	<136 U	<1.22 U	<1.17 U	<1400 U	<1.15 U	<142 U	<132 UJ	<1260 U	<1.24 U	2.04 J	7.87
1,1-DICHLOROETHANE	ug/kg	1000000	<2.56 U	<272 U	<2.44 U	<2.34 U	<2800 U	<2.3 U	<284 U	<264 UJ	<2520 U	<2.48 U	<520 U	2.93 J
1,1-DICHLOROETHENE	ug/kg	700	<1.28 U	<136 U	<1.22 U	<1.17 U	<1400 U	<1.15 U	<142 U	<132 UJ	<1260 U	<1.24 U	<260 U	3.37 J
1,1-DICHLOROPROPENE	ug/kg	290	<1.28 U	<136 U	<1.22 U	<1.17 U	<1400 U	<1.15 U	<142 U	<132 UJ	<1260 U	<1.24 U	<260 U	<2460 U
1,2,3-TRICHLOROBENZENE	ug/kg	31000	<1.28 U	<136 U	<1.22 U	<1.17 U	<1400 U	<1.15 U	<142 U	<132 UJ	<1260 U	<1.24 U	<260 U	<2460 U
1,2,3-TRICHLOROPROPANE	ug/kg	4.1	<2.56 U	<272 U	<2.44 U	<2.34 U	<2800 U	<2.3 U	<284 U	<264 UJ	<2520 U	<2.48 U	<520 UJ	<4920 UJ
1,2,4-TRICHLOROBENZENE	ug/kg	7000	<1.28 U	<136 U	<1.22 U	<1.17 U	<1400 U	<1.15 U	<142 U	<132 UJ	<1260 U	<1.24 U	<260 U	<2460 U
1,2,4-TRIMETHYLBENZENE	ug/kg	510000	<1.28 U	<136 U	<1.22 U	<1.17 U	<1400 U	<1.15 U	<142 U	<132 UJ	<1260 U	<1.24 U	<260 U	6.65
1,2-DIBROMO-3-CHLOROPROPANE	ug/kg	20	<5.1 U	<544 U	<4.86 U	<4.7 U	<5580 U	<4.62 U	<566 UJ	<528 UJ	<5040 UJ	<4.96 U	<4.82 U	<9820 UJ
1,2-DIBROMOETHANE	ug/kg	5	<1.28 U	<136 U	<1.22 U	<1.17 U	<1400 U	<1.15 U	<142 U	<132 UJ	<1260 U	<1.24 U	<260 U	<2460 U
1,2-DICHLOROBENZENE	ug/kg	60000	<1.28 U	<136 U	<1.22 U	<1.17 U	<1400 U	<1.15 U	<142 U	<132 UJ	<1260 U	<1.24 U	<260 U	<2460 U
1,2-DICHLOROETHANE	ug/kg	500	<1.28 U	<136 U	<1.22 U	<1.17 U	<1400 U	<1.15 U	189 J	<132 UJ	<1260 U	<1.24 U	1.56 J	3.41 J
1,2-DICHLOROPROPANE	ug/kg	500	<1.28 U	<136 U	<1.22 U	<1.17 U	<1400 U	<1.15 U	<142 U	<132 UJ	<1260 U	<1.24 U	<260 U	<2460 U
1,3,5-TRIMETHYLBENZENE	ug/kg	510000	<1.28 U	<136 U	<1.22 U	<1.17 U	<1400 U	<1.15 U	<142 U	<132 UJ	<1260 U	<1.24 U	<260 U	1.76 J
1,3-DICHLOROBENZENE	ug/kg	310000	<1.28 U	<136 U	<1.22 U	<1.17 U	<1400 U	<1.15 U	<142 U	<132 UJ	<1260 U	<1.24 U	<260 U	<2460 U
1,3-DICHLOROPROPANE	ug/kg	2900	<1.28 U	<136 U	<1.22 U	<1.17 U	<1400 U	<1.15 U	<142 U	<132 UJ	<1260 U	<1.24 U	<260 UJ	<2460 UJ
1,4-DICHLOROBENZENE	ug/kg	7500	<1.28 U	<136 U	<1.22 U	<1.17 U	<1400 U	<1.15 U	<142 U	<132 UJ	<1260 U	<1.24 U	<260 U	<2460 U
2,2-DICHLOROPROPANE	ug/kg	4200	<1.28 U	<136 U	<1.22 U	<1.17 U	<1400 U	<1.15 U	<142 U	<132 UJ	<1260 U	<1.24 U	<260 U	<2460 U
2-BUTANONE	ug/kg	6100000	<6.38 U	<680 U	<6.08 U	<5.86 UJ	<6980 U	<5.76 U	<708 UJ	<660 UJ	<6320 UJ	<6.2 U	<6.02 U	13.6
2-CHLOROTOLUENE	ug/kg	200000	<1.28 U	<136 U	<1.22 U	<1.17 U	<1400 U	<1.15 U	<142 U	<132 UJ	<1260 U	<1.24 U	<260 U	<2460 U
2-HEXANONE	ug/kg	610000	<6.38 U	<680 U	<6.08 U	<5.86 U	<6980 U	<5.76 U	<708 UJ	<660 UJ	<6320 UJ	<6.2 U	<6.02 U	<6.14 U
4-CHLOROTOLUENE	ug/kg	200000	<1.28 U	<136 U	<1.22 U	<1.17 U	<1400 U	<1.15 U	<142 U	<132 UJ	<1260 U	<1.24 U	<260 U	<2460 U
4-METHYL-2-PENTANONE	ug/kg	820000	<6.38 U	<680 U	<6.08 U	<5.86 UJ	<6980 U	<5.76 U	<708 UJ	<660 UJ	<6320 UJ	<6.2 U	3.22 J	15.5
ACETONE	ug/kg	920000	16 J	<1360 U	<12.2 U	<11.7 UJ	<14000 U	15.5 J	<1420 U	<1320 UJ	<12600 U	<12.4 U	<2600 UJ	32.3
BENZENE	ug/kg	500	<1.28 U	<136 U	<1.22 U	<1.17 U	<1400 U	<1.15 U	<142 U	<132 UJ	<1260 U	<1.24 U	<260 U	<2460 U
BROMOBENZENE	ug/kg	200000	<1.28 U	<136 U	<1.22 U	<1.17 U	<1400 U	<1.15 U	<142 U	<132 UJ	<1260 U	<1.24 U	<260 U	<2460 U
BROMOCHLOROMETHANE	ug/kg	410000	<2.56 U	<272 U	<2.44 U	<2.34 U	<2800 U	<2.3 U	<284 U	<264 UJ	<2520 U	<2.48 U	4.05 J	10.3
BROMODICHLOROMETHANE	ug/kg	460	<1.28 U	<136 U	<1.22 U	<1.17 U	<1400 U	<1.15 U	<142 U	<132 UJ	<1260 U	<1.24 U	<260 U	<2460 U
BROMOFORM	ug/kg	3600	<1.28 U	<136 U	<1.22 U	<1.17 U	<1400 U	<1.15 U	<142 U	<132 UJ	<1260 U	<1.24 U	<260 U	<2460 U
BROMOMETHANE	ug/kg	14000	<2.56 U	<272 U	<2.44 U	<2.34 U	<2800 U	<2.3 U	<284 U	<264 UJ	<2520 U	<2.48 U	<520 U	<4920 U
CARBON DISULFIDE	ug/kg	1000000	<1.28 U	<136 U	<1.22 U	<1.17 U	<1400 U	<1.15 U	<142 U	<132 UJ	<1260 U	<1.24 U	<260 U	<2460 U
CARBON TETRACHLORIDE	ug/kg	500	<1.28 U	<136 U	<1.22 U	<1.17 U	<1400 U	<1.15 U	<142 U	<132 UJ	<1260 U	<1.24 U	<260 U	<2460 U
CHLOROBENZENE	ug/kg	10000	<1.28 U	<136 U	<1.22 U	<1.17 U	<1400 U	<1.15 U	<142 U	<132 UJ	<1260 U	<1.24 U	<260 U	<2460 U
CHLOROETHANE	ug/kg	4100000	<2.56 U	<272 U	<2.44 U	<2.34 U	<2800 U	<2.3 U	<284 U	<264 UJ	<2520 U	<2.48 U	<520 U	<4920 U
CHLOROFORM	ug/kg	100000	<1.28 U	<136 U	<1.22 U	<1.17 U	<1400 U	<1.15 U	<142 U	<132 UJ	<1260 U	<1.24 U	1.52 J	6.65
CHLOROMETHANE	ug/kg	22000	<5.1 U	<544 U	<4.86 U	<4.7 U	<5580 U	<4.62 UJ	<566 U	<528 UJ	<5040 U	<4.96 U	<4.82 U	<9820 U
CIS-1,2-DICHLOROETHENE	ug/kg	7000	1.16 J	167 J	<1.22 U	2.42 J	<1400 U	1.25 J	5210	4710 J	<1260 U	7.97	443 J	2.84 J
CIS-1,3-DICHLOROPROPENE	ug/kg	530	<1.28 U	<136 U	<1.22 U	<1.17 U	<1400 U	<1.15 U	<142 U	<132 UJ	<1260 U	<1.24 U	<260 U	<2460 U
DIBROMOCHLOROMETHANE	ug/kg	3400	<1.28 U	<136 U	<1.22 U	<1.17 U	<1400 U	<1.15 U	<142 U	<132 UJ	<1260 U	<1.24 U	<260 U	<2460 U

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Location ID: Sample Date:	Units	MCL/ MSC	18CPTACD05 (36-37)020614 6/2/2014	18CPTACD05 (37-38)020614 6/2/2014	18CPTACD05 (7-8)020614 6/2/2014	18CPTACD06 (12-13)090614 6/9/2014	18CPTACD06 (26-27)090614 6/9/2014	18CPTACD06 (35-36)090614 6/9/2014	18CPTACD07 (12-13)020614 6/2/2014	18CPTACD07 (15-16)020614 6/2/2014	18CPTACD07 (27-28)020614 6/2/2014	18CPTACD07 (37-38)020614 6/2/2014	18CPTACD12 (19-20)030614 6/3/2014	18CPTACD12 (32-33)030614 6/3/2014
Location Description:			ACD Area. MIP verification soil sampling.	ACD Area. MIP verification soil sampling.	ACD Area. MIP verification soil sampling.	ACD Area. MIP verification soil sampling.	ACD Area. MIP verification soil sampling.	ACD Area. MIP verification soil sampling.	ACD Area. MIP verification soil sampling.	ACD Area. MIP verification soil sampling.	ACD Area. MIP verification soil sampling.	ACD Area. MIP verification soil sampling.	ACD Area. MIP verification soil sampling.	ACD Area. MIP verification soil sampling.
DIBROMOMETHANE	ug/kg	38000	<1.28 U	<136 U	<1.22 U	<1.17 U	<1400 U	<1.15 U	<142 U	<132 UJ	<1260 U	<1.24 U	<260 U	<2460 U
DICHLORODIFLUOROMETHANE	ug/kg	2000000	<2.56 U	<272 U	<2.44 U	<2.34 U	<2800 U	<2.3 U	<284 U	<264 UJ	<2520 U	<2.48 U	<520 U	<4920 U
ETHYLBENZENE	ug/kg	70000	<1.28 U	<136 U	<1.22 U	<1.17 U	<1400 U	<1.15 U	71.6 J	<132 UJ	<1260 U	<1.24 U	<260 U	4.56 J
HEXACHLOROBUTADIENE	ug/kg	2000	<1.28 U	<136 U	<1.22 U	<1.17 U	<1400 U	<1.15 U	<142 U	<132 UJ	<1260 U	<1.24 U	<260 U	<2460 U
ISOPROPYLBENZENE	ug/kg	1000000	<1.28 U	<136 U	<1.22 U	<1.17 U	<1400 U	<1.15 U	<142 U	<132 UJ	<1260 U	<1.24 U	<260 U	<2460 U
M,P-XYLENE	ug/kg	1000000	<1.28 U	<136 U	<1.22 U	<1.17 U	<1400 U	<1.15 U	<142 U	<132 UJ	<1260 U	<1.24 U	<260 U	12.3
METHYLENE CHLORIDE	ug/kg	500	36.4	744	3.6 J	9.85	163000	8.91	198 J	<264 UJ	109000	5.64 J	45300	7020
NAPHTHALENE	ug/kg	200000	<1.28 U	<136 U	<1.22 U	<1.17 U	<1400 U	<1.15 U	<142 U	<132 UJ	<1260 U	<1.24 U	<260 UJ	<2460 UJ
N-BUTYLBENZENE	ug/kg	410000	<1.28 U	<136 U	<1.22 U	<1.17 U	<1400 U	<1.15 U	<142 U	<132 UJ	<1260 U	<1.24 U	<260 U	<2460 U
N-PROPYLBENZENE	ug/kg	410000	<1.28 U	<136 U	<1.22 U	<1.17 U	<1400 U	<1.15 U	<142 U	<132 UJ	<1260 U	<1.24 U	<260 U	0.71 J
O-XYLENE	ug/kg	1000000	<1.28 U	<136 U	<1.22 U	<1.17 U	<1400 U	<1.15 U	<142 U	<132 UJ	<1260 U	<1.24 U	<260 U	7.45
P-ISOPROPYLTOLUENE	ug/kg	1000000	<1.28 U	<136 U	<1.22 U	<1.17 U	<1400 U	<1.15 U	<142 U	<132 UJ	<1260 U	<1.24 U	<260 U	<2460 U
SEC-BUTYLBENZENE	ug/kg	410000	<1.28 U	<136 U	<1.22 U	<1.17 U	<1400 U	<1.15 U	<142 U	<132 UJ	<1260 U	<1.24 U	<260 U	<2460 U
STYRENE	ug/kg	10000	<1.28 U	<136 U	<1.22 U	<1.17 U	<1400 U	<1.15 U	<142 U	<132 UJ	3740 J	<1.24 U	<260 U	75.7
TERT-BUTYLBENZENE	ug/kg	410000	<1.28 U	<136 U	<1.22 U	<1.17 U	<1400 U	<1.15 U	<142 U	<132 UJ	<1260 U	<1.24 U	<260 U	<2460 U
TETRACHLOROETHENE	ug/kg	500	<1.28 U	<136 U	<1.22 U	<1.17 U	<1400 U	<1.15 U	<142 U	<132 UJ	<1260 U	<1.24 U	<260 U	11.1
TOLUENE	ug/kg	100000	<1.28 U	<136 U	<1.22 U	<1.17 U	<1400 U	<1.15 U	<142 U	<132 UJ	<1260 U	<1.24 U	<260 U	11.6
TRANS-1,2-DICHLOROETHENE	ug/kg	10000	<1.28 U	<136 U	<1.22 U	<1.17 U	<1400 U	<1.15 U	<142 U	<132 UJ	<1260 U	<1.24 U	<260 U	<2460 U
TRANS-1,3-DICHLOROPROPENE	ug/kg	2900	<1.28 U	<136 U	<1.22 U	<1.17 U	<1400 U	<1.15 U	<142 U	<132 UJ	<1260 U	<1.24 U	<260 U	<2460 U
TRICHLOROETHENE	ug/kg	500	16.4	2400	3.47 J	91.7	32800	42.1	2170	8420 J	170000	0.787 J	4110	5150
TRICHLOROFLUOROMETHANE	ug/kg	3100000	<2.56 U	<272 U	<2.44 U	<2.34 U	<2800 U	<2.3 U	<284 U	<264 UJ	<2520 U	<2.48 U	<520 U	<4920 U
VINYL CHLORIDE	ug/kg	200	<2.56 U	<272 U	<2.44 U	<2.34 U	<2800 U	<2.3 UJ	<284 U	<264 UJ	<2520 U	<2.48 U	<520 U	<4920 U
Percent Solids (D2216-90)														
Solids, Percent	%		75.6	80.5	83.6	80.1	79.7	80.2	81.2	81.9	82.7	81.6	82.4	84.1
Total Organic Carbon (LYDKHN)														
TOTAL ORGANIC CARBON (TOC)	mg/kg		NA	NA	NA	NA	NA	NA	NA	<1000 UJ	752 J	NA	NA	NA

Blue Highlighting Indicates concentrations above the MCL/MSC

Note: Some samples may have been diluted due to the concentration(s) of one or more analytes exceeding the upper limit of the calibration curve.

J - Estimated: The analyte was positively identified, the quantitation is an estimation due to discrepancies in meeting certain analyte-specific quality control criteria.

MCL/MSC - Maximum Contaminant Limit/Medium-Specific Concentrations

mg/kg - milligrams per kilogram

N/A - not analyzed

U - Undetected: The analyte was analyzed for, but not detected.

UJ - The analyte was not detected; however, the result is estimated due to discrepancies in meeting certain analyte-specific quality control criteria.

ug/kg - micrograms per kilogram

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Location ID: **Sample Date:**	**Units**	**MCL/ MSC**	**18CPTACD12 (38-39)030614 6/3/2014**	**18CPTACD12 (6-7)030614 6/3/2014**	**18CPTACD13 (11-12)030614 6/3/2014**	**18CPTACD13 (22-24)030614 6/3/2014**	**18CPTACD13 (3-4)030614 6/3/2014**	**18CPTACD13 (36-37)030614 6/3/2014**	**18CPTACD14 (19.5-20.5)030614 6/3/2014**	**18CPTACD14 (30-31)030614 6/3/2014**	**18CPTACD14 (35.5-36)030614 6/3/2014**	**18CPTACD14 (5-6)030614 6/3/2014**	**18CPTACD15 (13-14)030614 6/3/2014**
Location Description:			ACD Area. MIP verification soil sampling.	ACD Area. MIP verification soil sampling.	ACD Area. MIP verification soil sampling.	ACD Area. MIP verification soil sampling.	ACD Area. MIP verification soil sampling.	ACD Area. MIP verification soil sampling.	ACD Area. MIP verification soil sampling.	ACD Area. MIP verification soil sampling.	ACD Area. MIP verification soil sampling.	ACD Area. MIP verification soil sampling.	ACD Area. MIP verification soil sampling.
Perchlorate (6850)													
PERCHLORATE	ug/kg	7200	110	7.9	1.2 J	94000	<1.3 U	110	49000	59	9.9	2.3	<1.2 U
Volatile Organic Compounds (8260B)													
1,1,1,2-TETRACHLOROETHANE	ug/kg	11000	<130 U	<1.18 U	<131 UJ	<1240 U	<1.34 U	<135 U	<1340 U	<1.19 U	<1.13 U	<1.15 U	<1.1 U
1,1,1-TRICHLOROETHANE	ug/kg	20000	<130 U	<1.18 U	<131 UJ	<1240 U	<1.34 U	<135 U	<1340 U	<1.19 U	<1.13 U	<1.15 U	<1.1 U
1,1,2,2-TETRACHLOROETHANE	ug/kg	1400	<130 UJ	<1.18 U	<131 UJ	<1240 U	<1.34 UJ	<135 U	<1340 U	<1.19 U	<1.13 U	<1.15 U	<1.1 UJ
1,1,2-TRICHLOROETHANE	ug/kg	500	<130 U	<1.18 U	<131 UJ	<1240 U	<1.34 U	<135 U	<1340 U	<1.19 U	<1.13 U	<1.15 U	<1.1 U
1,1-DICHLOROETHANE	ug/kg	1000000	<260 U	<2.36 U	<262 UJ	<2480 U	<2.68 U	<270 U	<2680 U	<2.38 U	<2.26 U	<2.3 U	<2.2 U
1,1-DICHLOROETHENE	ug/kg	700	<130 U	<1.18 U	<131 UJ	<1240 U	<1.34 U	<135 U	<1340 U	<1.19 U	<1.13 U	<1.15 U	<1.1 U
1,1-DICHLOROPROPENE	ug/kg	290	<130 U	<1.18 U	<131 UJ	<1240 U	<1.34 U	<135 U	<1340 U	<1.19 U	<1.13 U	<1.15 U	<1.1 U
1,2,3-TRICHLOROBENZENE	ug/kg	31000	<130 U	<1.18 U	<131 UJ	<1240 U	<1.34 UJ	<135 U	<1340 U	<1.19 U	<1.13 U	<1.15 U	<1.1 UJ
1,2,3-TRICHLOROPROPANE	ug/kg	4.1	<260 UJ	<2.36 U	<262 UJ	<2480 U	<2.68 UJ	<270 U	<2680 U	<2.38 U	<2.26 U	<2.3 U	<2.2 UJ
1,2,4-TRICHLOROBENZENE	ug/kg	7000	<130 U	<1.18 U	<131 UJ	<1240 U	<1.34 U	<135 U	<1340 U	<1.19 U	<1.13 U	<1.15 U	<1.1 U
1,2,4-TRIMETHYLBENZENE	ug/kg	510000	<130 U	0.818 J	<131 UJ	<1240 U	<1.34 U	<135 U	<1340 U	<1.19 U	<1.13 U	<1.15 U	<1.1 U
1,2-DIBROMO-3-CHLOROPROPANE	ug/kg	20	<522 UJ	<4.74 U	<524 UJ	<4940 UJ	<5.34 U	<540 UJ	<5360 UJ	<4.74 U	<4.5 U	<4.62 U	<4.4 U
1,2-DIBROMOETHANE	ug/kg	5	<130 U	<1.18 U	<131 UJ	<1240 U	<1.34 U	<135 U	<1340 U	<1.19 U	<1.13 U	<1.15 U	<1.1 U
1,2-DICHLOROBENZENE	ug/kg	60000	<130 U	<1.18 U	<131 UJ	<1240 U	<1.34 U	<135 U	<1340 U	<1.19 U	<1.13 U	<1.15 U	<1.1 U
1,2-DICHLOROETHANE	ug/kg	500	<130 U	<1.18 U	<131 UJ	<1240 U	<1.34 U	<135 U	<1340 U	<1.19 U	<1.13 U	<1.15 U	<1.1 U
1,2-DICHLOROPROPANE	ug/kg	500	<130 U	<1.18 U	<131 UJ	<1240 U	<1.34 U	<135 U	<1340 U	<1.19 U	<1.13 U	<1.15 U	<1.1 U
1,3,5-TRIMETHYLBENZENE	ug/kg	510000	<130 U	<1.18 U	<131 UJ	<1240 U	<1.34 U	<135 U	<1340 U	<1.19 U	<1.13 U	<1.15 U	<1.1 U
1,3-DICHLOROBENZENE	ug/kg	310000	<130 U	<1.18 U	<131 UJ	<1240 U	<1.34 U	<135 U	<1340 U	<1.19 U	<1.13 U	<1.15 U	<1.1 U
1,3-DICHLOROPROPANE	ug/kg	2900	<130 UJ	<1.18 U	<131 UJ	<1240 U	<1.34 U	<135 U	<1340 U	<1.19 U	<1.13 U	<1.15 U	<1.1 U
1,4-DICHLOROBENZENE	ug/kg	7500	<130 U	<1.18 U	<131 UJ	<1240 U	<1.34 U	<135 U	<1340 U	<1.19 U	<1.13 U	<1.15 U	<1.1 U
2,2-DICHLOROPROPANE	ug/kg	4200	<130 U	<1.18 U	<131 UJ	<1240 U	<1.34 U	<135 U	<1340 U	<1.19 U	<1.13 U	<1.15 U	<1.1 U
2-BUTANONE	ug/kg	6100000	<652 UJ	<5.92 U	<656 UJ	<6180 UJ	<6.68 U	<676 UJ	<6700 UJ	<5.94 U	<5.62 U	<5.78 U	5.75 J
2-CHLOROTOLUENE	ug/kg	200000	<130 U	<1.18 U	<131 UJ	<1240 U	<1.34 U	<135 U	<1340 U	<1.19 U	<1.13 U	<1.15 U	<1.1 U
2-HEXANONE	ug/kg	610000	<652 UJ	<5.92 U	<656 UJ	<6180 UJ	<6.68 U	<676 UJ	<6700 UJ	<5.94 U	<5.62 U	<5.78 U	<5.48 U
4-CHLOROTOLUENE	ug/kg	200000	<130 U	<1.18 U	<131 UJ	<1240 U	<1.34 U	<135 U	<1340 U	<1.19 U	<1.13 U	<1.15 U	<1.1 U
4-METHYL-2-PENTANONE	ug/kg	820000	<652 UJ	<5.92 U	<656 UJ	<6180 UJ	<6.68 U	<676 UJ	<6700 UJ	<5.94 U	<5.62 U	<5.78 U	<5.48 U
ACETONE	ug/kg	920000	<1300 UJ	25.5	<1310 UJ	<12400 U	<13.4 U	<1350 U	<13400 U	13.8 J	10.4 J	<11.5 U	48.2
BENZENE	ug/kg	500	<130 U	<1.18 U	<131 UJ	<1240 U	<1.34 U	<135 U	<1340 U	<1.19 U	<1.13 U	<1.15 U	<1.1 U
BROMOBENZENE	ug/kg	200000	<130 U	<1.18 U	<131 UJ	<1240 U	<1.34 U	<135 U	<1340 U	<1.19 U	<1.13 U	<1.15 U	<1.1 U
BROMOCHLOROMETHANE	ug/kg	410000	<260 U	<2.36 U	<262 UJ	<2480 U	<2.68 U	<270 U	<2680 U	<2.38 U	<2.26 U	<2.3 U	<2.2 U
BROMODICHLOROMETHANE	ug/kg	460	<130 U	<1.18 U	<131 UJ	<1240 U	<1.34 U	<135 U	<1340 U	<1.19 U	<1.13 U	<1.15 U	<1.1 U
BROMOFORM	ug/kg	3600	<130 U	<1.18 U	<131 UJ	<1240 U	<1.34 U	<135 U	<1340 U	<1.19 U	<1.13 U	<1.15 U	<1.1 U
BROMOMETHANE	ug/kg	14000	<260 U	<2.36 U	<262 UJ	<2480 U	<2.68 UJ	<270 U	<2680 U	<2.38 U	<2.26 U	<2.3 U	<2.2 UJ
CARBON DISULFIDE	ug/kg	1000000	<130 U	<1.18 U	<131 UJ	<1240 U	<1.34 U	<135 U	<1340 U	<1.19 U	<1.13 U	<1.15 U	<1.1 U
CARBON TETRACHLORIDE	ug/kg	500	<130 U	<1.18 U	<131 UJ	<1240 U	<1.34 U	<135 U	<1340 U	<1.19 U	<1.13 U	<1.15 U	<1.1 U
CHLOROBENZENE	ug/kg	10000	<130 U	<1.18 U	<131 UJ	<1240 U	<1.34 U	<135 U	<1340 U	<1.19 U	<1.13 U	<1.15 U	<1.1 U
CHLOROETHANE	ug/kg	4100000	<260 U	<2.36 U	<262 UJ	<2480 U	<2.68 U	<270 U	<2680 U	<2.38 U	<2.26 U	<2.3 U	<2.2 U
CHLOROFORM	ug/kg	100000	<130 U	<1.18 U	<131 UJ	<1240 U	<1.34 U	<135 U	<1340 U	<1.19 U	<1.13 U	<1.15 U	<1.1 U
CHLOROMETHANE	ug/kg	22000	<522 U	<4.74 U	<524 UJ	<4940 U	<5.34 U	<540 U	<5360 U	<4.74 U	<4.5 U	<4.62 U	<4.4 U
CIS-1,2-DICHLOROETHENE	ug/kg	7000	138 J	4.45 J	<131 UJ	2270 J	0.758 J	10100	3920 J	1.54 J	7	<1.15 U	<1.1 U
CIS-1,3-DICHLOROPROPENE	ug/kg	530	<130 U	<1.18 U	<131 UJ	<1240 U	<1.34 U	<135 U	<1340 U	<1.19 U	<1.13 U	<1.15 U	<1.1 U
DIBROMOCHLOROMETHANE	ug/kg	3400	<130 U	<1.18 U	<131 UJ	<1240 U	<1.34 U	<135 U	<1340 U	<1.19 U	<1.13 U	<1.15 U	<1.1 U

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Location ID: Sample Date:	Units	MCL/ MSC	18CPTACD12 (38-39)030614 6/3/2014	18CPTACD12 (6-7)030614 6/3/2014	18CPTACD13 (11-12)030614 6/3/2014	18CPTACD13 (22-24)030614 6/3/2014	18CPTACD13 (3-4)030614 6/3/2014	18CPTACD13 (36-37)030614 6/3/2014	18CPTACD14 (19.5-20.5)030614 6/3/2014	18CPTACD14 (30-31)030614 6/3/2014	18CPTACD14 (35.5-36)030614 6/3/2014	18CPTACD14 (5-6)030614 6/3/2014	18CPTACD15 (13-14)030614 6/3/2014
Location Description:			ACD Area. MIP verification soil sampling.	ACD Area. MIP verification soil sampling.	ACD Area. MIP verification soil sampling.	ACD Area. MIP verification soil sampling.	ACD Area. MIP verification soil sampling.	ACD Area. MIP verification soil sampling.	ACD Area. MIP verification soil sampling.	ACD Area. MIP verification soil sampling.	ACD Area. MIP verification soil sampling.	ACD Area. MIP verification soil sampling.	ACD Area. MIP verification soil sampling.
DIBROMOMETHANE	ug/kg	38000	<130 U	<1.18 U	<131 UJ	<1240 U	<1.34 U	<135 U	<1340 U	<1.19 U	<1.13 U	<1.15 U	<1.1 U
DICHLORODIFLUOROMETHANE	ug/kg	2000000	<260 U	<2.36 U	<262 UJ	<2480 U	<2.68 U	<270 U	<2680 U	<2.38 U	<2.26 U	<2.3 U	<2.2 U
ETHYLBENZENE	ug/kg	70000	<130 U	4.95 J	<131 UJ	<1240 U	<1.34 U	<135 U	<1340 U	<1.19 U	<1.13 U	<1.15 U	<1.1 U
HEXACHLOROBUTADIENE	ug/kg	2000	<130 U	<1.18 U	<131 UJ	<1240 U	<1.34 U	<135 U	<1340 U	<1.19 U	<1.13 U	<1.15 U	<1.1 U
ISOPROPYLBENZENE	ug/kg	1000000	<130 U	<1.18 U	<131 UJ	<1240 U	<1.34 U	<135 U	<1340 U	<1.19 U	<1.13 U	<1.15 U	<1.1 U
M,P-XYLENE	ug/kg	1000000	<130 U	0.754 J	<131 UJ	<1240 U	<1.34 U	<135 U	<1340 U	<1.19 U	<1.13 U	<1.15 U	<1.1 U
METHYLENE CHLORIDE	ug/kg	500	4890	4.68 J	<262 UJ	232000	20.8	11000	352000	5.75 J	15.4	3.98 J	6.61
NAPHTHALENE	ug/kg	200000	<130 UJ	<1.18 U	<131 UJ	<1240 U	<1.34 UJ	<135 U	<1340 U	0.607 J	<1.13 U	<1.15 U	<1.1 UJ
N-BUTYLBENZENE	ug/kg	410000	<130 U	<1.18 U	<131 UJ	<1240 U	<1.34 U	<135 U	<1340 U	<1.19 U	<1.13 U	<1.15 U	<1.1 U
N-PROPYLBENZENE	ug/kg	410000	<130 U	<1.18 U	<131 UJ	<1240 U	<1.34 U	<135 U	<1340 U	<1.19 U	<1.13 U	<1.15 U	<1.1 U
O-XYLENE	ug/kg	1000000	<130 U	<1.18 U	<131 UJ	<1240 U	<1.34 U	<135 U	<1340 U	<1.19 U	<1.13 U	<1.15 U	<1.1 U
P-ISOPROPYLTOLUENE	ug/kg	1000000	<130 U	<1.18 U	<131 UJ	<1240 U	<1.34 U	<135 U	<1340 U	<1.19 U	<1.13 U	<1.15 U	<1.1 U
SEC-BUTYLBENZENE	ug/kg	410000	<130 U	<1.18 U	<131 UJ	<1240 U	<1.34 U	<135 U	<1340 U	<1.19 U	<1.13 U	<1.15 U	<1.1 U
STYRENE	ug/kg	10000	<130 U	16.6	<131 UJ	<1240 U	<1.34 U	<135 U	<1340 U	<1.19 U	<1.13 U	<1.15 U	<1.1 U
TERT-BUTYLBENZENE	ug/kg	410000	<130 U	<1.18 U	<131 UJ	<1240 U	<1.34 U	<135 U	<1340 U	<1.19 U	<1.13 U	<1.15 U	<1.1 U
TETRACHLOROETHENE	ug/kg	500	<130 U	<1.18 U	<131 UJ	<1240 U	<1.34 U	<135 U	<1340 U	<1.19 U	<1.13 U	<1.15 U	<1.1 U
TOLUENE	ug/kg	100000	<130 U	<1.18 U	<131 UJ	<1240 U	<1.34 U	<135 U	<1340 U	<1.19 U	<1.13 U	<1.15 U	<1.1 U
TRANS-1,2-DICHLOROETHENE	ug/kg	10000	<130 U	<1.18 U	<131 UJ	<1240 U	<1.34 U	<135 U	<1340 U	<1.19 U	<1.13 U	<1.15 U	<1.1 U
TRANS-1,3-DICHLOROPROPENE	ug/kg	2900	<130 U	<1.18 U	<131 UJ	<1240 U	<1.34 U	<135 U	<1340 U	<1.19 U	<1.13 U	<1.15 U	<1.1 U
TRICHLOROETHENE	ug/kg	500	113 J	27.1	<131 UJ	119000	<1.34 U	23000	62200	3.99 J	23.1	1.78 J	0.648 J
TRICHLOROFLUOROMETHANE	ug/kg	3100000	<260 U	<2.36 U	<262 UJ	<2480 U	<2.68 U	<270 U	<2680 U	<2.38 U	<2.26 U	<2.3 U	<2.2 U
VINYL CHLORIDE	ug/kg	200	<260 U	<2.36 U	<262 UJ	<2480 U	<2.68 U	<270 U	<2680 U	<2.38 U	<2.26 U	<2.3 U	<2.2 U
Percent Solids (D2216-90)													
Solids, Percent	%		83.1	83.7	81.2	81.3	76.3	76.6	80.6	81.2	81.6	86.5	84.5
Total Organic Carbon (LYDKHN)													
TOTAL ORGANIC CARBON (TOC)	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Blue Highlighting Indicates concentrations above the MCL/MSC

Note: Some samples may have been diluted due to the concentration(s) of one or more analytes exceeding the upper limit of the calibration curve.

J - Estimated: The analyte was positively identified, the quantitation is an estimation due to discrepancies in meeting certain analyte-specific quality control criteria.

MCL/MSC - Maximum Contaminant Limit/Medium-Specific Concentrations

mg/kg - milligrams per kilogram

N/A - not analyzed

U - Undetected: The analyte was analyzed for, but not detected.

UJ - The analyte was not detected; however, the result is estimated due to discrepancies in meeting certain analyte-specific quality control criteria.

ug/kg - micrograms per kilogram

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Location ID: Sample Date:	Units	MCL/ MSC	18CPTACD15 (26-28)030614 6/3/2014	18CPTACD15 (34-36)030614 6/3/2014	18CPTACD15 (51-52)030614 6/3/2014	18CPTBB01 (22-23)210514 5/21/2014	18CPTBB01 (37-38)210514 5/21/2014	18CPTBB01 (4.5-5.5)210514 5/21/2014	18CPTBB01 (44-45)210514 5/21/2014	18CPTBB02 (15-16)210514 5/21/2014	18CPTBB02 (31-32)210514 5/21/2014	18CPTBB02 (39-40)210514 5/21/2014	18CPTBB02 (4.5-5.5)210514 5/21/2014
Location Description:			ACD Area. MIP verification soil sampling.	ACD Area. MIP verification soil sampling.	ACD Area. MIP verification soil sampling.	Former Burn Pit 8A-984 soil.	Former Burn Pit 8A-984 soil.	Former Burn Pit 8A-984 soil.	Former Burn Pit 8A-984 soil.	Former Burn Pit 8A-940 soil.	Former Burn Pit 8A-940 soil.	Former Burn Pit 8A-940 soil.	Former Burn Pit 8A-940 soil.
Perchlorate (6850)													
PERCHLORATE	ug/kg	7200	91	220000	130	10400	118	3.96 J	266	957	267	<2.5 U	18700
Volatile Organic Compounds (8260B)													
1,1,1,2-TETRACHLOROETHANE	ug/kg	11000	<1.26 U	<2580 U	<148 U	<131 U	<135 U	<1.16 U	<1.17 UJ	<1.11 UJ	<262 U	<4.62 UJ	<1.11 UJ
1,1,1-TRICHLOROETHANE	ug/kg	20000	<1.26 U	<2580 U	<148 U	<131 U	<135 U	<1.16 U	<1.17 UJ	<1.11 UJ	<262 U	<4.62 UJ	<1.11 UJ
1,1,2,2-TETRACHLOROETHANE	ug/kg	1400	<1.26 U	<2580 U	<148 U	<131 U	<135 U	<1.16 U	<1.17 UJ	<1.11 UJ	<262 U	<4.62 UJ	<1.11 UJ
1,1,2-TRICHLOROETHANE	ug/kg	500	<1.26 U	<2580 U	<148 U	<131 U	<135 U	<1.16 U	<1.17 UJ	<1.11 UJ	<262 U	<4.62 UJ	<1.11 UJ
1,1-DICHLOROETHANE	ug/kg	1000000	<2.52 U	<5160 U	<296 U	<262 U	<270 U	<2.32 U	<2.34 UJ	<2.22 UJ	<522 U	<9.24 UJ	<2.22 UJ
1,1-DICHLOROETHENE	ug/kg	700	<1.26 U	<2580 U	<148 U	<131 U	<135 U	<1.16 U	<1.17 UJ	<1.11 UJ	<262 U	<4.62 UJ	<1.11 UJ
1,1-DICHLOROPROPENE	ug/kg	290	<1.26 U	<2580 U	<148 U	<131 U	<135 U	<1.16 U	<1.17 UJ	<1.11 UJ	<262 U	<4.62 UJ	<1.11 UJ
1,2,3-TRICHLOROBENZENE	ug/kg	31000	<1.26 U	<2580 U	<148 U	<131 U	<135 U	<1.16 U	<1.17 UJ	<1.11 UJ	<262 U	<4.62 UJ	<1.11 UJ
1,2,3-TRICHLOROPROPANE	ug/kg	4.1	<2.52 U	<5160 U	<296 U	<262 U	<270 U	<2.32 U	<2.34 UJ	<2.22 UJ	<522 U	<9.24 UJ	<2.22 UJ
1,2,4-TRICHLOROBENZENE	ug/kg	7000	<1.26 U	<2580 U	<148 U	<131 U	<135 U	<1.16 U	<1.17 UJ	<1.11 UJ	<262 U	<4.62 UJ	<1.11 UJ
1,2,4-TRIMETHYLBENZENE	ug/kg	510000	1.05 J	<2580 U	<148 U	<131 U	<135 U	<1.16 U	<1.17 UJ	<1.11 UJ	255 J	15 J	<1.11 UJ
1,2-DIBROMO-3-CHLOROPROPANE	ug/kg	20	<5.02 U	<10300 UJ	<592 UJ	<522 UJ	<542 UJ	<4.64 U	<4.66 UJ	<4.44 UJ	<1040 UJ	<18.5 UJ	<4.46 UJ
1,2-DIBROMOETHANE	ug/kg	5	<1.26 U	<2580 U	<148 U	<131 U	<135 U	<1.16 U	<1.17 UJ	<1.11 UJ	<262 U	<4.62 UJ	<1.11 UJ
1,2-DICHLOROBENZENE	ug/kg	60000	<1.26 U	<2580 U	<148 U	<131 U	<135 U	<1.16 U	<1.17 UJ	<1.11 UJ	<262 U	<4.62 UJ	<1.11 UJ
1,2-DICHLOROETHANE	ug/kg	500	0.996 J	<2580 U	<148 U	1160	<135 U	<1.16 U	3.54 J	<1.11 UJ	3190	6.37 J	<1.11 UJ
1,2-DICHLOROPROPANE	ug/kg	500	<1.26 U	<2580 U	<148 U	<131 U	<135 U	<1.16 U	<1.17 UJ	<1.11 UJ	<262 U	<4.62 UJ	<1.11 UJ
1,3,5-TRIMETHYLBENZENE	ug/kg	510000	<1.26 U	<2580 U	<148 U	<131 UJ	<135 UJ	<1.16 U	<1.17 UJ	<1.11 UJ	<262 UJ	4.85 J	<1.11 UJ
1,3-DICHLOROBENZENE	ug/kg	310000	<1.26 U	<2580 U	<148 U	<131 U	<135 U	<1.16 U	<1.17 UJ	<1.11 UJ	<262 U	<4.62 UJ	<1.11 UJ
1,3-DICHLOROPROPANE	ug/kg	2900	<1.26 U	<2580 U	<148 U	<131 U	<135 U	<1.16 U	<1.17 UJ	<1.11 UJ	<262 U	<4.62 UJ	<1.11 UJ
1,4-DICHLOROBENZENE	ug/kg	7500	<1.26 U	<2580 U	<148 U	<131 U	<135 U	<1.16 U	<1.17 UJ	<1.11 UJ	<262 U	<4.62 UJ	<1.11 UJ
2,2-DICHLOROPROPANE	ug/kg	4200	<1.26 U	<2580 U	<148 U	<131 U	<135 U	<1.16 U	<1.17 UJ	<1.11 UJ	<262 U	<4.62 UJ	<1.11 UJ
2-BUTANONE	ug/kg	6100000	7.9 J	<12900 UJ	<740 UJ	<652 UJ	<678 UJ	<5.8 U	3.19 J	<5.54 UJ	<1310 UJ	<23 UJ	<5.56 UJ
2-CHLOROTOLUENE	ug/kg	200000	<1.26 U	<2580 U	<148 U	<131 U	<135 U	<1.16 U	<1.17 UJ	<1.11 UJ	<262 U	<4.62 UJ	<1.11 UJ
2-HEXANONE	ug/kg	610000	<6.28 U	<12900 UJ	<740 UJ	<652 UJ	<678 UJ	<5.8 U	<5.82 UJ	<5.54 UJ	<1310 UJ	<23 UJ	<5.56 UJ
4-CHLOROTOLUENE	ug/kg	200000	<1.26 U	<2580 U	<148 U	<131 U	<135 U	<1.16 U	<1.17 UJ	<1.11 UJ	<262 U	<4.62 UJ	<1.11 UJ
4-METHYL-2-PENTANONE	ug/kg	820000	<6.28 U	<12900 UJ	<740 UJ	<652 U	<678 U	<5.8 U	<5.82 UJ	<5.54 UJ	<1310 U	<23 UJ	<5.56 UJ
ACETONE	ug/kg	920000	79.3	<25800 U	<1480 U	<1310 U	<1350 U	6.97 J	58.2 J	13.1 J	<2620 U	24.1 J	<11.1 UJ
BENZENE	ug/kg	500	<1.26 U	<2580 U	<148 U	<131 U	<135 U	<1.16 U	<1.17 UJ	<1.11 UJ	<262 U	<4.62 UJ	<1.11 UJ
BROMOBENZENE	ug/kg	200000	<1.26 U	<2580 U	<148 U	<131 U	<135 U	<1.16 U	<1.17 UJ	<1.11 UJ	<262 U	<4.62 UJ	<1.11 UJ
BROMOCHLOROMETHANE	ug/kg	410000	<2.52 U	<5160 U	<296 U	<262 U	<270 U	<2.32 U	<2.34 UJ	<2.22 UJ	<522 U	<9.24 UJ	<2.22 UJ
BROMODICHLOROMETHANE	ug/kg	460	<1.26 U	<2580 U	<148 U	<131 U	<135 U	<1.16 U	<1.17 UJ	<1.11 UJ	<262 U	<4.62 UJ	<1.11 UJ
BROMOFORM	ug/kg	3600	<1.26 U	<2580 U	<148 U	<131 U	<135 U	<1.16 U	<1.17 UJ	<1.11 UJ	<262 U	<4.62 UJ	<1.11 UJ
BROMOMETHANE	ug/kg	14000	<2.52 U	<5160 U	<296 U	<262 U	<270 U	<2.32 U	<2.34 UJ	<2.22 UJ	<522 U	<9.24 UJ	<2.22 UJ
CARBON DISULFIDE	ug/kg	1000000	<1.26 U	<2580 U	<148 U	<131 U	<135 U	<1.16 U	2.73 J	<1.11 UJ	<262 U	11.3 J	<1.11 UJ
CARBON TETRACHLORIDE	ug/kg	500	<1.26 U	<2580 U	<148 U	<131 U	<135 U	<1.16 U	<1.17 UJ	<1.11 UJ	<262 U	<4.62 UJ	<1.11 UJ
CHLOROBENZENE	ug/kg	10000	<1.26 U	<2580 U	<148 U	<131 U	<135 U	<1.16 U	<1.17 UJ	<1.11 UJ	<262 U	<4.62 UJ	<1.11 UJ
CHLOROETHANE	ug/kg	4100000	<2.52 U	<5160 U	<296 U	<262 U	<270 U	<2.32 U	<2.34 UJ	<2.22 UJ	<522 U	<9.24 UJ	<2.22 UJ
CHLOROFORM	ug/kg	100000	<1.26 U	<2580 U	<148 U	<131 U	<135 U	<1.16 U	<1.17 UJ	<1.11 UJ	<262 U	<4.62 UJ	<1.11 UJ
CHLOROMETHANE	ug/kg	22000	<5.02 U	<10300 U	<592 U	<522 UJ	<542 UJ	<4.64 U	<4.66 UJ	<4.44 UJ	<1040 UJ	<18.5 UJ	<4.46 UJ
CIS-1,2-DICHLOROETHENE	ug/kg	7000	<1.26 U	2230 J	915	<131 U	<135 U	<1.16 U	<1.17 UJ	<1.11 UJ	<262 U	<4.62 UJ	<1.11 UJ
CIS-1,3-DICHLOROPROPENE	ug/kg	530	<1.26 U	<2580 U	<148 U	<131 U	<135 U	<1.16 U	<1.17 UJ	<1.11 UJ	<262 U	<4.62 UJ	<1.11 UJ
DIBROMOCHLOROMETHANE	ug/kg	3400	<1.26 U	<2580 U	<148 U	<131 U	<135 U	<1.16 U	<1.17 UJ	<1.11 UJ	<262 U	<4.62 UJ	<1.11 UJ

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Location ID: **Sample Date:**	**Units**	**MCL/ MSC**	**18CPTACD15 (26-28)030614 6/3/2014**	**18CPTACD15 (34-36)030614 6/3/2014**	**18CPTACD15 (51-52)030614 6/3/2014**	**18CPTBB01 (22-23)210514 5/21/2014**	**18CPTBB01 (37-38)210514 5/21/2014**	**18CPTBB01 (4.5-5.5)210514 5/21/2014**	**18CPTBB01 (44-45)210514 5/21/2014**	**18CPTBB02 (15-16)210514 5/21/2014**	**18CPTBB02 (31-32)210514 5/21/2014**	**18CPTBB02 (39-40)210514 5/21/2014**	**18CPTBB02 (4.5-5.5)210514 5/21/2014**
Location Description:			ACD Area. MIP verification soil sampling.	ACD Area. MIP verification soil sampling.	ACD Area. MIP verification soil sampling.	Former Burn Pit 8A-984 soil.	Former Burn Pit 8A-984 soil.	Former Burn Pit 8A-984 soil.	Former Burn Pit 8A-984 soil.	Former Burn Pit 8A-940 soil.	Former Burn Pit 8A-940 soil.	Former Burn Pit 8A-940 soil.	Former Burn Pit 8A-940 soil.
DIBROMOMETHANE	ug/kg	38000	<1.26 U	<2580 U	<148 U	<131 U	<135 U	<1.16 U	<1.17 UJ	<1.11 UJ	<262 U	<4.62 UJ	<1.11 UJ
DICHLORODIFLUOROMETHANE	ug/kg	2000000	<2.52 U	<5160 U	<296 U	<262 U	<270 U	<2.32 U	<2.34 UJ	<2.22 UJ	<522 U	<9.24 UJ	<2.22 UJ
ETHYLBENZENE	ug/kg	70000	1.74 J	<2580 U	<148 U	<131 U	<135 U	<1.16 U	<1.17 UJ	<1.11 UJ	<262 U	<4.62 UJ	<1.11 UJ
HEXACHLOROBUTADIENE	ug/kg	2000	<1.26 U	<2580 U	<148 U	<131 U	<135 U	<1.16 U	<1.17 UJ	<1.11 UJ	<262 U	<4.62 UJ	<1.11 UJ
ISOPROPYLBENZENE	ug/kg	1000000	<1.26 U	<2580 U	<148 U	<131 U	<135 U	<1.16 U	<1.17 UJ	<1.11 UJ	<262 U	<4.62 UJ	<1.11 UJ
M,P-XYLENE	ug/kg	1000000	1.84 J	<2580 U	<148 U	<131 U	<135 U	<1.16 U	<1.17 UJ	<1.11 UJ	<262 U	4.9 J	<1.11 UJ
METHYLENE CHLORIDE	ug/kg	500	75	567000	1020	16300	165 J	2.47 J	13.8 J	<2.22 UJ	36100	15.1 J	2.83 J
NAPHTHALENE	ug/kg	200000	2.28 J	<2580 U	<148 U	<131 UJ	<135 UJ	<1.16 U	<1.17 UJ	<1.11 UJ	<262 UJ	17.1 J	<1.11 UJ
N-BUTYLBENZENE	ug/kg	410000	<1.26 U	<2580 U	<148 U	<131 U	<135 U	<1.16 U	<1.17 UJ	<1.11 UJ	<262 U	<4.62 UJ	<1.11 UJ
N-PROPYLBENZENE	ug/kg	410000	<1.26 U	<2580 U	<148 U	<131 U	<135 U	<1.16 U	<1.17 UJ	<1.11 UJ	<262 U	<4.62 UJ	<1.11 UJ
O-XYLENE	ug/kg	1000000	0.732 J	<2580 U	<148 U	<131 U	<135 U	<1.16 U	<1.17 UJ	<1.11 UJ	<262 U	2.63 J	<1.11 UJ
P-ISOPROPYLTOLUENE	ug/kg	1000000	0.734 J	<2580 U	<148 U	<131 U	<135 U	<1.16 U	<1.17 UJ	<1.11 UJ	<262 U	<4.62 UJ	<1.11 UJ
SEC-BUTYLBENZENE	ug/kg	410000	<1.26 U	<2580 U	<148 U	<131 U	<135 U	<1.16 U	<1.17 UJ	<1.11 UJ	<262 U	<4.62 UJ	<1.11 UJ
STYRENE	ug/kg	10000	<1.26 U	<2580 U	<148 U	<131 U	<135 U	<1.16 U	<1.17 UJ	<1.11 UJ	<262 U	<4.62 UJ	<1.11 UJ
TERT-BUTYLBENZENE	ug/kg	410000	<1.26 U	<2580 U	<148 U	<131 U	<135 U	<1.16 U	<1.17 UJ	<1.11 UJ	<262 U	<4.62 UJ	<1.11 UJ
TETRACHLOROETHENE	ug/kg	500	<1.26 U	<2580 U	<148 U	<131 U	<135 U	<1.16 U	<1.17 UJ	<1.11 UJ	<262 U	<4.62 UJ	<1.11 UJ
TOLUENE	ug/kg	100000	<1.26 U	<2580 U	<148 U	<131 U	<135 U	<1.16 U	1.1 J	<1.11 UJ	941 J	38 J	<1.11 UJ
TRANS-1,2-DICHLOROETHENE	ug/kg	10000	<1.26 U	<2580 U	<148 U	<131 U	<135 U	<1.16 U	<1.17 UJ	<1.11 UJ	<262 U	<4.62 UJ	<1.11 UJ
TRANS-1,3-DICHLOROPROPENE	ug/kg	2900	<1.26 U	<2580 U	<148 U	<131 U	<135 U	<1.16 U	<1.17 UJ	<1.11 UJ	<262 U	<4.62 UJ	<1.11 UJ
TRICHLOROETHENE	ug/kg	500	2.59 J	49700	4160	2300	5870	1.2 J	322 J	<1.11 UJ	67500	1300 J	1.59 J
TRICHLOROFLUOROMETHANE	ug/kg	3100000	<2.52 U	<5160 U	<296 U	<262 U	<270 U	<2.32 U	<2.34 UJ	<2.22 UJ	<522 U	<9.24 UJ	<2.22 UJ
VINYL CHLORIDE	ug/kg	200	<2.52 U	<5160 U	<296 U	<262 U	<270 U	<2.32 U	<2.34 UJ	<2.22 UJ	<522 U	<9.24 UJ	<2.22 UJ
Percent Solids (D2216-90)													
Solids, Percent	%		80	80.9	78.7	78.2	78.3	83.5	78.9	83.7	81.3	80.2	86.5
Total Organic Carbon (LYDKHN)													
TOTAL ORGANIC CARBON (TOC)	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Blue Highlighting Indicates concentrations above the MCL/MSC

Note: Some samples may have been diluted due to the concentration(s) of one or more analytes exceeding the upper limit of the calibration curve.

J - Estimated: The analyte was positively identified, the quantitation is an estimation due to discrepancies in meeting certain analyte-specific quality control criteria.

MCL/MSC - Maximum Contaminant Limit/Medium-Specific Concentrations

mg/kg - milligrams per kilogram

N/A - not analyzed

U - Undetected: The analyte was analyzed for, but not detected.

UJ - The analyte was not detected; however, the result is estimated due to discrepancies in meeting certain analyte-specific quality control criteria.

ug/kg - micrograms per kilogram

LHAAP-18/24 PSI Work Plan Field Work
May/June 2014

Location ID: **Sample Date:**	**Units**	**MCL/ MSC**	**18CPTBB02 (47-48)210514 5/21/2014**	**18CPTPB01 (1.5-2.5)300514 5/30/2014**	**18CPTPB01 (15-16)300514 5/30/2014**	**18CPTPB01 (18-19)300514 5/30/2014**	**18CPTPB01 (5-6)300514 5/30/2014**	**18CPTPB02 (06-07)190514 5/19/2014**	**18CPTPB02 (16-17)190514 5/19/2014**	**18CPTPB02 (11-12)190514 5/19/2014**	**18CPTPB02 (22-23)190514 5/19/2014**	**18CPTPB03 (09-10)190514 5/19/2014**	**18CPTPB03 (11.5-12.5)190514 5/19/2014**
Location Description:			Former Burn Pit 8A-940 soil.	UEP Area vadose zone MIP verification soil sample.	UEP Area vadose zone MIP verification soil sample.	UEP Area vadose zone MIP verification soil sample.	UEP Area vadose zone MIP verification soil sample.	UEP Area vadose zone MIP verification soil sample.	UEP Area vadose zone MIP verification soil sample.	UEP Area vadose zone MIP verification soil sample.	UEP Area vadose zone MIP verification soil sample.	UEP Area vadose zone MIP verification soil sample.	UEP Area vadose zone MIP verification soil sample.
Perchlorate (6850)													
PERCHLORATE	ug/kg	7200	20.6	<1.4 U	1.6	97	32	<2.16 U	40.7	1.14 J	41.7	<2.06 U	<2.16 U
Volatile Organic Compounds (8260B)													
1,1,1,2-TETRACHLOROETHANE	ug/kg	11000	<1.26 UJ	<1.2 U	<1.32 U	<1.21 U	<1.23 U	<1.02 UJ	<1.11 U	<1.03 U	<1.04 U	<1.06 U	<1.07 U
1,1,1-TRICHLOROETHANE	ug/kg	20000	<1.26 UJ	<1.2 U	<1.32 U	<1.21 U	<1.23 U	<1.02 U	<1.11 U	<1.03 U	<1.04 U	<1.06 U	<1.07 U
1,1,2,2-TETRACHLOROETHANE	ug/kg	1400	<1.26 UJ	<1.2 U	<1.32 U	<1.21 U	<1.23 U	<1.02 U	<1.11 U	<1.03 UJ	<1.04 UJ	<1.06 UJ	<1.07 UJ
1,1,2-TRICHLOROETHANE	ug/kg	500	<1.26 UJ	<1.2 U	<1.32 U	<1.21 U	<1.23 U	<1.02 UJ	<1.11 UJ	<1.03 UJ	<1.04 UJ	<1.06 UJ	<1.07 UJ
1,1-DICHLOROETHANE	ug/kg	1000000	<2.52 UJ	<2.4 U	<2.64 U	<2.42 U	<2.46 U	<2.04 U	<2.22 U	<2.06 U	<2.08 U	<2.12 U	<2.14 U
1,1-DICHLOROETHENE	ug/kg	700	<1.26 UJ	<1.2 U	<1.32 U	<1.21 U	<1.23 U	<1.02 UJ	<1.11 U	<1.03 U	<1.04 U	<1.06 U	<1.07 U
1,1-DICHLOROPROPENE	ug/kg	290	<1.26 UJ	<1.2 U	<1.32 U	<1.21 U	<1.23 U	<1.02 UJ	<1.11 U	<1.03 U	<1.04 U	<1.06 U	<1.07 U
1,2,3-TRICHLOROBENZENE	ug/kg	31000	<1.26 UJ	<1.2 U	<1.32 U	<1.21 U	<1.23 U	<1.02 U	<1.11 U	<1.03 U	<1.04 U	<1.06 U	<1.07 U
1,2,3-TRICHLOROPROPANE	ug/kg	4.1	<2.52 UJ	<2.4 U	<2.64 U	<2.42 U	<2.46 U	<2.04 UJ	<2.22 UJ	<2.06 UJ	<2.08 UJ	<2.12 UJ	<2.14 UJ
1,2,4-TRICHLOROBENZENE	ug/kg	7000	<1.26 UJ	<1.2 U	<1.32 U	<1.21 U	<1.23 U	<1.02 UJ	<1.11 U	<1.03 U	<1.04 U	<1.06 U	<1.07 U
1,2,4-TRIMETHYLBENZENE	ug/kg	510000	0.92 J	<1.2 U	<1.32 U	<1.21 U	<1.23 U	<1.02 U	<1.11 U	<1.03 U	<1.04 U	0.772 J	<1.07 U
1,2-DIBROMO-3-CHLOROPROPANE	ug/kg	20	<5.04 UJ	<4.82 U	<5.28 U	<4.86 U	<4.92 U	<4.08 U	<4.44 U	<4.14 U	<4.16 U	<4.22 U	<4.3 U
1,2-DIBROMOETHANE	ug/kg	5	<1.26 UJ	<1.2 U	<1.32 U	<1.21 U	<1.23 U	<1.02 UJ	<1.11 U	<1.03 U	<1.04 U	<1.06 U	<1.07 U
1,2-DICHLOROBENZENE	ug/kg	60000	<1.26 UJ	<1.2 U	<1.32 U	<1.21 U	<1.23 U	<1.02 UJ	<1.11 U	<1.03 U	<1.04 U	<1.06 U	<1.07 U
1,2-DICHLOROETHANE	ug/kg	500	1.95 J	<1.2 U	<1.32 U	<1.21 U	<1.23 U	<1.02 U	<1.11 U	<1.03 U	<1.04 U	<1.06 U	<1.07 U
1,2-DICHLOROPROPANE	ug/kg	500	<1.26 UJ	<1.2 U	<1.32 U	<1.21 U	<1.23 U	<1.02 UJ	<1.11 U	<1.03 U	<1.04 U	<1.06 U	<1.07 U
1,3,5-TRIMETHYLBENZENE	ug/kg	510000	<1.26 UJ	<1.2 U	<1.32 U	<1.21 U	<1.23 U	<1.02 U	<1.11 U	<1.03 U	<1.04 U	0.605 J	<1.07 U
1,3-DICHLOROBENZENE	ug/kg	310000	<1.26 UJ	<1.2 U	<1.32 U	<1.21 U	<1.23 U	<1.02 UJ	<1.11 U	<1.03 U	<1.04 U	<1.06 U	1.06 J
1,3-DICHLOROPROPANE	ug/kg	2900	<1.26 UJ	<1.2 U	<1.32 U	<1.21 U	<1.23 U	<1.02 UJ	<1.11 UJ	<1.03 UJ	<1.04 UJ	<1.06 UJ	<1.07 UJ
1,4-DICHLOROBENZENE	ug/kg	7500	<1.26 UJ	<1.2 U	<1.32 U	<1.21 U	<1.23 U	<1.02 U	<1.11 U	<1.03 U	<1.04 U	<1.06 U	<1.07 U
2,2-DICHLOROPROPANE	ug/kg	4200	<1.26 UJ	<1.2 U	<1.32 U	<1.21 U	<1.23 U	<1.02 UJ	<1.11 UJ	<1.03 UJ	<1.04 UJ	<1.06 UJ	<1.07 UJ
2-BUTANONE	ug/kg	6100000	3.57 J	<6.02 U	<6.6 U	<6.08 U	<6.16 U	<5.1 U	<5.54 UJ	<5.18 UJ	<5.2 UJ	<5.28 UJ	<5.38 UJ
2-CHLOROTOLUENE	ug/kg	200000	<1.26 UJ	<1.2 U	<1.32 U	<1.21 U	<1.23 U	<1.02 UJ	<1.11 U	<1.03 U	<1.04 U	<1.06 U	<1.07 U
2-HEXANONE	ug/kg	610000	<6.28 UJ	<6.02 U	<6.6 U	<6.08 U	<6.16 U	<5.1 U	<5.54 U	<5.18 U	<5.2 U	<5.28 U	<5.38 U
4-CHLOROTOLUENE	ug/kg	200000	<1.26 UJ	<1.2 U	<1.32 U	<1.21 U	<1.23 U	<1.02 UJ	<1.11 UJ	<1.03 UJ	<1.04 UJ	<1.06 UJ	<1.07 UJ
4-METHYL-2-PENTANONE	ug/kg	820000	<6.28 UJ	<6.02 U	<6.6 U	<6.08 U	<6.16 U	<5.1 U	<5.54 U	<5.18 U	<5.2 U	<5.28 U	<5.38 U
ACETONE	ug/kg	920000	49.2 J	<12 U	<13.2 U	<12.1 U	<12.3 U	<10.2 UJ	<11.1 UJ	<10.3 UJ	<10.4 UJ	<10.6 UJ	<10.7 UJ
BENZENE	ug/kg	500	<1.26 UJ	<1.2 U	<1.32 U	<1.21 U	<1.23 U	<1.02 U	<1.11 U	<1.03 U	<1.04 U	<1.06 U	<1.07 U
BROMOBENZENE	ug/kg	200000	<1.26 UJ	<1.2 U	<1.32 U	<1.21 U	<1.23 U	<1.02 U	<1.11 U	<1.03 U	<1.04 U	<1.06 U	<1.07 U
BROMOCHLOROMETHANE	ug/kg	410000	<2.52 UJ	<2.4 U	<2.64 U	<2.42 U	<2.46 U	<2.04 U	<2.22 U	<2.06 U	<2.08 U	<2.12 U	<2.14 U
BROMODICHLOROMETHANE	ug/kg	460	<1.26 UJ	<1.2 U	<1.32 U	<1.21 U	<1.23 U	<1.02 U	<1.11 U	<1.03 U	<1.04 U	<1.06 U	<1.07 U
BROMOFORM	ug/kg	3600	<1.26 UJ	<1.2 U	<1.32 U	<1.21 U	<1.23 U	<1.02 U	<1.11 U	<1.03 U	<1.04 U	<1.06 U	<1.07 U
BROMOMETHANE	ug/kg	14000	<2.52 UJ	<2.4 U	<2.64 U	<2.42 U	<2.46 U	<2.04 U	<2.22 U	<2.06 U	<2.08 U	<2.12 U	<2.14 U
CARBON DISULFIDE	ug/kg	1000000	56.2 J	<1.2 U	<1.32 U	<1.21 U	<1.23 U	<1.02 UJ	<1.11 U	<1.03 U	<1.04 U	0.954 J	2.09 J
CARBON TETRACHLORIDE	ug/kg	500	<1.26 UJ	<1.2 U	<1.32 U	<1.21 U	<1.23 U	<1.02 U	<1.11 U	<1.03 U	<1.04 U	<1.06 U	<1.07 U
CHLOROBENZENE	ug/kg	10000	<1.26 UJ	<1.2 U	<1.32 U	<1.21 U	<1.23 U	<1.02 UJ	<1.11 U	<1.03 U	<1.04 U	<1.06 U	<1.07 U
CHLOROETHANE	ug/kg	4100000	<2.52 UJ	<2.4 U	<2.64 U	<2.42 U	<2.46 U	<2.04 U	<2.22 UJ	<2.06 UJ	<2.08 UJ	<2.12 UJ	<2.14 UJ
CHLOROFORM	ug/kg	100000	0.707 J	<1.2 U	<1.32 U	<1.21 U	<1.23 U	<1.02 U	<1.11 U	<1.03 U	<1.04 U	<1.06 U	<1.07 U
CHLOROMETHANE	ug/kg	22000	<5.04 UJ	<4.82 U	<5.28 U	<4.86 U	<4.92 U	<4.08 U	<4.44 U	<4.14 U	<4.16 U	<4.22 U	<4.3 U
CIS-1,2-DICHLOROETHENE	ug/kg	7000	<1.26 UJ	<1.2 U	<1.32 U	<1.21 U	<1.23 U	<1.02 U	<1.11 U	<1.03 U	<1.04 U	1.89 J	<1.07 U
CIS-1,3-DICHLOROPROPENE	ug/kg	530	<1.26 UJ	<1.2 U	<1.32 U	<1.21 U	<1.23 U	<1.02 U	<1.11 U	<1.03 U	<1.04 U	<1.06 U	<1.07 U
DIBROMOCHLOROMETHANE	ug/kg	3400	<1.26 UJ	<1.2 U	<1.32 U	<1.21 U	<1.23 U	<1.02 U	<1.11 U	<1.03 U	<1.04 U	<1.06 U	<1.07 U

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May/June 2014

Location ID: **Sample Date:**	**Units**	**MCL/ MSC**	**18CPTBB02 (47-48)210514** **5/21/2014**	**18CPTPB01 (1.5-2.5)300514** **5/30/2014**	**18CPTPB01 (15-16)300514** **5/30/2014**	**18CPTPB01 (18-19)300514** **5/30/2014**	**18CPTPB01 (5-6)300514** **5/30/2014**	**18CPTPB02 (06-07)190514** **5/19/2014**	**18CPTPB02 (16-17)190514** **5/19/2014**	**18CPTPB02 (11-12)190514** **5/19/2014**	**18CPTPB02 (22-23)190514** **5/19/2014**	**18CPTPB03 (09-10)190514** **5/19/2014**	**18CPTPB03 (11.5-12.5)190514** **5/19/2014**
Location Description:			Former Burn Pit 8A-940 soil.	UEP Area vadose zone MIP verification soil sample.	UEP Area vadose zone MIP verification soil sample.	UEP Area vadose zone MIP verification soil sample.	UEP Area vadose zone MIP verification soil sample.	UEP Area vadose zone MIP verification soil sample.	UEP Area vadose zone MIP verification soil sample.	UEP Area vadose zone MIP verification soil sample.	UEP Area vadose zone MIP verification soil sample.	UEP Area vadose zone MIP verification soil sample.	UEP Area vadose zone MIP verification soil sample.
DIBROMOMETHANE	ug/kg	38000	<1.26 UJ	<1.2 U	<1.32 U	<1.21 U	<1.23 U	<1.02 U	<1.11 U	<1.03 U	<1.04 U	<1.06 U	<1.07 U
DICHLORODIFLUOROMETHANE	ug/kg	2000000	<2.52 UJ	<2.4 U	<2.64 U	<2.42 U	<2.46 U	<2.04 U	<2.22 U	<2.06 U	<2.08 U	<2.12 U	<2.14 U
ETHYLBENZENE	ug/kg	70000	<1.26 UJ	<1.2 U	<1.32 U	<1.21 U	<1.23 U	<1.02 U	<1.11 U	<1.03 U	<1.04 U	<1.06 U	<1.07 U
HEXACHLOROBUTADIENE	ug/kg	2000	<1.26 UJ	<1.2 U	<1.32 U	<1.21 U	<1.23 U	<1.02 U	<1.11 U	<1.03 U	<1.04 U	<1.06 U	<1.07 U
ISOPROPYLBENZENE	ug/kg	1000000	<1.26 UJ	<1.2 U	<1.32 U	<1.21 U	<1.23 U	<1.02 U	<1.11 U	<1.03 U	<1.04 U	<1.06 U	<1.07 U
M,P-XYLENE	ug/kg	1000000	1.4 J	<1.2 U	<1.32 U	<1.21 U	<1.23 U	<1.02 U	<1.11 U	<1.03 U	<1.04 U	0.602 J	<1.07 U
METHYLENE CHLORIDE	ug/kg	500	5.91 J	6.66	9.22	5.36 J	8.22	2.43 J	2.95 J	<2.06 U	1.24 J	2.84 J	<2.14 U
NAPHTHALENE	ug/kg	200000	<1.26 UJ	<1.2 U	<1.32 UJ	<1.21 UJ	<1.23 UJ	<1.02 U	<1.11 U	<1.03 U	<1.04 U	<1.06 U	<1.07 U
N-BUTYLBENZENE	ug/kg	410000	<1.26 UJ	<1.2 U	<1.32 U	<1.21 U	<1.23 U	<1.02 UJ	<1.11 U	<1.03 U	<1.04 U	<1.06 U	<1.07 U
N-PROPYLBENZENE	ug/kg	410000	<1.26 UJ	<1.2 U	<1.32 U	<1.21 U	<1.23 U	<1.02 U	<1.11 U	<1.03 U	<1.04 U	<1.06 U	<1.07 U
O-XYLENE	ug/kg	1000000	<1.26 UJ	<1.2 U	<1.32 U	<1.21 U	<1.23 U	<1.02 U	<1.11 U	<1.03 U	<1.04 U	0.541 J	<1.07 U
P-ISOPROPYLTOLUENE	ug/kg	1000000	<1.26 UJ	<1.2 U	<1.32 U	<1.21 U	<1.23 U	<1.02 UJ	<1.11 UJ	<1.03 UJ	<1.04 UJ	<1.06 UJ	<1.07 UJ
SEC-BUTYLBENZENE	ug/kg	410000	<1.26 UJ	<1.2 U	<1.32 U	<1.21 U	<1.23 U	<1.02 U	<1.11 U	<1.03 U	<1.04 U	<1.06 U	<1.07 U
STYRENE	ug/kg	10000	<1.26 UJ	<1.2 U	<1.32 U	<1.21 U	<1.23 U	<1.02 U	<1.11 U	<1.03 U	<1.04 U	<1.06 U	<1.07 U
TERT-BUTYLBENZENE	ug/kg	410000	<1.26 UJ	<1.2 U	<1.32 U	<1.21 U	<1.23 U	<1.02 UJ	<1.11 UJ	<1.03 UJ	<1.04 UJ	<1.06 UJ	<1.07 UJ
TETRACHLOROETHENE	ug/kg	500	<1.26 UJ	<1.2 U	<1.32 U	<1.21 U	<1.23 U	<1.02 U	<1.11 U	<1.03 U	<1.04 U	<1.06 U	<1.07 U
TOLUENE	ug/kg	100000	3.35 J	<1.2 U	<1.32 U	<1.21 U	<1.23 U	<1.02 UJ	<1.11 U	<1.03 U	<1.04 U	1.89 J	<1.07 U
TRANS-1,2-DICHLOROETHENE	ug/kg	10000	<1.26 UJ	<1.2 U	<1.32 U	<1.21 U	<1.23 U	<1.02 UJ	<1.11 U	<1.03 U	<1.04 U	<1.06 U	<1.07 U
TRANS-1,3-DICHLOROPROPENE	ug/kg	2900	<1.26 UJ	<1.2 U	<1.32 U	<1.21 U	<1.23 U	<1.02 UJ	<1.11 UJ	<1.03 UJ	<1.04 UJ	<1.06 UJ	<1.07 UJ
TRICHLOROETHENE	ug/kg	500	122 J	1.13 J	1.11 J	1.13 J	1.2 J	<1.02 U	<1.11 U	<1.03 U	<1.04 U	1.18 J	<1.07 U
TRICHLOROFLUOROMETHANE	ug/kg	3100000	<2.52 UJ	<2.4 U	<2.64 U	<2.42 U	<2.46 U	<2.04 UJ	<2.22 U	<2.06 U	<2.08 U	<2.12 U	<2.14 U
VINYL CHLORIDE	ug/kg	200	<2.52 UJ	<2.4 U	<2.64 U	<2.42 U	<2.46 U	<2.04 U	<2.22 U	<2.06 U	<2.08 U	<2.12 U	<2.14 U
Percent Solids (D2216-90)													
Solids, Percent	%		78.6	79.9	75.6	77.5	78.3	91.5	84.9	95.3	88	94.3	91.2
Total Organic Carbon (LYDKHN)													
TOTAL ORGANIC CARBON (TOC)	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Blue Highlighting Indicates concentrations above the MCL/MSC

Note: Some samples may have been diluted due to the concentration(s) of one or more analytes exceeding the upper limit of the calibration curve.

J - Estimated: The analyte was positively identified, the quantitation is an estimation due to discrepancies in meeting certain analyte-specific quality control criteria.

MCL/MSC - Maximum Contaminant Limit/Medium-Specific Concentrations

mg/kg - milligrams per kilogram

N/A - not analyzed

U - Undetected: The analyte was analyzed for, but not detected.

UJ - The analyte was not detected; however, the result is estimated due to discrepancies in meeting certain analyte-specific quality control criteria.

ug/kg - micrograms per kilogram

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May/June 2014

Location ID: Sample Date:	Units	MCL/ MSC	18CPTPB03 (19-20)190514 5/19/2014	18CPTPB03 (25-25.5)190514 5/19/2014	18CPTPB04 (13-14)190514 5/19/2014	18CPTPB04 (19-20)190514 5/19/2014	18CPTPB05 (07-08)200514 5/20/2014	18CPTPB05 (12-12.5)200514 5/20/2014	18CPTPB05 (4.5-05)200514 5/20/2014	18CPTPB06 (03-04)200514 5/20/2014	18CPTPB06 (14.5-15.5)200514 5/20/2014	18CPTPB06 (19-20)200514 5/20/2014	18CPTPB07 (03-04)200514 5/20/2014
Location Description:			UEP Area vadose zone MIP verification soil sample.	UEP Area vadose zone MIP verification soil sample.	UEP Area vadose zone MIP verification soil sample.	UEP Area vadose zone MIP verification soil sample.	UEP Area vadose zone MIP verification soil sample.	UEP Area vadose zone MIP verification soil sample.	UEP Area vadose zone MIP verification soil sample.	UEP Area vadose zone MIP verification soil sample.	UEP Area vadose zone MIP verification soil sample.	UEP Area vadose zone MIP verification soil sample.	UEP Area vadose zone MIP verification soil sample.
Perchlorate (6850)													
PERCHLORATE	ug/kg	7200	<2.18 U	<2.28 U	<2.1 U	<2.08 U	<2.12 U	<2.14 U	<2.18 U	<2.14 U	<2.12 U	<2.22 U	<2.26 U
Volatile Organic Compounds (8260B)													
1,1,1,2-TETRACHLOROETHANE	ug/kg	11000	<1.1 UJ	<1.11 UJ	<1.12 U	<1.11 U	<1.13 U	<0.986 U	<1.15 U	<1.1 U	<1.11 U	<1.04 U	<1.24 U
1,1,1-TRICHLOROETHANE	ug/kg	20000	<1.1 UJ	<1.11 U	<1.12 U	<1.11 U	<1.13 U	<0.986 U	<1.15 U	<1.1 U	<1.11 U	<1.04 U	<1.24 U
1,1,2,2-TETRACHLOROETHANE	ug/kg	1400	<1.1 U	<1.11 U	<1.12 U	<1.11 U	<1.13 U	<0.986 U	<1.15 U	<1.1 U	<1.11 U	<1.04 U	<1.24 U
1,1,2-TRICHLOROETHANE	ug/kg	500	<1.1 U	<1.11 UJ	<1.12 U	<1.11 U	<1.13 U	<0.986 U	<1.15 U	<1.1 U	<1.11 U	<1.04 U	<1.24 U
1,1-DICHLOROETHANE	ug/kg	1000000	<2.2 U	<2.22 U	<2.24 U	<2.22 U	<2.26 U	<1.97 U	<2.3 U	<2.2 U	<2.22 U	<2.08 U	<2.48 U
1,1-DICHLOROETHENE	ug/kg	700	<1.1 UJ	<1.11 UJ	<1.12 U	<1.11 U	<1.13 U	<0.986 U	<1.15 U	<1.1 U	<1.11 U	<1.04 U	<1.24 U
1,1-DICHLOROPROPENE	ug/kg	290	<1.1 UJ	<1.11 UJ	<1.12 U	<1.11 U	<1.13 U	<0.986 U	<1.15 U	<1.1 U	<1.11 U	<1.04 U	<1.24 U
1,2,3-TRICHLOROBENZENE	ug/kg	31000	<1.1 U	<1.11 U	<1.12 U	<1.11 U	<1.13 U	<0.986 U	<1.15 U	<1.1 U	<1.11 U	<1.04 U	<1.24 U
1,2,3-TRICHLOROPROPANE	ug/kg	4.1	<2.2 U	<2.22 UJ	<2.24 U	<2.22 U	<2.26 U	<1.97 U	<2.3 U	<2.2 U	<2.22 U	<2.08 U	<2.48 U
1,2,4-TRICHLOROBENZENE	ug/kg	7000	<1.1 UJ	<1.11 UJ	<1.12 U	<1.11 U	<1.13 U	<0.986 U	<1.15 U	<1.1 U	<1.11 U	<1.04 U	<1.24 U
1,2,4-TRIMETHYLBENZENE	ug/kg	510000	<1.1 U	<1.11 U	<1.12 U	<1.11 U	<1.13 U	<0.986 U	<1.15 U	<1.1 U	<1.11 U	<1.04 U	<1.24 U
1,2-DIBROMO-3-CHLOROPROPANE	ug/kg	20	<4.4 U	<4.44 U	<4.48 U	<4.42 U	<4.52 U	<3.94 U	<4.6 U	<4.38 U	<4.44 U	<4.16 U	<4.96 U
1,2-DIBROMOETHANE	ug/kg	5	<1.1 UJ	<1.11 UJ	<1.12 U	<1.11 U	<1.13 U	<0.986 U	<1.15 U	<1.1 U	<1.11 U	<1.04 U	<1.24 U
1,2-DICHLOROBENZENE	ug/kg	60000	<1.1 UJ	<1.11 UJ	<1.12 U	<1.11 U	<1.13 U	<0.986 U	<1.15 U	<1.1 U	<1.11 U	<1.04 U	<1.24 U
1,2-DICHLOROETHANE	ug/kg	500	<1.1 U	<1.11 U	<1.12 U	<1.11 U	<1.13 U	<0.986 U	<1.15 U	<1.1 U	<1.11 U	<1.04 U	<1.24 U
1,2-DICHLOROPROPANE	ug/kg	500	<1.1 UJ	<1.11 UJ	<1.12 U	<1.11 U	<1.13 U	<0.986 U	<1.15 U	<1.1 U	<1.11 U	<1.04 U	<1.24 U
1,3,5-TRIMETHYLBENZENE	ug/kg	510000	<1.1 U	<1.11 U	<1.12 U	<1.11 U	<1.13 U	<0.986 U	<1.15 U	<1.1 U	<1.11 U	<1.04 U	<1.24 U
1,3-DICHLOROBENZENE	ug/kg	310000	<1.1 UJ	<1.11 UJ	<1.12 U	<1.11 U	<1.13 U	<0.986 U	<1.15 U	<1.1 U	<1.11 U	<1.04 U	<1.24 U
1,3-DICHLOROPROPANE	ug/kg	2900	<1.1 UJ	<1.11 UJ	<1.12 U	<1.11 U	<1.13 U	<0.986 U	<1.15 U	<1.1 U	<1.11 U	<1.04 U	<1.24 U
1,4-DICHLOROBENZENE	ug/kg	7500	<1.1 U	<1.11 U	<1.12 U	<1.11 U	<1.13 U	<0.986 U	<1.15 U	<1.1 U	<1.11 U	<1.04 U	<1.24 U
2,2-DICHLOROPROPANE	ug/kg	4200	<1.1 UJ	<1.11 UJ	<1.12 U	<1.11 U	<1.13 U	<0.986 U	<1.15 U	<1.1 U	<1.11 U	<1.04 U	<1.24 U
2-BUTANONE	ug/kg	6100000	2.75 J	<5.56 U	<5.58 U	<5.52 U	<5.66 U	<4.94 U	<5.76 U	<5.48 U	<5.54 U	<5.2 U	<6.2 U
2-CHLOROTOLUENE	ug/kg	200000	<1.1 UJ	<1.11 UJ	<1.12 U	<1.11 U	<1.13 U	<0.986 U	<1.15 U	<1.1 U	<1.11 U	<1.04 U	<1.24 U
2-HEXANONE	ug/kg	610000	<5.5 U	<5.56 U	<5.58 U	<5.52 U	<5.66 U	<4.94 U	<5.76 U	<5.48 U	<5.54 U	<5.2 U	<6.2 U
4-CHLOROTOLUENE	ug/kg	200000	<1.1 UJ	<1.11 UJ	<1.12 U	<1.11 U	<1.13 U	<0.986 U	<1.15 U	<1.1 U	<1.11 U	<1.04 U	<1.24 U
4-METHYL-2-PENTANONE	ug/kg	820000	<5.5 U	<5.56 U	<5.58 U	<5.52 U	<5.66 U	<4.94 U	<5.76 U	<5.48 U	<5.54 U	<5.2 U	<6.2 U
ACETONE	ug/kg	920000	31.1 J	<11.1 UJ	<11.2 U	<11.1 U	21.5 J	25.4	<11.5 U	7.51 J	27	<10.4 U	<12.4 U
BENZENE	ug/kg	500	<1.1 U	<1.11 U	<1.12 U	<1.11 U	<1.13 U	<0.986 U	<1.15 U	<1.1 U	<1.11 U	<1.04 U	<1.24 U
BROMOBENZENE	ug/kg	200000	<1.1 U	<1.11 U	<1.12 U	<1.11 U	<1.13 U	<0.986 U	<1.15 U	<1.1 U	<1.11 U	<1.04 U	<1.24 U
BROMOCHLOROMETHANE	ug/kg	410000	<2.2 U	<2.22 U	<2.24 U	<2.22 U	<2.26 U	<1.97 U	<2.3 U	<2.2 U	<2.22 U	<2.08 U	<2.48 U
BROMODICHLOROMETHANE	ug/kg	460	<1.1 U	<1.11 U	<1.12 U	<1.11 U	<1.13 U	<0.986 U	<1.15 U	<1.1 U	<1.11 U	<1.04 U	<1.24 U
BROMOFORM	ug/kg	3600	<1.1 U	<1.11 U	<1.12 U	<1.11 U	<1.13 U	<0.986 U	<1.15 U	<1.1 U	<1.11 U	<1.04 U	<1.24 U
BROMOMETHANE	ug/kg	14000	<2.2 U	<2.22 U	<2.24 U	<2.22 U	<2.26 U	<1.97 U	<2.3 U	<2.2 U	<2.22 U	<2.08 U	<2.48 U
CARBON DISULFIDE	ug/kg	1000000	<1.1 UJ	<1.11 UJ	<1.12 U	<1.11 U	<1.13 U	<0.986 U	<1.15 U	<1.1 U	<1.11 U	<1.04 U	<1.24 U
CARBON TETRACHLORIDE	ug/kg	500	<1.1 U	<1.11 U	<1.12 U	<1.11 U	<1.13 U	<0.986 U	<1.15 U	<1.1 U	<1.11 U	<1.04 U	<1.24 U
CHLOROBENZENE	ug/kg	10000	<1.1 UJ	<1.11 UJ	<1.12 U	<1.11 U	<1.13 U	<0.986 U	<1.15 U	<1.1 U	<1.11 U	<1.04 U	<1.24 U
CHLOROETHANE	ug/kg	4100000	<2.2 U	<2.22 U	<2.24 U	<2.22 U	<2.26 U	<1.97 U	<2.3 U	<2.2 U	<2.22 U	<2.08 U	<2.48 U
CHLOROFORM	ug/kg	100000	<1.1 U	<1.11 U	<1.12 U	<1.11 U	<1.13 U	<0.986 U	<1.15 U	<1.1 U	<1.11 U	<1.04 U	0.679 J
CHLOROMETHANE	ug/kg	22000	<4.4 U	<4.44 U	<4.48 U	<4.42 U	<4.52 U	<3.94 U	<4.6 U	<4.38 U	<4.44 U	<4.16 U	<4.96 U
CIS-1,2-DICHLOROETHENE	ug/kg	7000	<1.1 U	<1.11 U	<1.12 U	<1.11 U	<1.13 U	<0.986 U	<1.15 U	<1.1 U	1.14 J	1.12 J	<1.24 U
CIS-1,3-DICHLOROPROPENE	ug/kg	530	<1.1 U	<1.11 U	<1.12 U	<1.11 U	<1.13 U	<0.986 U	<1.15 U	<1.1 U	<1.11 U	<1.04 U	<1.24 U
DIBROMOCHLOROMETHANE	ug/kg	3400	<1.1 U	<1.11 U	<1.12 U	<1.11 U	<1.13 U	<0.986 U	<1.15 U	<1.1 U	<1.11 U	<1.04 U	<1.24 U

LHAAP-18/24 PSI Work Plan Field Work
May/June 2014

Location ID: **Sample Date:**	**Units**	**MCL/ MSC**	**18CPTPB03 (19-20)190514 5/19/2014**	**18CPTPB03 (25-25.5)190514 5/19/2014**	**18CPTPB04 (13-14)190514 5/19/2014**	**18CPTPB04 (19-20)190514 5/19/2014**	**18CPTPB05 (07-08)200514 5/20/2014**	**18CPTPB05 (12-12.5)200514 5/20/2014**	**18CPTPB05 (4.5-05)200514 5/20/2014**	**18CPTPB06 (03-04)200514 5/20/2014**	**18CPTPB06 (14.5-15.5)200514 5/20/2014**	**18CPTPB06 (19-20)200514 5/20/2014**	**18CPTPB07 (03-04)200514 5/20/2014**
Location Description:			UEP Area vadose zone MIP verification soil sample.	UEP Area vadose zone MIP verification soil sample.	UEP Area vadose zone MIP verification soil sample.	UEP Area vadose zone MIP verification soil sample.	UEP Area vadose zone MIP verification soil sample.	UEP Area vadose zone MIP verification soil sample.	UEP Area vadose zone MIP verification soil sample.	UEP Area vadose zone MIP verification soil sample.	UEP Area vadose zone MIP verification soil sample.	UEP Area vadose zone MIP verification soil sample.	UEP Area vadose zone MIP verification soil sample.
DIBROMOMETHANE	ug/kg	38000	<1.1 U	<1.11 U	<1.12 U	<1.11 U	<1.13 U	<0.986 U	<1.15 U	<1.1 U	<1.11 U	<1.04 U	<1.24 U
DICHLORODIFLUOROMETHANE	ug/kg	2000000	<2.2 U	<2.22 U	<2.24 U	<2.22 U	<2.26 U	<1.97 U	<2.3 U	<2.2 U	<2.22 U	<2.08 U	<2.48 U
ETHYLBENZENE	ug/kg	70000	<1.1 U	<1.11 U	<1.12 U	<1.11 U	<1.13 U	<0.986 U	<1.15 U	<1.1 U	<1.11 U	<1.04 U	<1.24 U
HEXACHLOROBUTADIENE	ug/kg	2000	<1.1 U	<1.11 U	<1.12 U	<1.11 U	<1.13 U	<0.986 U	<1.15 U	<1.1 U	<1.11 U	<1.04 U	<1.24 U
ISOPROPYLBENZENE	ug/kg	1000000	<1.1 U	<1.11 U	<1.12 U	<1.11 U	<1.13 U	<0.986 U	<1.15 U	<1.1 U	<1.11 U	<1.04 U	<1.24 U
M,P-XYLENE	ug/kg	1000000	<1.1 U	<1.11 U	<1.12 U	<1.11 U	<1.13 U	<0.986 U	<1.15 U	<1.1 U	<1.11 U	<1.04 U	<1.24 U
METHYLENE CHLORIDE	ug/kg	500	1.86 J	<2.22 U	13	3.03 J	3.52 J	2.85 J	<2.3 U	<2.2 U	5.85	3.63 J	7.62
NAPHTHALENE	ug/kg	200000	<1.1 U	<1.11 U	<1.12 U	<1.11 U	<1.13 U	<0.986 U	<1.15 U	<1.1 U	<1.11 U	<1.04 U	<1.24 U
N-BUTYLBENZENE	ug/kg	410000	<1.1 UJ	<1.11 UJ	<1.12 U	<1.11 U	<1.13 U	<0.986 U	<1.15 U	<1.1 U	<1.11 U	<1.04 U	<1.24 U
N-PROPYLBENZENE	ug/kg	410000	<1.1 U	<1.11 U	<1.12 U	<1.11 U	<1.13 U	<0.986 U	<1.15 U	<1.1 U	<1.11 U	<1.04 U	<1.24 U
O-XYLENE	ug/kg	1000000	<1.1 U	<1.11 U	<1.12 U	<1.11 U	<1.13 U	<0.986 U	<1.15 U	<1.1 U	<1.11 U	<1.04 U	<1.24 U
P-ISOPROPYLTOLUENE	ug/kg	1000000	<1.1 UJ	<1.11 UJ	<1.12 U	<1.11 U	<1.13 U	<0.986 U	<1.15 U	<1.1 U	<1.11 U	<1.04 U	<1.24 U
SEC-BUTYLBENZENE	ug/kg	410000	<1.1 U	<1.11 U	<1.12 U	<1.11 U	<1.13 U	<0.986 U	<1.15 U	<1.1 U	<1.11 U	<1.04 U	<1.24 U
STYRENE	ug/kg	10000	<1.1 U	<1.11 U	<1.12 U	<1.11 U	<1.13 U	<0.986 U	<1.15 U	<1.1 U	<1.11 U	<1.04 U	<1.24 U
TERT-BUTYLBENZENE	ug/kg	410000	<1.1 UJ	<1.11 UJ	<1.12 U	<1.11 U	<1.13 U	<0.986 U	<1.15 U	<1.1 U	<1.11 U	<1.04 U	<1.24 U
TETRACHLOROETHENE	ug/kg	500	<1.1 U	<1.11 U	<1.12 U	<1.11 U	<1.13 U	<0.986 U	<1.15 U	<1.1 U	<1.11 U	<1.04 U	<1.24 U
TOLUENE	ug/kg	100000	<1.1 UJ	<1.11 UJ	<1.12 U	<1.11 U	<1.13 U	<0.986 U	<1.15 U	<1.1 U	<1.11 U	<1.04 U	<1.24 U
TRANS-1,2-DICHLOROETHENE	ug/kg	10000	<1.1 UJ	<1.11 UJ	<1.12 U	<1.11 U	<1.13 U	<0.986 U	<1.15 U	<1.1 U	<1.11 U	<1.04 U	<1.24 U
TRANS-1,3-DICHLOROPROPENE	ug/kg	2900	<1.1 UJ	<1.11 UJ	<1.12 U	<1.11 U	<1.13 U	<0.986 U	<1.15 U	<1.1 U	<1.11 U	<1.04 U	<1.24 U
TRICHLOROETHENE	ug/kg	500	<1.1 U	<1.11 U	1.06 J	<1.11 U	1.3 J	<0.986 U	<1.15 U	<1.1 U	1.84 J	2.55 J	1.51 J
TRICHLOROFLUOROMETHANE	ug/kg	3100000	<2.2 UJ	<2.22 UJ	<2.24 U	<2.22 U	<2.26 U	<1.97 U	<2.3 U	<2.2 U	<2.22 U	<2.08 U	<2.48 U
VINYL CHLORIDE	ug/kg	200	<2.2 U	<2.22 U	<2.24 U	<2.22 U	<2.26 U	<1.97 U	<2.3 U	<2.2 U	<2.22 U	<2.08 U	<2.48 U
Percent Solids (D2216-90)													
Solids, Percent	%		88.9	86	94.2	94.6	94	92.7	90.9	92.9	93.6	89.3	87.7
Total Organic Carbon (LYDKHN)													
TOTAL ORGANIC CARBON (TOC)	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Blue Highlighting Indicates concentrations above the MCL/MSC

Note: Some samples may have been diluted due to the concentration(s) of one or more analytes exceeding the upper limit of the calibration curve.

J - Estimated: The analyte was positively identified, the quantitation is an estimation due to discrepancies in meeting certain analyte-specific quality control criteria.

MCL/MSC - Maximum Contaminant Limit/Medium-Specific Concentrations

mg/kg - milligrams per kilogram

N/A - not analyzed

U - Undetected: The analyte was analyzed for, but not detected.

UJ - The analyte was not detected; however, the result is estimated due to discrepancies in meeting certain analyte-specific quality control criteria.

ug/kg - micrograms per kilogram

LHAAP-18/24 PSI Work Plan Field Work
May/June 2014

Location ID: Sample Date:	Units	MCL/ MSC	18CPTPB07 (10-11)200514 5/20/2014	18CPTPB07 (19.5-20)200514 5/20/2014	18CPTPB07 (22.5-23.5)200514 5/20/2014	18CPTPB08 (10.5-11.5)210514 5/21/2014	18CPTPB08 (19-20)200514 5/20/2014	18CPTPB08 (20-21)210514 5/21/2014	18CPTPB08 (23-24)210514 5/21/2014	18CPTPB08 (28-29)210514 5/21/2014	18CPTPB09 (16-17)210514 5/21/2014	18CPTPB09 (23.5-24.5)210514 5/21/2014	18CPTPB09 (26-27)210514 5/21/2014
Location Description:			UEP Area vadose zone MIP verification soil sample.	UEP Area vadose zone MIP verification soil sample.	UEP Area vadose zone MIP verification soil sample.	UEP Area vadose zone MIP verification soil sample.	UEP Area vadose zone MIP verification soil sample.	UEP Area vadose zone MIP verification soil sample.	UEP Area vadose zone MIP verification soil sample.	UEP Area vadose zone MIP verification soil sample.	UEP Area vadose zone MIP verification soil sample.	UEP Area vadose zone MIP verification soil sample.	UEP Area vadose zone MIP verification soil sample.
Perchlorate (6850)													
PERCHLORATE	ug/kg	7200	<2.1 U	<2.1 U	<2.1 U	5.19	<2.14 U	4.33 J	<2.38 U	<2.34 U	<2.24 U	<2.36 U	<2.36 U
Volatile Organic Compounds (8260B)													
1,1,1,2-TETRACHLOROETHANE	ug/kg	11000	<1.07 U	<1.14 U	<1.12 U	<1.15 U	<1.03 U	<1.08 U	<1.16 U	<1.09 U	<1.07 U	<1.15 U	<1.1 U
1,1,1-TRICHLOROETHANE	ug/kg	20000	<1.07 U	<1.14 U	<1.12 U	<1.15 U	<1.03 U	<1.08 U	<1.16 U	<1.09 U	<1.07 U	<1.15 U	<1.1 U
1,1,2,2-TETRACHLOROETHANE	ug/kg	1400	<1.07 U	<1.14 U	<1.12 U	<1.15 U	<1.03 U	<1.08 U	<1.16 U	<1.09 U	<1.07 U	<1.15 U	<1.1 U
1,1,2-TRICHLOROETHANE	ug/kg	500	<1.07 U	<1.14 U	<1.12 U	<1.15 U	<1.03 U	<1.08 U	<1.16 U	<1.09 U	<1.07 U	<1.15 U	<1.1 U
1,1-DICHLOROETHANE	ug/kg	1000000	<2.14 U	<2.28 U	<2.24 U	<2.3 U	<2.06 U	<2.16 U	<2.32 U	<2.18 U	<2.14 U	<2.3 U	<2.2 U
1,1-DICHLOROETHENE	ug/kg	700	<1.07 U	<1.14 U	<1.12 U	<1.15 U	<1.03 U	<1.08 U	<1.16 U	<1.09 U	<1.07 U	<1.15 U	<1.1 U
1,1-DICHLOROPROPENE	ug/kg	290	<1.07 U	<1.14 U	<1.12 U	<1.15 U	<1.03 U	<1.08 U	<1.16 U	<1.09 U	<1.07 U	<1.15 U	<1.1 U
1,2,3-TRICHLOROBENZENE	ug/kg	31000	<1.07 U	<1.14 U	<1.12 U	<1.15 U	<1.03 U	<1.08 U	<1.16 U	<1.09 U	<1.07 U	<1.15 U	<1.1 U
1,2,3-TRICHLOROPROPANE	ug/kg	4.1	<2.14 U	<2.28 U	<2.24 U	<2.3 U	<2.06 U	<2.16 U	<2.32 U	<2.18 U	<2.14 U	<2.3 U	<2.2 U
1,2,4-TRICHLOROBENZENE	ug/kg	7000	<1.07 U	<1.14 U	<1.12 U	<1.15 U	<1.03 U	<1.08 U	<1.16 U	<1.09 U	<1.07 U	<1.15 U	<1.1 U
1,2,4-TRIMETHYLBENZENE	ug/kg	510000	<1.07 U	<1.14 U	<1.12 U	<1.15 U	<1.03 U	<1.08 U	<1.16 U	<1.09 U	<1.07 U	<1.15 U	<1.1 U
1,2-DIBROMO-3-CHLOROPROPANE	ug/kg	20	<4.28 U	<4.58 U	<4.48 U	<4.62 U	<4.12 U	<4.32 U	<4.64 U	<4.36 U	<4.28 U	<4.58 U	<4.38 U
1,2-DIBROMOETHANE	ug/kg	5	<1.07 U	<1.14 U	<1.12 U	<1.15 U	<1.03 U	<1.08 U	<1.16 U	<1.09 U	<1.07 U	<1.15 U	<1.1 U
1,2-DICHLOROBENZENE	ug/kg	60000	<1.07 U	<1.14 U	<1.12 U	<1.15 U	<1.03 U	<1.08 U	<1.16 U	<1.09 U	<1.07 U	<1.15 U	<1.1 U
1,2-DICHLOROETHANE	ug/kg	500	<1.07 U	<1.14 U	<1.12 U	<1.15 U	<1.03 U	<1.08 U	<1.16 U	<1.09 U	<1.07 U	<1.15 U	<1.1 U
1,2-DICHLOROPROPANE	ug/kg	500	<1.07 U	<1.14 U	<1.12 U	<1.15 U	<1.03 U	<1.08 U	<1.16 U	<1.09 U	<1.07 U	<1.15 U	<1.1 U
1,3,5-TRIMETHYLBENZENE	ug/kg	510000	<1.07 U	<1.14 U	<1.12 U	<1.15 U	<1.03 U	<1.08 U	<1.16 U	<1.09 U	<1.07 U	<1.15 U	<1.1 U
1,3-DICHLOROBENZENE	ug/kg	310000	<1.07 U	<1.14 U	<1.12 U	<1.15 U	<1.03 U	<1.08 U	<1.16 U	<1.09 U	<1.07 U	<1.15 U	<1.1 U
1,3-DICHLOROPROPANE	ug/kg	2900	<1.07 U	<1.14 U	<1.12 U	<1.15 U	<1.03 U	<1.08 U	<1.16 U	<1.09 U	<1.07 U	<1.15 U	<1.1 U
1,4-DICHLOROBENZENE	ug/kg	7500	<1.07 U	<1.14 U	<1.12 U	<1.15 U	<1.03 U	<1.08 U	<1.16 U	<1.09 U	<1.07 U	<1.15 U	<1.1 U
2,2-DICHLOROPROPANE	ug/kg	4200	<1.07 U	<1.14 U	<1.12 U	<1.15 U	<1.03 U	<1.08 U	<1.16 U	<1.09 U	<1.07 U	<1.15 U	<1.1 U
2-BUTANONE	ug/kg	6100000	<5.36 U	<5.72 U	<5.6 U	<5.76 U	<5.14 U	<5.38 U	<5.8 U	<5.44 U	<5.34 U	<5.72 U	<5.48 U
2-CHLOROTOLUENE	ug/kg	200000	<1.07 U	<1.14 U	<1.12 U	<1.15 U	<1.03 U	<1.08 U	<1.16 U	<1.09 U	<1.07 U	<1.15 U	<1.1 U
2-HEXANONE	ug/kg	610000	<5.36 U	<5.72 U	<5.6 U	<5.76 U	<5.14 U	<5.38 U	<5.8 U	<5.44 U	<5.34 U	<5.72 U	<5.48 U
4-CHLOROTOLUENE	ug/kg	200000	<1.07 U	<1.14 U	<1.12 U	<1.15 U	<1.03 U	<1.08 U	<1.16 U	<1.09 U	<1.07 U	<1.15 U	<1.1 U
4-METHYL-2-PENTANONE	ug/kg	820000	<5.36 U	<5.72 U	<5.6 U	<5.76 U	<5.14 U	<5.38 U	<5.8 U	<5.44 U	<5.34 U	<5.72 U	<5.48 U
ACETONE	ug/kg	920000	<10.7 U	<11.4 U	<11.2 U	44.4	<10.3 U	7.67 J	11.3 J	6.46 J	<10.7 U	<11.5 U	<11 U
BENZENE	ug/kg	500	<1.07 U	<1.14 U	<1.12 U	<1.15 U	<1.03 U	<1.08 U	<1.16 U	<1.09 U	<1.07 U	<1.15 U	<1.1 U
BROMOBENZENE	ug/kg	200000	<1.07 U	<1.14 U	<1.12 U	<1.15 U	<1.03 U	<1.08 U	<1.16 U	<1.09 U	<1.07 U	<1.15 U	<1.1 U
BROMOCHLOROMETHANE	ug/kg	410000	<2.14 U	<2.28 U	<2.24 U	<2.3 U	<2.06 U	<2.16 U	<2.32 U	<2.18 U	<2.14 U	<2.3 U	<2.2 U
BROMODICHLOROMETHANE	ug/kg	460	<1.07 U	<1.14 U	<1.12 U	<1.15 U	<1.03 U	<1.08 U	<1.16 U	<1.09 U	<1.07 U	<1.15 U	<1.1 U
BROMOFORM	ug/kg	3600	<1.07 U	<1.14 U	<1.12 U	<1.15 U	<1.03 U	<1.08 U	<1.16 U	<1.09 U	<1.07 U	<1.15 U	<1.1 U
BROMOMETHANE	ug/kg	14000	<2.14 U	<2.28 U	<2.24 U	<2.3 U	<2.06 U	<2.16 U	<2.32 U	<2.18 U	<2.14 U	<2.3 U	<2.2 U
CARBON DISULFIDE	ug/kg	1000000	<1.07 U	<1.14 U	<1.12 U	<1.15 U	<1.03 U	<1.08 U	<1.16 U	<1.09 U	<1.07 U	<1.15 U	<1.1 U
CARBON TETRACHLORIDE	ug/kg	500	<1.07 U	<1.14 U	<1.12 U	<1.15 U	<1.03 U	<1.08 U	<1.16 U	<1.09 U	<1.07 U	<1.15 U	<1.1 U
CHLOROBENZENE	ug/kg	10000	<1.07 U	<1.14 U	<1.12 U	<1.15 U	<1.03 U	<1.08 U	<1.16 U	<1.09 U	<1.07 U	<1.15 U	<1.1 U
CHLOROETHANE	ug/kg	4100000	<2.14 U	<2.28 U	<2.24 U	<2.3 U	<2.06 U	<2.16 U	<2.32 U	<2.18 U	<2.14 U	<2.3 U	<2.2 U
CHLOROFORM	ug/kg	100000	<1.07 U	<1.14 U	0.645 J	<1.15 U	<1.03 U	<1.08 U	<1.16 U	<1.09 U	<1.07 U	<1.15 U	<1.1 U
CHLOROMETHANE	ug/kg	22000	<4.28 U	<4.58 U	<4.48 U	<4.62 U	<4.12 U	<4.32 U	<4.64 U	<4.36 U	<4.28 U	<4.58 U	<4.38 U
CIS-1,2-DICHLOROETHENE	ug/kg	7000	<1.07 U	5.69 J	1.77 J	<1.15 U	<1.03 U	<1.08 U	<1.16 U	<1.09 U	<1.07 U	<1.15 U	<1.1 U
CIS-1,3-DICHLOROPROPENE	ug/kg	530	<1.07 U	<1.14 U	<1.12 U	<1.15 U	<1.03 U	<1.08 U	<1.16 U	<1.09 U	<1.07 U	<1.15 U	<1.1 U
DIBROMOCHLOROMETHANE	ug/kg	3400	<1.07 U	<1.14 U	<1.12 U	<1.15 U	<1.03 U	<1.08 U	<1.16 U	<1.09 U	<1.07 U	<1.15 U	<1.1 U

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Location ID: Sample Date:	Units	MCL/ MSC	18CPTPB07 (10-11)200514 5/20/2014	18CPTPB07 (19.5-20)200514 5/20/2014	18CPTPB07 (22.5-23.5)200514 5/20/2014	18CPTPB08 (10.5-11.5)210514 5/21/2014	18CPTPB08 (19-20)200514 5/20/2014	18CPTPB08 (20-21)210514 5/21/2014	18CPTPB08 (23-24)210514 5/21/2014	18CPTPB08 (28-29)210514 5/21/2014	18CPTPB09 (16-17)210514 5/21/2014	18CPTPB09 (23.5-24.5)210514 5/21/2014	18CPTPB09 (26-27)210514 5/21/2014
Location Description:			UEP Area vadose zone MIP verification soil sample.	UEP Area vadose zone MIP verification soil sample.	UEP Area vadose zone MIP verification soil sample.	UEP Area vadose zone MIP verification soil sample.	UEP Area vadose zone MIP verification soil sample.	UEP Area vadose zone MIP verification soil sample.	UEP Area vadose zone MIP verification soil sample.	UEP Area vadose zone MIP verification soil sample.	UEP Area vadose zone MIP verification soil sample.	UEP Area vadose zone MIP verification soil sample.	UEP Area vadose zone MIP verification soil sample.
DIBROMOMETHANE	ug/kg	38000	<1.07 U	<1.14 U	<1.12 U	<1.15 U	<1.03 U	<1.08 U	<1.16 U	<1.09 U	<1.07 U	<1.15 U	<1.1 U
DICHLORODIFLUOROMETHANE	ug/kg	2000000	<2.14 U	<2.28 U	<2.24 U	<2.3 U	<2.06 U	<2.16 U	<2.32 U	<2.18 U	<2.14 U	<2.3 U	<2.2 U
ETHYLBENZENE	ug/kg	70000	<1.07 U	<1.14 U	<1.12 U	<1.15 U	<1.03 U	<1.08 U	<1.16 U	<1.09 U	<1.07 U	<1.15 U	<1.1 U
HEXACHLOROBUTADIENE	ug/kg	2000	<1.07 U	<1.14 U	<1.12 U	<1.15 U	<1.03 U	<1.08 U	<1.16 U	<1.09 U	<1.07 U	<1.15 U	<1.1 U
ISOPROPYLBENZENE	ug/kg	1000000	<1.07 U	<1.14 U	<1.12 U	<1.15 U	<1.03 U	<1.08 U	<1.16 U	<1.09 U	<1.07 U	<1.15 U	<1.1 U
M,P-XYLENE	ug/kg	1000000	<1.07 U	<1.14 U	<1.12 U	<1.15 U	<1.03 U	<1.08 U	<1.16 U	<1.09 U	<1.07 U	<1.15 U	<1.1 U
METHYLENE CHLORIDE	ug/kg	500	3.74 J	<2.28 U	1.93 J	1.42 J	4.73 J	1.37 J	3.01 J	<2.18 U	1.56 J	1.81 J	1.47 J
NAPHTHALENE	ug/kg	200000	<1.07 U	<1.14 U	<1.12 U	1.2 J	<1.03 U	<1.08 U	<1.16 U	<1.09 U	<1.07 U	<1.15 U	<1.1 U
N-BUTYLBENZENE	ug/kg	410000	<1.07 U	<1.14 U	<1.12 U	<1.15 U	<1.03 U	<1.08 U	<1.16 U	<1.09 U	<1.07 U	<1.15 U	<1.1 U
N-PROPYLBENZENE	ug/kg	410000	<1.07 U	<1.14 U	<1.12 U	<1.15 U	<1.03 U	<1.08 U	<1.16 U	<1.09 U	<1.07 U	<1.15 U	<1.1 U
O-XYLENE	ug/kg	1000000	<1.07 U	<1.14 U	<1.12 U	<1.15 U	<1.03 U	<1.08 U	<1.16 U	<1.09 U	<1.07 U	<1.15 U	<1.1 U
P-ISOPROPYLTOLUENE	ug/kg	1000000	<1.07 U	<1.14 U	<1.12 U	<1.15 U	<1.03 U	<1.08 U	<1.16 U	<1.09 U	<1.07 U	<1.15 U	<1.1 U
SEC-BUTYLBENZENE	ug/kg	410000	<1.07 U	<1.14 U	<1.12 U	<1.15 U	<1.03 U	<1.08 U	<1.16 U	<1.09 U	<1.07 U	<1.15 U	<1.1 U
STYRENE	ug/kg	10000	<1.07 U	<1.14 U	<1.12 U	<1.15 U	<1.03 U	<1.08 U	<1.16 U	<1.09 U	<1.07 U	<1.15 U	<1.1 U
TERT-BUTYLBENZENE	ug/kg	410000	<1.07 U	<1.14 U	<1.12 U	<1.15 U	<1.03 U	<1.08 U	<1.16 U	<1.09 U	<1.07 U	<1.15 U	<1.1 U
TETRACHLOROETHENE	ug/kg	500	<1.07 U	<1.14 U	<1.12 U	<1.15 U	<1.03 U	<1.08 U	<1.16 U	<1.09 U	<1.07 U	<1.15 U	<1.1 U
TOLUENE	ug/kg	100000	<1.07 U	<1.14 U	<1.12 U	<1.15 U	<1.03 U	<1.08 U	<1.16 U	<1.09 U	<1.07 U	<1.15 U	<1.1 U
TRANS-1,2-DICHLOROETHENE	ug/kg	10000	<1.07 U	<1.14 U	<1.12 U	<1.15 U	<1.03 U	<1.08 U	<1.16 U	<1.09 U	<1.07 U	<1.15 U	<1.1 U
TRANS-1,3-DICHLOROPROPENE	ug/kg	2900	<1.07 U	<1.14 U	<1.12 U	<1.15 U	<1.03 U	<1.08 U	<1.16 U	<1.09 U	<1.07 U	<1.15 U	<1.1 U
TRICHLOROETHENE	ug/kg	500	0.66 J	3.47 J	0.722 J	<1.15 U	1.07 J	<1.08 U	<1.16 U	<1.09 U	<1.07 U	<1.15 U	<1.1 U
TRICHLOROFLUOROMETHANE	ug/kg	3100000	<2.14 U	<2.28 U	<2.24 U	<2.3 U	<2.06 U	<2.16 U	<2.32 U	<2.18 U	<2.14 U	<2.3 U	<2.2 U
VINYL CHLORIDE	ug/kg	200	<2.14 U	<2.28 U	<2.24 U	<2.3 U	<2.06 U	<2.16 U	<2.32 U	<2.18 U	<2.14 U	<2.3 U	<2.2 U
Percent Solids (D2216-90)													
Solids, Percent	%		93.6	94.6	93.8	84.6	93.3	87.1	82.7	85.4	89.3	84.3	83.7
Total Organic Carbon (LYDKHN)													
TOTAL ORGANIC CARBON (TOC)	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Blue Highlighting Indicates concentrations above the MCL/MSC

Note: Some samples may have been diluted due to the concentration(s) of one or more analytes exceeding the upper limit of the calibration curve.

J - Estimated: The analyte was positively identified, the quantitation is an estimation due to discrepancies in meeting certain analyte-specific quality control criteria.

MCL/MSC - Maximum Contaminant Limit/Medium-Specific Concentrations

mg/kg - milligrams per kilogram

N/A - not analyzed

U - Undetected: The analyte was analyzed for, but not detected.

UJ - The analyte was not detected; however, the result is estimated due to discrepancies in meeting certain analyte-specific quality control criteria.

ug/kg - micrograms per kilogram

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Location ID: Sample Date:	Units	MCL/ MSC	18CPTPB09 (8-9)210514 5/21/2014	18CPTPB11 (16-17)210514 5/21/2014	18CPTPB11 (19-20)210514 5/21/2014	18CPTPB11 (24-25)210514 5/21/2014	18CPTPB11 (5-6)210514 5/21/2014	18CPTPB13 (13.5-14.5)280514 5/28/2014	18CPTPB13 (18-19)280514 5/28/2014	18CPTPB13 (22-23)280514 5/28/2014	18CPTPB13 (8-9)280514 5/28/2014	18CPTPB14 (18-19)280514 5/28/2014	18CPTPB14 (22-23)280514 5/28/2014	18CPTPB14 (25-26)280514 5/28/2014
Location Description:			UEP Area vadose zone MIP verification soil sample.	UEP Area vadose zone MIP verification soil sample.	UEP Area vadose zone MIP verification soil sample.	UEP Area vadose zone MIP verification soil sample.	UEP Area vadose zone MIP verification soil sample.	UEP Area vadose zone MIP verification soil sample.	UEP Area vadose zone MIP verification soil sample.	UEP Area vadose zone MIP verification soil sample.	UEP Area vadose zone MIP verification soil sample.	UEP Area vadose zone MIP verification soil sample.	UEP Area vadose zone MIP verification soil sample.	UEP Area vadose zone MIP verification soil sample.
Perchlorate (6850)														
PERCHLORATE	ug/kg	7200	<2.26 U	<2.44 U	<2.5 U	<2.4 U	<2.48 U	<1.2 U	<1.2 U	0.45 J	<1.3 U	77	490	1300
Volatile Organic Compounds (8260B)														
1,1,1,2-TETRACHLOROETHANE	ug/kg	11000	<1.07 U	<1.24 U	<1.17 U	<1.14 U	<1.16 U	<1.16 UJ	<1.1 U	<1.13 U	<1.15 U	<1.16 U	<1.26 U	<1.23 U
1,1,1-TRICHLOROETHANE	ug/kg	20000	<1.07 U	<1.24 U	<1.17 U	<1.14 U	<1.16 U	<1.16 UJ	<1.1 U	<1.13 U	<1.15 U	<1.16 U	<1.26 U	<1.23 U
1,1,2,2-TETRACHLOROETHANE	ug/kg	1400	<1.07 U	<1.24 U	<1.17 U	<1.14 U	<1.16 U	<1.16 UJ	<1.1 U	<1.13 U	<1.15 U	<1.16 U	<1.26 U	<1.23 U
1,1,2-TRICHLOROETHANE	ug/kg	500	<1.07 U	<1.24 U	<1.17 U	<1.14 U	<1.16 U	<1.16 UJ	<1.1 U	<1.13 U	<1.15 U	<1.16 U	<1.26 U	<1.23 U
1,1-DICHLOROETHANE	ug/kg	1000000	<2.14 U	<2.48 U	<2.34 U	<2.28 U	<2.32 U	<2.32 U	<2.2 U	<2.26 U	<2.3 U	<2.32 U	<2.52 U	<2.46 U
1,1-DICHLOROETHENE	ug/kg	700	<1.07 U	1.17 J	<1.17 U	<1.14 U	<1.16 U	<1.16 UJ	<1.1 U	<1.13 U	<1.15 U	<1.16 U	<1.26 U	<1.23 U
1,1-DICHLOROPROPENE	ug/kg	290	<1.07 U	<1.24 U	<1.17 U	<1.14 U	<1.16 U	<1.16 U	<1.1 U	<1.13 U	<1.15 U	<1.16 U	<1.26 U	<1.23 U
1,2,3-TRICHLOROBENZENE	ug/kg	31000	<1.07 U	<1.24 U	<1.17 U	<1.14 U	<1.16 U	<1.16 UJ	<1.1 U	<1.13 U	<1.15 U	<1.16 U	<1.26 U	<1.23 U
1,2,3-TRICHLOROPROPANE	ug/kg	4.1	<2.14 U	<2.48 U	<2.34 U	<2.28 U	<2.32 U	<2.32 UJ	<2.2 U	<2.26 U	<2.3 U	<2.32 U	<2.52 U	<2.46 U
1,2,4-TRICHLOROBENZENE	ug/kg	7000	<1.07 U	<1.24 U	<1.17 U	<1.14 U	<1.16 U	<1.16 UJ	<1.1 U	<1.13 U	<1.15 U	<1.16 U	<1.26 U	<1.23 U
1,2,4-TRIMETHYLBENZENE	ug/kg	510000	<1.07 U	<1.24 U	<1.17 U	<1.14 U	<1.16 U	<1.16 UJ	<1.1 U	<1.13 U	<1.15 U	<1.16 U	<1.26 U	<1.23 U
1,2-DIBROMO-3-CHLOROPROPANE	ug/kg	20	<4.26 U	<4.94 U	<4.68 U	<4.54 U	<4.64 U	<4.64 UJ	<4.38 U	<4.52 U	<4.6 U	<4.64 U	<5.06 U	<4.94 U
1,2-DIBROMOETHANE	ug/kg	5	<1.07 U	<1.24 U	<1.17 U	<1.14 U	<1.16 U	<1.16 UJ	<1.1 U	<1.13 U	<1.15 U	<1.16 U	<1.26 U	<1.23 U
1,2-DICHLOROBENZENE	ug/kg	60000	<1.07 U	<1.24 U	<1.17 U	<1.14 U	<1.16 U	<1.16 UJ	<1.1 U	<1.13 U	<1.15 U	<1.16 U	<1.26 UJ	<1.23 U
1,2-DICHLOROETHANE	ug/kg	500	<1.07 U	<1.24 U	<1.17 U	<1.14 U	<1.16 U	<1.16 UJ	<1.1 U	<1.13 U	<1.15 U	<1.16 U	2.15 J	13.8
1,2-DICHLOROPROPANE	ug/kg	500	<1.07 U	<1.24 U	<1.17 U	<1.14 U	<1.16 U	<1.16 UJ	<1.1 U	<1.13 U	<1.15 U	<1.16 U	<1.26 U	<1.23 U
1,3,5-TRIMETHYLBENZENE	ug/kg	510000	<1.07 U	<1.24 U	<1.17 U	<1.14 U	<1.16 U	<1.16 UJ	<1.1 U	<1.13 U	<1.15 U	<1.16 U	<1.26 U	<1.23 U
1,3-DICHLOROBENZENE	ug/kg	310000	<1.07 U	<1.24 U	<1.17 U	<1.14 U	<1.16 U	<1.16 UJ	<1.1 U	<1.13 U	<1.15 U	<1.16 U	<1.26 U	<1.23 U
1,3-DICHLOROPROPANE	ug/kg	2900	<1.07 U	<1.24 U	<1.17 U	<1.14 U	<1.16 U	<1.16 UJ	<1.1 U	<1.13 U	<1.15 U	<1.16 U	<1.26 U	<1.23 U
1,4-DICHLOROBENZENE	ug/kg	7500	<1.07 U	<1.24 U	<1.17 U	<1.14 U	<1.16 U	<1.16 UJ	<1.1 U	<1.13 U	<1.15 U	<1.16 U	<1.26 U	<1.23 U
2,2-DICHLOROPROPANE	ug/kg	4200	<1.07 U	<1.24 U	<1.17 U	<1.14 U	<1.16 U	<1.16 U	<1.1 U	<1.13 U	<1.15 U	<1.16 U	<1.26 U	<1.23 U
2-BUTANONE	ug/kg	6100000	7.48 J	<6.18 U	<5.86 U	<5.68 U	<5.82 U	<5.8 UJ	<5.48 U	3.47 J	<5.76 U	<5.8 U	3.75 J	<6.16 U
2-CHLOROTOLUENE	ug/kg	200000	<1.07 U	<1.24 U	<1.17 U	<1.14 U	<1.16 U	<1.16 UJ	<1.1 U	<1.13 U	<1.15 U	<1.16 U	<1.26 U	<1.23 U
2-HEXANONE	ug/kg	610000	<5.32 U	<6.18 U	<5.86 U	<5.68 U	<5.82 U	<5.8 UJ	<5.48 U	<5.64 U	<5.76 U	<5.8 U	<6.32 U	<6.16 U
4-CHLOROTOLUENE	ug/kg	200000	<1.07 U	<1.24 U	<1.17 U	<1.14 U	<1.16 U	<1.16 UJ	<1.1 U	<1.13 U	<1.15 U	<1.16 U	<1.26 UJ	<1.23 U
4-METHYL-2-PENTANONE	ug/kg	820000	<5.32 U	<6.18 U	<5.86 U	<5.68 U	<5.82 U	<5.8 UJ	<5.48 U	<5.64 U	<5.76 U	<5.8 U	<6.32 U	<6.16 U
ACETONE	ug/kg	920000	52.6	<12.4 U	<11.7 U	<11.4 U	6.09 J	<11.6 U	<11 U	6.4 J	<11.5 U	<11.6 U	<12.6 U	6.28 J
BENZENE	ug/kg	500	<1.07 U	<1.24 U	<1.17 U	<1.14 U	<1.16 U	<1.16 UJ	<1.1 U	<1.13 U	<1.15 U	<1.16 U	<1.26 U	<1.23 U
BROMOBENZENE	ug/kg	200000	<1.07 U	<1.24 U	<1.17 U	<1.14 U	<1.16 U	<1.16 UJ	<1.1 U	<1.13 U	<1.15 U	<1.16 U	<1.26 U	<1.23 U
BROMOCHLOROMETHANE	ug/kg	410000	<2.14 U	<2.48 U	<2.34 U	<2.28 U	<2.32 U	<2.32 UJ	<2.2 U	<2.26 U	<2.3 U	<2.32 U	<2.52 U	<2.46 U
BROMODICHLOROMETHANE	ug/kg	460	<1.07 U	<1.24 U	<1.17 U	<1.14 U	<1.16 U	<1.16 UJ	<1.1 U	<1.13 U	<1.15 U	<1.16 U	<1.26 U	<1.23 U
BROMOFORM	ug/kg	3600	<1.07 U	<1.24 U	<1.17 U	<1.14 U	<1.16 U	<1.16 U	<1.1 U	<1.13 U	<1.15 U	<1.16 U	<1.26 U	<1.23 U
BROMOMETHANE	ug/kg	14000	<2.14 U	<2.48 U	<2.34 U	<2.28 U	<2.32 U	<2.32 U	<2.2 U	<2.26 U	<2.3 U	<2.32 U	<2.52 U	<2.46 U
CARBON DISULFIDE	ug/kg	1000000	<1.07 U	<1.24 U	<1.17 U	<1.14 U	<1.16 U	<1.16 U	<1.1 U	<1.13 U	<1.15 U	<1.16 U	<1.26 U	<1.23 U
CARBON TETRACHLORIDE	ug/kg	500	<1.07 U	<1.24 U	<1.17 U	<1.14 U	<1.16 U	<1.16 UJ	<1.1 U	<1.13 U	<1.15 U	<1.16 U	<1.26 U	0.962 J
CHLOROBENZENE	ug/kg	10000	<1.07 U	<1.24 U	<1.17 U	<1.14 U	<1.16 U	<1.16 UJ	<1.1 U	<1.13 U	<1.15 U	<1.16 U	<1.26 U	<1.23 U
CHLOROETHANE	ug/kg	4100000	<2.14 U	<2.48 U	<2.34 U	<2.28 U	<2.32 U	<2.32 U	<2.2 U	<2.26 U	<2.3 U	<2.32 U	<2.52 U	<2.46 U
CHLOROFORM	ug/kg	100000	<1.07 U	<1.24 U	<1.17 U	<1.14 U	<1.16 U	<1.16 UJ	<1.1 U	<1.13 U	<1.15 U	<1.16 U	<1.26 U	2.74 J
CHLOROMETHANE	ug/kg	22000	<4.26 U	<4.94 U	<4.68 U	<4.54 U	<4.64 U	<4.64 U	<4.38 U	<4.52 U	<4.6 U	<4.64 U	<5.06 U	<4.94 U
CIS-1,2-DICHLOROETHENE	ug/kg	7000	<1.07 U	65.1	47	13	<1.16 U	<1.16 UJ	<1.1 U	<1.13 U	<1.15 U	<1.16 U	1.64 J	11.6
CIS-1,3-DICHLOROPROPENE	ug/kg	530	<1.07 U	<1.24 U	<1.17 U	<1.14 U	<1.16 U	<1.16 UJ	<1.1 U	<1.13 U	<1.15 U	<1.16 U	<1.26 U	<1.23 U
DIBROMOCHLOROMETHANE	ug/kg	3400	<1.07 U	<1.24 U	<1.17 U	<1.14 U	<1.16 U	<1.16 UJ	<1.1 U	<1.13 U	<1.15 U	<1.16 U	<1.26 U	<1.23 U

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Location ID: Sample Date:	Units	MCL/ MSC	18CPTPB09 (8-9)210514 5/21/2014	18CPTPB11 (16-17)210514 5/21/2014	18CPTPB11 (19-20)210514 5/21/2014	18CPTPB11 (24-25)210514 5/21/2014	18CPTPB11 (5-6)210514 5/21/2014	18CPTPB13 (13.5-14.5)280514 5/28/2014	18CPTPB13 (18-19)280514 5/28/2014	18CPTPB13 (22-23)280514 5/28/2014	18CPTPB13 (8-9)280514 5/28/2014	18CPTPB14 (18-19)280514 5/28/2014	18CPTPB14 (22-23)280514 5/28/2014	18CPTPB14 (25-26)280514 5/28/2014
Location Description:			UEP Area vadose zone MIP verification soil sample.	UEP Area vadose zone MIP verification soil sample.	UEP Area vadose zone MIP verification soil sample.	UEP Area vadose zone MIP verification soil sample.	UEP Area vadose zone MIP verification soil sample.	UEP Area vadose zone MIP verification soil sample.	UEP Area vadose zone MIP verification soil sample.	UEP Area vadose zone MIP verification soil sample.	UEP Area vadose zone MIP verification soil sample.	UEP Area vadose zone MIP verification soil sample.	UEP Area vadose zone MIP verification soil sample.	UEP Area vadose zone MIP verification soil sample.
DIBROMOMETHANE	ug/kg	38000	<1.07 U	<1.24 U	<1.17 U	<1.14 U	<1.16 U	<1.16 UJ	<1.1 U	<1.13 U	<1.15 U	<1.16 U	<1.26 U	<1.23 U
DICHLORODIFLUOROMETHANE	ug/kg	2000000	<2.14 U	<2.48 U	<2.34 U	<2.28 U	<2.32 U	<2.32 U	<2.2 U	<2.26 U	<2.3 U	<2.32 U	<2.52 U	<2.46 U
ETHYLBENZENE	ug/kg	70000	<1.07 U	<1.24 U	<1.17 U	<1.14 U	<1.16 U	<1.16 UJ	<1.1 U	<1.13 U	<1.15 U	<1.16 U	<1.26 U	<1.23 U
HEXACHLOROBUTADIENE	ug/kg	2000	<1.07 U	<1.24 U	<1.17 U	<1.14 U	<1.16 U	<1.16 UJ	<1.1 U	<1.13 U	<1.15 U	<1.16 U	<1.26 U	<1.23 U
ISOPROPYLBENZENE	ug/kg	1000000	<1.07 U	<1.24 U	<1.17 U	<1.14 U	<1.16 U	<1.16 UJ	<1.1 U	<1.13 U	<1.15 U	<1.16 U	<1.26 U	<1.23 U
M,P-XYLENE	ug/kg	1000000	<1.07 U	<1.24 U	<1.17 U	<1.14 U	<1.16 U	<1.16 UJ	<1.1 U	<1.13 U	<1.15 U	<1.16 U	<1.26 U	<1.23 U
METHYLENE CHLORIDE	ug/kg	500	1.8 J	1.46 J	2.79 J	1.59 J	<2.32 U	<2.32 UJ	2.21 J	7.92	11.4	7.57	21	27.1
NAPHTHALENE	ug/kg	200000	<1.07 U	<1.24 U	<1.17 U	<1.14 U	<1.16 U	<1.16 UJ	0.628 J	<1.13 U	<1.15 U	<1.16 U	<1.26 U	<1.23 U
N-BUTYLBENZENE	ug/kg	410000	<1.07 U	<1.24 U	<1.17 U	<1.14 U	<1.16 U	<1.16 UJ	<1.1 U	<1.13 U	<1.15 U	<1.16 U	<1.26 U	<1.23 U
N-PROPYLBENZENE	ug/kg	410000	<1.07 U	<1.24 U	<1.17 U	<1.14 U	<1.16 U	<1.16 UJ	<1.1 U	<1.13 U	<1.15 U	<1.16 U	<1.26 U	<1.23 U
O-XYLENE	ug/kg	1000000	<1.07 U	<1.24 U	<1.17 U	<1.14 U	<1.16 U	<1.16 UJ	<1.1 U	<1.13 U	<1.15 U	<1.16 U	<1.26 U	<1.23 U
P-ISOPROPYLTOLUENE	ug/kg	1000000	<1.07 U	<1.24 U	<1.17 U	<1.14 U	<1.16 U	<1.16 UJ	<1.1 U	<1.13 U	<1.15 U	<1.16 U	<1.26 UJ	<1.23 U
SEC-BUTYLBENZENE	ug/kg	410000	<1.07 U	<1.24 U	<1.17 U	<1.14 U	<1.16 U	<1.16 UJ	<1.1 U	<1.13 U	<1.15 U	<1.16 U	<1.26 U	<1.23 U
STYRENE	ug/kg	10000	<1.07 U	<1.24 U	<1.17 U	<1.14 U	<1.16 U	<1.16 UJ	<1.1 U	<1.13 U	<1.15 U	<1.16 U	<1.26 U	<1.23 U
TERT-BUTYLBENZENE	ug/kg	410000	<1.07 U	<1.24 U	<1.17 U	<1.14 U	<1.16 U	<1.16 UJ	<1.1 U	<1.13 U	<1.15 U	<1.16 U	<1.26 U	<1.23 U
TETRACHLOROETHENE	ug/kg	500	<1.07 U	0.697 J	0.991 J	<1.14 U	<1.16 U	2.24 J	<1.1 U	<1.13 U	<1.15 U	<1.16 U	<1.26 U	1.1 J
TOLUENE	ug/kg	100000	<1.07 U	<1.24 U	<1.17 U	<1.14 U	<1.16 U	<1.16 UJ	<1.1 U	<1.13 U	<1.15 U	<1.16 U	<1.26 U	<1.23 U
TRANS-1,2-DICHLOROETHENE	ug/kg	10000	<1.07 U	<1.24 U	<1.17 U	<1.14 U	<1.16 U	<1.16 U	<1.1 U	<1.13 U	<1.15 U	<1.16 U	<1.26 U	<1.23 U
TRANS-1,3-DICHLOROPROPENE	ug/kg	2900	<1.07 U	<1.24 U	<1.17 U	<1.14 U	<1.16 U	<1.16 UJ	<1.1 U	<1.13 U	<1.15 U	<1.16 U	<1.26 U	<1.23 U
TRICHLOROETHENE	ug/kg	500	1.44 J	172	272	70	<1.16 U	48.5	<1.1 U	1.2 J	1.4 J	0.843 J	16.3	358
TRICHLOROFLUOROMETHANE	ug/kg	3100000	<2.14 U	<2.48 U	<2.34 U	<2.28 U	<2.32 U	<2.32 U	<2.2 U	<2.26 U	<2.3 U	<2.32 U	<2.52 U	<2.46 U
VINYL CHLORIDE	ug/kg	200	<2.14 U	<2.48 U	<2.34 U	<2.28 U	<2.32 U	<2.32 U	<2.2 U	<2.26 U	<2.3 U	<2.32 U	<2.52 U	<2.46 U
Percent Solids (D2216-90)														
Solids, Percent	%		87.1	80.4	79.2	82.9	80.1	82.8	85.3	86.9	81.5	81	79	76.2
Total Organic Carbon (LYDKHN)														
TOTAL ORGANIC CARBON (TOC)	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Blue Highlighting Indicates concentrations above the MCL/MSC

Note: Some samples may have been diluted due to the concentration(s) of one or more analytes exceeding the upper limit of the calibration curve.

J - Estimated: The analyte was positively identified, the quantitation is an estimation due to discrepancies in meeting certain analyte-specific quality control criteria.

MCL/MSC - Maximum Contaminant Limit/Medium-Specific Concentrations

mg/kg - milligrams per kilogram

N/A - not analyzed

U - Undetected: The analyte was analyzed for, but not detected.

UJ - The analyte was not detected; however, the result is estimated due to discrepancies in meeting certain analyte-specific quality control criteria.

ug/kg - micrograms per kilogram

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Location ID: Sample Date:	Units	MCL/ MSC	18CPTPB14 (6-7)280514 5/28/2014	18CPTUEP01 (10-11)120514 5/12/2014	18CPTUEP01 (29-30)120514 5/12/2014	18CPTUEP01 (36-37)120514 5/12/2014	18CPTUEP01 (45-46)120514 5/12/2014	18CPTUEP02 (17-18)120514 5/12/2014	18CPTUEP02 (26-27)120514 5/12/2014	18CPTUEP02(40-41)120514 5/12/2014	18CPTUEP02 (47.5-48.5)120514 5/12/2014	18CPTUEP03 (1-2)130514 5/13/2014	18CPTUEP03 (19-20)130514 5/13/2014	18CPTUEP03 (27-28)130514 5/13/2014
Location Description:			UEP Area vadose zone MIP verification soil sample.	UEP Area. MIP verification soil sampling.	UEP Area. MIP verification soil sampling.	UEP Area. MIP verification soil sampling.	UEP Area. MIP verification soil sampling.	UEP Area. MIP verification soil sampling.	UEP Area. MIP verification soil sampling.	UEP Area. MIP verification soil sampling.	UEP Area. MIP verification soil sampling.	UEP Area. MIP verification soil sampling.	UEP Area. MIP verification soil sampling.	UEP Area. MIP verification soil sampling.
Perchlorate (6850)														
PERCHLORATE	ug/kg	7200	<1.2 U	<2.44 U	1.19 J	13.6	590	196	20.5	1600	116	<2.30 U	<2.40 U	<2.01
Volatile Organic Compounds (8260B)														
1,1,1,2-TETRACHLOROETHANE	ug/kg	11000	<1.15 U	<1.32 U	<123 U	<330 U	<1.23 U	<1.15 U	<1.16 U	<1.31 U	<1.17 U	<1.13 U	<1.16 U	<1.22 U
1,1,1-TRICHLOROETHANE	ug/kg	20000	<1.15 U	<1.32 U	<123 U	<330 U	<1.23 U	<1.15 U	<1.16 U	<1.31 U	<1.17 U	<1.13 U	<1.16 U	<1.22 U
1,1,2,2-TETRACHLOROETHANE	ug/kg	1400	<1.15 U	<1.32 U	<123 U	<330 U	<1.23 U	<1.15 U	<1.16 U	<1.31 U	<1.17 U	<1.13 U	<1.16 U	<1.22 U
1,1,2-TRICHLOROETHANE	ug/kg	500	<1.15 U	<1.32 U	<123 U	<330 U	<1.23 U	<1.15 U	<1.16 U	<1.31 U	<1.17 U	<1.13 U	<1.16 U	<1.22 U
1,1-DICHLOROETHANE	ug/kg	1000000	<2.3 U	<2.64 U	<246 U	<662 U	<2.46 U	<2.30 U	<2.32 U	<2.62 U	<2.34 U	<2.26 U	<2.32 U	<2.44 U
1,1-DICHLOROETHENE	ug/kg	700	<1.15 U	<1.32 U	<123 U	<330 U	<1.23 U	<1.15 U	<1.16 U	<1.31 U	<1.17 U	<1.13 U	<1.16 U	3.86 J
1,1-DICHLOROPROPENE	ug/kg	290	<1.15 U	<1.32 U	<123 U	<330 U	<1.23 U	<1.15 U	<1.16 U	<1.31 U	<1.17 U	<1.13 U	<1.16 U	<1.22 U
1,2,3-TRICHLOROBENZENE	ug/kg	31000	<1.15 U	<1.32 U	<123 U	<330 U	<1.23 U	<1.15 U	<1.16 U	<1.31 U	<1.17 U	<1.13 U	<1.16 U	<1.22 U
1,2,3-TRICHLOROPROPANE	ug/kg	4.1	<2.3 U	<2.64 U	<246 U	<662 U	<2.46 U	<2.30 U	<2.32 U	<2.62 U	<2.34 U	<2.26 U	<2.32 U	<2.44 U
1,2,4-TRICHLOROBENZENE	ug/kg	7000	<1.15 U	<1.32 U	<123 U	<330 U	<1.23 U	<1.15 U	<1.16 U	<1.31 U	<1.17 U	<1.13 U	<1.16 U	<1.22 U
1,2,4-TRIMETHYLBENZENE	ug/kg	510000	<1.15 U	<1.32 U	<123 U	<330 U	<1.23 U	<1.15 U	<1.16 U	<1.31 U	<1.17 U	<1.13 U	<1.16 U	<1.22 U
1,2-DIBROMO-3-CHLOROPROPANE	ug/kg	20	<4.58 U	<5.28 U	<494 U	<1320 U	<4.92 U	<4.60 U	<4.64 U	<5.22 U	<4.68 U	<4.52 U	<4.64 U	<4.88 U
1,2-DIBROMOETHANE	ug/kg	5	<1.15 U	<1.32 U	<123 U	<330 U	<1.23 U	<1.15 U	<1.16 U	<1.31 U	<1.17 U	<1.13 U	<1.16 U	<1.22 U
1,2-DICHLOROBENZENE	ug/kg	60000	<1.15 U	<1.32 U	<123 U	<330 U	<1.23 U	<1.15 U	<1.16 U	<1.31 U	<1.17 U	<1.13 U	<1.16 U	<1.22 U
1,2-DICHLOROETHANE	ug/kg	500	<1.15 U	<1.32 U	<123 U	<330 U	<1.23 U	<1.15 U	<1.16 U	<1.31 U	<1.17 U	<1.13 U	<1.16 U	<1.22 U
1,2-DICHLOROPROPANE	ug/kg	500	<1.15 U	<1.32 U	<123 U	<330 U	<1.23 U	<1.15 U	<1.16 U	<1.31 U	<1.17 U	<1.13 U	<1.16 U	<1.22 U
1,3,5-TRIMETHYLBENZENE	ug/kg	510000	<1.15 U	<1.32 U	<123 U	<330 U	<1.23 U	<1.15 U	<1.16 U	<1.31 U	<1.17 U	<1.13 U	<1.16 U	<1.22 U
1,3-DICHLOROBENZENE	ug/kg	310000	<1.15 U	<1.32 U	<123 U	<330 U	<1.23 U	<1.15 U	<1.16 U	<1.31 U	<1.17 U	<1.13 U	<1.16 U	<1.22 U
1,3-DICHLOROPROPANE	ug/kg	2900	<1.15 U	<1.32 U	<123 U	<330 U	<1.23 U	<1.15 U	<1.16 U	<1.31 U	<1.17 U	<1.13 U	<1.16 U	<1.22 U
1,4-DICHLOROBENZENE	ug/kg	7500	<1.15 U	<1.32 U	<123 U	<330 U	<1.23 U	<1.15 U	<1.16 U	<1.31 U	<1.17 U	<1.13 U	<1.16 U	<1.22 U
2,2-DICHLOROPROPANE	ug/kg	4200	<1.15 U	<1.32 U	<123 U	<330 U	<1.23 U	<1.15 U	<1.16 U	<1.31 U	<1.17 U	<1.13 U	<1.16 U	<1.22 U
2-BUTANONE	ug/kg	6100000	<5.74 U	<6.6 U	<616 U	<1650 U	<6.16 U	<5.76 U	<5.80 U	<6.52 U	<5.84 U	<5.64 U	<5.80 U	<6.12 U
2-CHLOROTOLUENE	ug/kg	200000	<1.15 U	<1.32 U	<123 U	<330 U	<1.23 U	<1.15 U	<1.16 U	<1.31 U	<1.17 U	<1.13 U	<1.16 U	<1.22 U
2-HEXANONE	ug/kg	610000	<5.74 U	<6.6 U	<616 U	<1650 U	<6.16 U	<5.76 U	<5.80 U	<6.52 U	<5.84 U	<5.64 U	<5.80 U	<6.12 U
4-CHLOROTOLUENE	ug/kg	200000	<1.15 U	<1.32 U	<123 U	<330 U	<1.23 U	<1.15 U	<1.16 U	<1.31 U	<1.17 U	<1.13 U	<1.16 U	<1.22 U
4-METHYL-2-PENTANONE	ug/kg	820000	<5.74 U	<6.6 U	<616 U	<1650 U	<6.16 U	<5.76 U	<5.80 U	<6.52 U	<5.84 U	<5.64 U	<5.80 U	<6.12 U
ACETONE	ug/kg	920000	<11.5 U	<13.2 U	<1230 U	<3300 U	21 J	<11.5 U	8.02 J	13 J	12.8 J	<11.3 U	6.71 J	<12.2 U
BENZENE	ug/kg	500	<1.15 U	<1.32 U	<123 U	<330 U	<1.23 U	<1.15 U	<1.16 U	<1.31 U	<1.17 U	<1.13 U	<1.16 U	<1.22 U
BROMOBENZENE	ug/kg	200000	<1.15 U	<1.32 U	<123 U	<330 U	<1.23 U	<1.15 U	<1.16 U	<1.31 U	<1.17 U	<1.13 U	<1.16 U	<1.22 U
BROMOCHLOROMETHANE	ug/kg	410000	<2.3 U	<2.64 U	<246 U	<662 U	<2.46 U	<2.30 U	<2.32 U	<1.31 U	<2.34 U	<2.26 U	<2.32 U	<2.44 U
BROMODICHLOROMETHANE	ug/kg	460	<1.15 U	<1.32 U	<123 U	<330 U	<1.23 U	<1.15 U	<1.16 U	10.9	<1.17 U	<1.13 U	<1.16 U	<1.22 U
BROMOFORM	ug/kg	3600	<1.15 U	<1.32 U	<123 U	<330 U	<1.23 U	<1.15 U	<1.16 U	<1.31 U	<1.17 U	<1.13 U	<1.16 U	<1.22 U
BROMOMETHANE	ug/kg	14000	<2.3 U	<2.64 U	<246 U	<662 U	<2.46 U	<2.30 U	<2.32 U	<2.62 U	<2.34 U	<2.26 U	<2.32 U	<2.44 U
CARBON DISULFIDE	ug/kg	1000000	<1.15 U	<1.32 U	<123 U	<330 U	<1.23 U	<1.15 U	<1.16 U	<1.31 U	<1.17 U	<1.13 U	<1.16 U	<1.22 U
CARBON TETRACHLORIDE	ug/kg	500	<1.15 U	<1.32 U	<123 U	<330 U	<1.23 U	<1.15 U	<1.16 U	<1.31 U	<1.17 U	<1.13 U	<1.16 U	<1.22 U
CHLOROBENZENE	ug/kg	10000	<1.15 U	<1.32 U	<123 U	<330 U	<1.23 U	<1.15 U	<1.16 U	<1.31 U	<1.17 U	<1.13 U	<1.16 U	<1.22 U
CHLOROETHANE	ug/kg	4100000	<2.3 U	<2.64 U	<246 U	<662 U	<2.46 U	<2.30 U	<2.32 U	<2.62 U	<2.34 U	<2.26 U	<2.32 U	<2.44 U
CHLOROFORM	ug/kg	100000	<1.15 U	<1.32 U	<123 U	<330 U	<1.23 U	<1.15 U	<1.16 U	2.3 J	1.79 J	1.25 J	2.49 J	1.37 J
CHLOROMETHANE	ug/kg	22000	<4.58 U	<5.28 U	<494 U	<1320 U	<4.92 U	<4.60 U	<4.64 U	<5.22 U	<4.68 U	<4.52 U	<4.64 U	<4.88 U
CIS-1,2-DICHLOROETHENE	ug/kg	7000	<1.15 U	0.753 J	2750	936 J	1.43 J	7.56	<1.16 U	1.14 J	<1.17 U	<1.13 U	<1.16 U	102
CIS-1,3-DICHLOROPROPENE	ug/kg	530	<1.15 U	<1.32 U	<123 U	<330 U	<1.23 U	<1.15 U	<1.16 U	<1.31 U	<1.17 U	<1.13 U	<1.16 U	<1.22 U
DIBROMOCHLOROMETHANE	ug/kg	3400	<1.15 U	<1.32 U	<123 U	<330 U	<1.23 U	<1.15 U	<1.16 U	<1.31 U	<1.17 U	<1.13 U	<1.16 U	<1.22 U

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Location ID: Sample Date:	Units	MCL/ MSC	18CPTPB14 (6-7)280514 5/28/2014	18CPTUEP01 (10-11)120514 5/12/2014	18CPTUEP01 (29-30)120514 5/12/2014	18CPTUEP01 (36-37)120514 5/12/2014	18CPTUEP01 (45-46)120514 5/12/2014	18CPTUEP02 (17-18)120514 5/12/2014	18CPTUEP02 (26-27)120514 5/12/2014	18CPTUEP02(40-41)120514 5/12/2014	18CPTUEP02 (47.5-48.5)120514 5/12/2014	18CPTUEP03 (1-2)130514 5/13/2014	18CPTUEP03 (19-20)130514 5/13/2014	18CPTUEP03 (27-28)130514 5/13/2014
Location Description:			UEP Area vadose zone MIP verification soil sample.	UEP Area. MIP verification soil sampling.	UEP Area. MIP verification soil sampling.	UEP Area. MIP verification soil sampling.	UEP Area. MIP verification soil sampling.	UEP Area. MIP verification soil sampling.	UEP Area. MIP verification soil sampling.	UEP Area. MIP verification soil sampling.	UEP Area. MIP verification soil sampling.	UEP Area. MIP verification soil sampling.	UEP Area. MIP verification soil sampling.	UEP Area. MIP verification soil sampling.
DIBROMOMETHANE	ug/kg	38000	<1.15 U	<1.32 U	<123 U	<330 U	<1.23 U	<1.15 U	<1.16 U	<1.31 U	<1.17 U	<1.13 U	<1.16 U	<1.22 U
DICHLORODIFLUOROMETHANE	ug/kg	2000000	<2.3 U	<2.64 U	<246 U	<662 U	<2.46 U	<2.30 U	<2.32 U	<2.62 U	<2.34 U	<2.26 U	<2.32 U	<2.44 U
ETHYLBENZENE	ug/kg	70000	<1.15 U	<1.32 U	<123 U	<330 U	<1.23 U	<1.15 U	<1.16 U	<1.31 U	<1.17 U	<1.13 U	<1.16 U	<1.22 U
HEXACHLOROBUTADIENE	ug/kg	2000	<1.15 U	<1.32 U	<123 U	<330 U	<1.23 U	<1.15 U	<1.16 U	<1.31 U	<1.17 U	<1.13 U	<1.16 U	<1.22 U
ISOPROPYLBENZENE	ug/kg	1000000	<1.15 U	<1.32 U	<123 U	<330 U	<1.23 U	<1.15 U	<1.16 U	<1.31 U	<1.17 U	<1.13 U	<1.16 U	<1.22 U
M,P-XYLENE	ug/kg	1000000	<1.15 U	<1.32 U	<123 U	<330 U	<1.23 U	<1.15 U	<1.16 U	<1.31 U	<1.17 U	<1.13 U	<1.16 U	<1.22 U
METHYLENE CHLORIDE	ug/kg	500	4.26 J	22.5	26200	64800	100	10.8	3.43 J	15000	28.4	7.81	20.3	18.1
NAPHTHALENE	ug/kg	200000	<1.15 U	0.799 J	<123 U	<330 U	<1.23 U	<1.15 U	<1.16 U	<1.31 U	<1.17 U	<1.13 U	<1.16 U	<1.22 U
N-BUTYLBENZENE	ug/kg	410000	<1.15 U	<1.32 U	<123 U	<330 U	<1.23 U	<1.15 U	<1.16 U	<1.31 U	<1.17 U	<1.13 U	<1.16 U	<1.22 U
N-PROPYLBENZENE	ug/kg	410000	<1.15 U	<1.32 U	<123 U	<330 U	<1.23 U	<1.15 U	<1.16 U	<1.31 U	<1.17 U	<1.13 U	<1.16 U	<1.22 U
O-XYLENE	ug/kg	1000000	<1.15 U	<1.32 U	<123 U	<330 U	<1.23 U	<1.15 U	<1.16 U	<1.31 U	<1.17 U	<1.13 U	<1.16 U	<1.22 U
P-ISOPROPYLTOLUENE	ug/kg	1000000	<1.15 U	<1.32 U	<123 U	<330 U	<1.23 U	<1.15 U	<1.16 U	<1.31 U	<1.17 U	<1.13 U	<1.16 U	<1.22 U
SEC-BUTYLBENZENE	ug/kg	410000	<1.15 U	<1.32 U	<123 U	<330 U	<1.23 U	<1.15 U	<1.16 U	<1.31 U	<1.17 U	<1.13 U	<1.16 U	<1.22 U
STYRENE	ug/kg	10000	<1.15 U	<1.32 U	<123 U	<330 U	<1.23 U	<1.15 U	<1.16 U	<1.31 U	<1.17 U	<1.13 U	<1.16 U	<1.22 U
TERT-BUTYLBENZENE	ug/kg	410000	<1.15 U	<1.32 U	<123 U	<330 U	<1.23 U	<1.15 U	<1.16 U	<1.31 U	<1.17 U	<1.13 U	<1.16 U	<1.22 U
TETRACHLOROETHENE	ug/kg	500	<1.15 U	<1.32 U	<123 U	<330 U	<1.23 U	<1.15 U	<1.16 U	<1.31 U	<1.17 U	<1.13 U	<1.16 U	<1.22 U
TOLUENE	ug/kg	100000	<1.15 U	<1.32 U	<123 U	<330 U	<1.23 U	<1.15 U	<1.16 U	<1.31 U	<1.17 U	<1.13 U	<1.16 U	<1.22 U
TRANS-1,2-DICHLOROETHENE	ug/kg	10000	<1.15 U	<1.32 U	<123 U	<330 U	<1.23 U	<1.15 U	<1.16 U	<1.31 U	<1.17 U	<1.13 U	<1.16 U	0.814 J
TRANS-1,3-DICHLOROPROPENE	ug/kg	2900	<1.15 U	<1.32 U	<123 U	<330 U	<1.23 U	<1.15 U	<1.16 U	<1.31 U	<1.17 U	<1.13 U	<1.16 U	<1.22 U
TRICHLOROETHENE	ug/kg	500	2.76 J	4.66 J	75.5 J	3980	2.22 J	22.5	8.84	127	2.47 J	0.949 J	8.84	367
TRICHLOROFLUOROMETHANE	ug/kg	3100000	<2.3 U	<2.64 U	<246 U	<662 U	<2.46 U	<2.30 U	<2.32 U	<2.62 U	<2.34 U	<2.26 U	<2.32 U	<2.44 U
VINYL CHLORIDE	ug/kg	200	<2.3 U	<2.64 U	<246 U	<662 U	<2.46 U	<2.30 U	<2.32 U	<2.62 U	<2.34 U	<2.26 U	<2.32 U	<2.44 U
Percent Solids (D2216-90)														
Solids, Percent	%		82.4	81	83.9	80.8	81.6	82.6	86.9	80.6	78.6	85.2	81.8	82.8
Total Organic Carbon (LYDKHN)														
TOTAL ORGANIC CARBON (TOC)	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Blue Highlighting Indicates concentrations above the MCL/MSC

Note: Some samples may have been diluted due to the concentration(s) of one or more analytes exceeding the upper limit of the calibration curve.

J - Estimated: The analyte was positively identified, the quantitation is an estimation due to discrepancies in meeting certain analyte-specific quality control criteria.

MCL/MSC - Maximum Contaminant Limit/Medium-Specific Concentrations

mg/kg - milligrams per kilogram

N/A - not analyzed

U - Undetected: The analyte was analyzed for, but not detected.

UJ - The analyte was not detected; however, the result is estimated due to discrepancies in meeting certain analyte-specific quality control criteria.

ug/kg - micrograms per kilogram

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Location ID: **Sample Date:**	**Units**	**MCL/ MSC**	**18CPTUEP03 (42-43)130514 5/13/2014**	**18CPTUEP04 (23-24)190514 5/19/2014**	**18CPTUEP04 (37-38)190514 5/19/2014**	**18CPTUEP04 (47-48)190514 5/19/2014**	**18CPTUEP04 (5.5-6.5)190514 5/19/2014**	**18CPTUEP05 (22-23)190514 5/19/2014**	**18CPTUEP05 (24-25)190514 5/19/2014**	**18CPTUEP05 (3.5-4.5)190514 5/19/2014**	**18CPTUEP05 (33-34)190514 5/19/2014**	**18CPTUEP05 (42-43)190514 5/19/2014**	**18CPTUEP05 (54-55)190514 5/19/2014**	**18CPTUEP06 (29-30)190514 5/19/2014**
Location Description:			UEP Area. MIP verification soil sampling.	UEP Area. MIP verification soil sampling.	UEP Area. MIP verification soil sampling.	UEP Area. MIP verification soil sampling.	UEP Area. MIP verification soil sampling.	UEP Area. MIP verification soil sampling.	UEP Area. MIP verification soil sampling.	UEP Area. MIP verification soil sampling.	UEP Area. MIP verification soil sampling.	UEP Area. MIP verification soil sampling.	UEP Area. MIP verification soil sampling.	UEP Area. MIP verification soil sampling.
Perchlorate (6850)														
PERCHLORATE	ug/kg	7200	8390	1.63 J	52	9020	<2.08 U	115	27.2	<2.20 U	<2.06 U	3.23 J	16900	400
Volatile Organic Compounds (8260B)														
1,1,1,2-TETRACHLOROETHANE	ug/kg	11000	<1.22 U	<1 U	<1.11 U	<1.04 U	<1.05 U	<0.938 U	<119 U	<1.04 U	<1.01 U	<1.08 U	<1.13 U	<1.11 U
1,1,1-TRICHLOROETHANE	ug/kg	20000	<1.22 U	<1 U	<1.11 U	<1.04 U	<1.05 U	<0.938 U	<119 U	<1.04 U	<1.01 U	<1.08 U	<1.13 U	<1.11 U
1,1,2,2-TETRACHLOROETHANE	ug/kg	1400	<1.22 U	<1 U	<1.11 U	<1.04 U	<1.05 U	<0.938 U	<119 U	<1.04 U	<1.01 U	<1.08 U	<1.13 U	<1.11 U
1,1,2-TRICHLOROETHANE	ug/kg	500	<1.22 U	<1 U	<1.11 U	<1.04 U	<1.05 U	<0.938 U	<119 U	<1.04 U	<1.01 U	<1.08 U	<1.13 U	1.26 J
1,1-DICHLOROETHANE	ug/kg	1000000	<2.44 U	<2 U	<2.22 U	<2.08 U	<2.1 U	<1.88 U	<238 U	<2.08 U	<2.02 U	<2.16 U	<2.26 U	<2.22 U
1,1-DICHLOROETHENE	ug/kg	700	3.86 J	<1 U	<1.11 U	<1.04 U	<1.05 U	<0.938 U	<119 U	<1.04 U	<1.01 U	<1.08 U	<1.13 U	<1.11 U
1,1-DICHLOROPROPENE	ug/kg	290	<1.22 U	<1 U	<1.11 U	<1.04 U	<1.05 U	<0.938 U	<119 U	<1.04 U	<1.01 U	<1.08 U	<1.13 U	<1.11 U
1,2,3-TRICHLOROBENZENE	ug/kg	31000	<1.22 U	<1 U	<1.11 U	<1.04 U	<1.05 U	<0.938 U	<119 U	<1.04 U	<1.01 U	<1.08 U	<1.13 U	<1.11 U
1,2,3-TRICHLOROPROPANE	ug/kg	4.1	<2.44 U	<2 U	<2.22 U	<2.08 U	<2.1 U	<1.88 U	<238 U	<2.08 U	<2.02 U	<2.16 U	<2.26 U	<2.22 U
1,2,4-TRICHLOROBENZENE	ug/kg	7000	<1.22 U	<1 U	<1.11 U	<1.04 U	<1.05 U	<0.938 U	<119 U	<1.04 U	<1.01 U	<1.08 U	<1.13 U	<1.11 U
1,2,4-TRIMETHYLBENZENE	ug/kg	510000	<1.22 U	<1 U	<1.11 U	<1.04 U	<1.05 U	<0.938 U	<119 U	<1.04 U	<1.01 U	<1.08 U	<1.13 U	<1.11 U
1,2-DIBROMO-3-CHLOROPROPANE	ug/kg	20	<4.88 U	<4 U	<4.44 U	<4.18 U	<4.2 U	<3.76 U	<476 U	<4.16 U	<4.04 U	<4.34 U	<4.52 U	<4.46 U
1,2-DIBROMOETHANE	ug/kg	5	<1.22 U	<1 U	<1.11 U	<1.04 U	<1.05 U	<0.938 U	<119 U	<1.04 U	<1.01 U	<1.08 U	<1.13 U	<1.11 U
1,2-DICHLOROBENZENE	ug/kg	60000	<1.22 U	<1 U	<1.11 U	<1.04 U	<1.05 U	<0.938 U	<119 U	<1.04 U	<1.01 U	<1.08 U	<1.13 U	<1.11 U
1,2-DICHLOROETHANE	ug/kg	500	<1.22 U	<1 U	<1.11 U	<1.04 U	<1.05 U	<0.938 U	<119 U	<1.04 U	<1.01 U	<1.08 U	<1.13 U	<1.11 U
1,2-DICHLOROPROPANE	ug/kg	500	<1.22 U	<1 U	<1.11 U	<1.04 U	<1.05 U	<0.938 U	<119 U	<1.04 U	<1.01 U	<1.08 U	<1.13 U	<1.11 U
1,3,5-TRIMETHYLBENZENE	ug/kg	510000	<1.22 U	<1 U	<1.11 U	<1.04 U	<1.05 U	<0.938 U	<119 U	<1.04 U	<1.01 U	<1.08 U	<1.13 U	<1.11 U
1,3-DICHLOROBENZENE	ug/kg	310000	<1.22 U	<1 U	<1.11 U	<1.04 U	<1.05 U	<0.938 U	<119 U	<1.04 U	<1.01 U	<1.08 U	<1.13 U	<1.11 U
1,3-DICHLOROPROPANE	ug/kg	2900	<1.22 U	<1 U	<1.11 U	<1.04 U	<1.05 U	<0.938 U	<119 U	<1.04 U	<1.01 U	<1.08 U	<1.13 U	<1.11 U
1,4-DICHLOROBENZENE	ug/kg	7500	<1.22 U	<1 U	<1.11 U	<1.04 U	<1.05 U	<0.938 U	<119 U	<1.04 U	<1.01 U	<1.08 U	<1.13 U	<1.11 U
2,2-DICHLOROPROPANE	ug/kg	4200	<1.22 U	<1 U	<1.11 U	<1.04 U	<1.05 U	<0.938 U	<119 U	<1.04 U	<1.01 U	<1.08 U	<1.13 U	<1.11 U
2-BUTANONE	ug/kg	6100000	<6.12 U	<5 U	<5.56 U	<5.22 U	<5.24 U	<4.68 U	<596 U	<5.2 U	<5.04 U	<5.42 U	<5.66 U	8 J
2-CHLOROTOLUENE	ug/kg	200000	<1.22 U	<1 U	<1.11 U	<1.04 U	<1.05 U	<0.938 U	<119 U	<1.04 U	<1.01 U	<1.08 U	<1.13 U	<1.11 U
2-HEXANONE	ug/kg	610000	<6.12 U	<5 U	<5.56 U	<5.22 U	<5.24 U	<4.68 U	<596 U	<5.2 U	<5.04 U	<5.42 U	<5.66 U	<5.56 U
4-CHLOROTOLUENE	ug/kg	200000	<1.22 U	<1 U	<1.11 U	<1.04 U	<1.05 U	<0.938 U	<119 U	<1.04 U	<1.01 U	<1.08 U	<1.13 U	<1.11 U
4-METHYL-2-PENTANONE	ug/kg	820000	<6.12 U	<5 U	<5.56 U	<5.22 U	<5.24 U	<4.68 U	<596 U	<5.2 U	<5.04 U	<5.42 U	<5.66 U	3.49 J
ACETONE	ug/kg	920000	14.3 J	5.35 J	<11.1 U	<10.4 U	9.08 J	5.58 J	<1190 U	36.8	12.9 J	6.4 J	<11.3 U	62.2
BENZENE	ug/kg	500	<1.22 U	<1 U	<1.11 U	<1.04 U	<1.05 U	<0.938 U	<119 U	<1.04 U	<1.01 U	<1.08 U	<1.13 U	<1.11 U
BROMOBENZENE	ug/kg	200000	<1.22 U	<1 U	<1.11 U	<1.04 U	<1.05 U	<0.938 U	<119 U	<1.04 U	<1.01 U	<1.08 U	<1.13 U	<1.11 U
BROMOCHLOROMETHANE	ug/kg	410000	<2.44 U	<2 U	<2.22 U	<2.08 U	<2.1 U	<1.88 U	<238 U	<2.08 U	<2.02 U	<2.16 U	<2.26 U	<2.22 U
BROMODICHLOROMETHANE	ug/kg	460	<1.22 U	<1 U	<1.11 U	<1.04 U	<1.05 U	<0.938 U	<119 U	<1.04 U	<1.01 U	<1.08 U	<1.13 U	<1.11 U
BROMOFORM	ug/kg	3600	<1.22 U	<1 U	<1.11 U	<1.04 U	<1.05 U	<0.938 U	<119 U	<1.04 U	<1.01 U	<1.08 U	<1.13 U	<1.11 U
BROMOMETHANE	ug/kg	14000	<2.44 U	<2 U	<2.22 U	<2.08 U	<2.1 U	<1.88 U	<238 U	<2.08 U	<2.02 U	<2.16 U	<2.26 U	<2.22 U
CARBON DISULFIDE	ug/kg	1000000	<1.22 U	<1 U	<1.11 U	<1.04 U	<1.05 U	<0.938 U	<119 U	<1.04 U	<1.01 U	<1.08 U	<1.13 U	<1.11 U
CARBON TETRACHLORIDE	ug/kg	500	<1.22 U	<1 U	<1.11 U	<1.04 U	<1.05 U	<0.938 U	<119 U	<1.04 U	<1.01 U	<1.08 U	<1.13 U	<1.11 U
CHLOROBENZENE	ug/kg	10000	<1.22 U	<1 U	<1.11 U	<1.04 U	<1.05 U	<0.938 U	<119 U	<1.04 U	<1.01 U	<1.08 U	<1.13 U	<1.11 U
CHLOROETHANE	ug/kg	4100000	<2.44 U	<2 U	<2.22 U	<2.08 U	<2.1 U	<1.88 U	<238 U	<2.08 U	<2.02 U	<2.16 U	<2.26 U	<2.22 U
CHLOROFORM	ug/kg	100000	0.995 J	<1 U	<1.11 U	<1.04 U	<1.05 U	0.49 J	<119 U	<1.04 U	0.615 J	<1.08 U	<1.13 U	<1.11 U
CHLOROMETHANE	ug/kg	22000	<4.88 U	<4 UJ	<4.44 UJ	<4.18 UJ	<4.2 UJ	<3.76 UJ	<476 UJ	<4.16 UJ	<4.04 UJ	<4.34 UJ	<4.52 UJ	<4.46 U
CIS-1,2-DICHLOROETHENE	ug/kg	7000	102	<1 U	<1.11 U	<1.04 U	<1.05 U	1.83 J	<119 U	<1.04 U	0.643 J	<1.08 U	<1.13 U	<1.11 U
CIS-1,3-DICHLOROPROPENE	ug/kg	530	<1.22 U	<1 U	<1.11 U	<1.04 U	<1.05 U	<0.938 U	<119 U	<1.04 U	<1.01 U	<1.08 U	<1.13 U	<1.11 U
DIBROMOCHLOROMETHANE	ug/kg	3400	<1.22 U	<1 U	<1.11 U	<1.04 U	<1.05 U	<0.938 U	<119 U	<1.04 U	<1.01 U	<1.08 U	<1.13 U	<1.11 U

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Location ID: Sample Date:	Units	MCL/ MSC	18CPTUEP03 (42-43)130514 5/13/2014	18CPTUEP04 (23-24)190514 5/19/2014	18CPTUEP04 (37-38)190514 5/19/2014	18CPTUEP04 (47-48)190514 5/19/2014	18CPTUEP04 (5.5-6.5)190514 5/19/2014	18CPTUEP05 (22-23)190514 5/19/2014	18CPTUEP05 (24-25)190514 5/19/2014	18CPTUEP05 (3.5-4.5)190514 5/19/2014	18CPTUEP05 (33-34)190514 5/19/2014	18CPTUEP05 (42-43)190514 5/19/2014	18CPTUEP05 (54-55)190514 5/19/2014	18CPTUEP06 (29-30)190514 5/19/2014
Location Description:			UEP Area. MIP verification soil sampling.	UEP Area. MIP verification soil sampling.	UEP Area. MIP verification soil sampling.	UEP Area. MIP verification soil sampling.	UEP Area. MIP verification soil sampling.	UEP Area. MIP verification soil sampling.	UEP Area. MIP verification soil sampling.	UEP Area. MIP verification soil sampling.	UEP Area. MIP verification soil sampling.	UEP Area. MIP verification soil sampling.	UEP Area. MIP verification soil sampling.	UEP Area. MIP verification soil sampling.
DIBROMOMETHANE	ug/kg	38000	<1.22 U	<1 U	<1.11 U	<1.04 U	<1.05 U	<0.938 U	<119 U	<1.04 U	<1.01 U	<1.08 U	<1.13 U	<1.11 U
DICHLORODIFLUOROMETHANE	ug/kg	2000000	<2.44 U	<2 U	<2.22 U	<2.08 U	<2.1 U	<1.88 U	<238 U	<2.08 U	<2.02 U	<2.16 U	<2.26 U	<2.22 U
ETHYLBENZENE	ug/kg	70000	<1.22 U	<1 U	<1.11 U	<1.04 U	<1.05 U	<0.938 U	<119 U	<1.04 U	<1.01 U	<1.08 U	<1.13 U	<1.11 U
HEXACHLOROBUTADIENE	ug/kg	2000	<1.22 U	<1 U	<1.11 U	<1.04 U	<1.05 U	<0.938 U	<119 U	<1.04 U	<1.01 U	<1.08 U	<1.13 U	<1.11 U
ISOPROPYLBENZENE	ug/kg	1000000	<1.22 U	<1 U	<1.11 U	<1.04 U	<1.05 U	<0.938 U	<119 U	<1.04 U	<1.01 U	<1.08 U	<1.13 U	<1.11 U
M,P-XYLENE	ug/kg	1000000	<1.22 U	<1 U	<1.11 U	<1.04 U	<1.05 U	<0.938 U	<119 U	<1.04 U	<1.01 U	<1.08 U	<1.13 U	<1.11 U
METHYLENE CHLORIDE	ug/kg	500	11	1.54 J	2.34 J	1.92 J	1.43 J	2.91 J	3420	3.32 J	2.14 J	3.16 J	5.46 J	10
NAPHTHALENE	ug/kg	200000	<1.22 U	<1 U	<1.11 U	<1.04 U	<1.05 U	<0.938 U	<119 U	<1.04 U	<1.01 U	<1.08 U	<1.13 U	2.77 J
N-BUTYLBENZENE	ug/kg	410000	<1.22 U	<1 U	<1.11 U	<1.04 U	<1.05 U	<0.938 U	<119 U	<1.04 U	<1.01 U	<1.08 U	<1.13 U	<1.11 U
N-PROPYLBENZENE	ug/kg	410000	<1.22 U	<1 U	<1.11 U	<1.04 U	<1.05 U	<0.938 U	<119 U	<1.04 U	<1.01 U	<1.08 U	<1.13 U	<1.11 U
O-XYLENE	ug/kg	1000000	<1.22 U	<1 U	<1.11 U	<1.04 U	<1.05 U	<0.938 U	<119 U	<1.04 U	<1.01 U	<1.08 U	<1.13 U	<1.11 U
P-ISOPROPYLTOLUENE	ug/kg	1000000	<1.22 U	<1 U	<1.11 U	<1.04 U	<1.05 U	<0.938 U	<119 U	<1.04 U	<1.01 U	<1.08 U	<1.13 U	<1.11 U
SEC-BUTYLBENZENE	ug/kg	410000	<1.22 U	<1 U	<1.11 U	<1.04 U	<1.05 U	<0.938 U	<119 U	<1.04 U	<1.01 U	<1.08 U	<1.13 U	<1.11 U
STYRENE	ug/kg	10000	<1.22 U	<1 U	<1.11 U	<1.04 U	<1.05 U	<0.938 U	<119 U	<1.04 U	<1.01 U	<1.08 U	<1.13 U	0.56 J
TERT-BUTYLBENZENE	ug/kg	410000	<1.22 U	<1 U	<1.11 U	<1.04 U	<1.05 U	<0.938 U	<119 U	<1.04 U	<1.01 U	<1.08 U	<1.13 U	<1.11 U
TETRACHLOROETHENE	ug/kg	500	<1.22 U	<1 U	<1.11 U	<1.04 U	<1.05 U	<0.938 U	<119 U	<1.04 U	<1.01 U	<1.08 U	<1.13 U	<1.11 U
TOLUENE	ug/kg	100000	<1.22 U	<1 U	<1.11 U	<1.04 U	<1.05 U	<0.938 U	<119 U	<1.04 U	<1.01 U	<1.08 U	<1.13 U	<1.11 U
TRANS-1,2-DICHLOROETHENE	ug/kg	10000	0.814 J	<1 U	<1.11 U	<1.04 U	<1.05 U	<0.938 U	<119 U	<1.04 U	<1.01 U	<1.08 U	<1.13 U	<1.11 U
TRANS-1,3-DICHLOROPROPENE	ug/kg	2900	<1.22 U	<1 U	<1.11 U	<1.04 U	<1.05 U	<0.938 U	<119 U	<1.04 U	<1.01 U	<1.08 U	<1.13 U	<1.11 U
TRICHLOROETHENE	ug/kg	500	16.5	0.779 J	<1.11 U	<1.04 U	<1.05 U	2.16 J	407 J	1.64 J	1.5 J	<1.08 U	<1.13 U	5.67
TRICHLOROFLUOROMETHANE	ug/kg	3100000	<2.44 U	<2 U	<2.22 U	<2.08 U	<2.1 U	<1.88 U	<238 U	<2.08 U	<2.02 U	<2.16 U	<2.26 U	<2.22 U
VINYL CHLORIDE	ug/kg	200	<2.44 U	<2 U	<2.22 U	<2.08 U	<2.1 U	<1.88 U	<238 U	<2.08 U	<2.02 U	<2.16 U	<2.26 U	<2.22 U
Percent Solids (D2216-90)														
Solids, Percent	%		80.5	95.8	85.7	88.6	94.3	98.6	87.4	90.5	94.9	89.8	85.8	87.7
Total Organic Carbon (LYDKHN)														
TOTAL ORGANIC CARBON (TOC)	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Blue Highlighting Indicates concentrations above the MCL/MSC

Note: Some samples may have been diluted due to the concentration(s) of one or more analytes exceeding the upper limit of the calibration curve.

J - Estimated: The analyte was positively identified, the quantitation is an estimation due to discrepancies in meeting certain analyte-specific quality control criteria.

MCL/MSC - Maximum Contaminant Limit/Medium-Specific Concentrations

mg/kg - milligrams per kilogram

N/A - not analyzed

U - Undetected: The analyte was analyzed for, but not detected.

UJ - The analyte was not detected; however, the result is estimated due to discrepancies in meeting certain analyte-specific quality control criteria.

ug/kg - micrograms per kilogram

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Location ID: **Sample Date:**	**Units**	**MCL/ MSC**	**18CPTUEP06 (47-48)190514 5/19/2014**	**18CPTUEP06 (54-55)190514 5/19/2014**	**18CPTUEP06 (61-62)190514 5/19/2014**	**18CPTUEP09 (19-20)300514 5/30/2014**	**18CPTUEP09 (27-28)300514 5/30/2014**	**18CPTUEP09 (34-35)300514 5/30/2014**	**18CPTUEP09 (35-36)300514 5/30/2014**	**18CPTUEP09 (50-51)300514 5/30/2014**	**18CPTUEP09 (58-59)300514 5/30/2014**	**18CPTUEP09 (7-8)300514 5/30/2014**	**18CPTUEP09 (7-8)300514 D 5/30/2014**	**18CPTUEP10 (12-13)300514 5/30/2014**
Location Description:			UEP Area. MIP verification soil sampling.	UEP Area. MIP verification soil sampling.	UEP Area. MIP verification soil sampling.	UEP Area. MIP verification soil sampling.	UEP Area. MIP verification soil sampling.	UEP Area. MIP verification soil sampling.	UEP Area. MIP verification soil sampling.	UEP Area. MIP verification soil sampling.	UEP Area. MIP verification soil sampling.	UEP Area. MIP verification soil sampling.	UEP Area. MIP verification soil sampling.	UEP Area. MIP verification soil sampling.
Perchlorate (6850)														
PERCHLORATE	ug/kg	7200	7550	4460	105	1400	NA	NA	<1.2 U	<1.3 U	<1.3 U	<1.2 U	<1.2 U	1.8
Volatile Organic Compounds (8260B)														
1,1,1,2-TETRACHLOROETHANE	ug/kg	11000	<1.07 U	<121 U	<102 U	<1.22 U	NA	NA	<1.12 U	<1.17 U	<1.19 U	<5.82 U	<1.18 U	<1.26 U
1,1,1-TRICHLOROETHANE	ug/kg	20000	<1.07 U	<121 U	<102 U	<1.22 U	NA	NA	<1.12 U	<1.17 U	<1.19 U	<5.82 U	<1.18 U	<1.26 U
1,1,2,2-TETRACHLOROETHANE	ug/kg	1400	<1.07 U	<121 U	<102 U	<1.22 U	NA	NA	<1.12 U	<1.17 U	<1.19 U	<5.82 U	<1.18 U	<1.26 U
1,1,2-TRICHLOROETHANE	ug/kg	500	<1.07 U	<121 U	<102 U	<1.22 U	NA	NA	<1.12 U	<1.17 U	<1.19 U	<5.82 U	<1.18 U	<1.26 U
1,1-DICHLOROETHANE	ug/kg	1000000	<2.14 U	<242 U	<204 U	<2.44 U	NA	NA	<2.24 U	<2.34 U	<2.38 U	<11.7 U	<2.36 U	<2.52 U
1,1-DICHLOROETHENE	ug/kg	700	<1.07 U	<121 U	<102 U	<1.22 U	NA	NA	<1.12 U	<1.17 U	<1.19 U	<5.82 U	<1.18 U	<1.26 U
1,1-DICHLOROPROPENE	ug/kg	290	<1.07 U	<121 U	<102 U	<1.22 U	NA	NA	<1.12 U	<1.17 U	<1.19 U	<5.82 U	<1.18 U	<1.26 U
1,2,3-TRICHLOROBENZENE	ug/kg	31000	<1.07 U	<121 U	<102 U	<1.22 U	NA	NA	<1.12 U	<1.17 U	<1.19 U	<5.82 U	<1.18 U	<1.26 U
1,2,3-TRICHLOROPROPANE	ug/kg	4.1	<2.14 U	<242 U	<204 U	<2.44 U	NA	NA	<2.24 U	<2.34 U	<2.38 U	<11.7 U	<2.36 U	<2.52 U
1,2,4-TRICHLOROBENZENE	ug/kg	7000	<1.07 U	<121 U	<102 U	<1.22 U	NA	NA	<1.12 U	<1.17 U	<1.19 U	<5.82 U	<1.18 U	<1.26 U
1,2,4-TRIMETHYLBENZENE	ug/kg	510000	2.09 J	<121 U	<102 U	<1.22 U	NA	NA	<1.12 U	<1.17 U	<1.19 U	<5.82 U	<1.18 U	<1.26 U
1,2-DIBROMO-3-CHLOROPROPANE	ug/kg	20	<4.26 U	<482 U	<408 U	<4.88 U	NA	NA	<4.48 U	<4.68 U	<4.76 U	<23.4 U	<4.72 U	<5.06 U
1,2-DIBROMOETHANE	ug/kg	5	<1.07 U	<121 U	<102 U	<1.22 U	NA	NA	<1.12 U	<1.17 U	<1.19 U	<5.82 U	<1.18 U	<1.26 U
1,2-DICHLOROBENZENE	ug/kg	60000	<1.07 U	<121 U	<102 U	<1.22 U	NA	NA	<1.12 U	<1.17 U	<1.19 U	<5.82 U	<1.18 U	<1.26 U
1,2-DICHLOROETHANE	ug/kg	500	<1.07 U	<121 U	<102 U	<1.22 U	NA	NA	<1.12 U	<1.17 U	<1.19 U	3.02 J	<1.18 U	<1.26 U
1,2-DICHLOROPROPANE	ug/kg	500	<1.07 U	<121 U	<102 U	<1.22 U	NA	NA	<1.12 U	<1.17 U	<1.19 U	<5.82 U	<1.18 U	<1.26 U
1,3,5-TRIMETHYLBENZENE	ug/kg	510000	<1.07 U	<121 U	<102 U	<1.22 U	NA	NA	<1.12 U	<1.17 U	<1.19 U	<5.82 U	<1.18 U	<1.26 U
1,3-DICHLOROBENZENE	ug/kg	310000	<1.07 U	<121 U	<102 U	<1.22 U	NA	NA	<1.12 U	<1.17 U	<1.19 U	<5.82 U	<1.18 U	<1.26 U
1,3-DICHLOROPROPANE	ug/kg	2900	<1.07 U	<121 U	<102 U	<1.22 U	NA	NA	<1.12 U	<1.17 U	<1.19 U	<5.82 U	<1.18 U	<1.26 U
1,4-DICHLOROBENZENE	ug/kg	7500	<1.07 U	<121 U	<102 U	<1.22 U	NA	NA	<1.12 U	<1.17 U	<1.19 U	<5.82 U	<1.18 U	<1.26 U
2,2-DICHLOROPROPANE	ug/kg	4200	<1.07 U	<121 U	<102 U	<1.22 U	NA	NA	<1.12 U	<1.17 U	<1.19 U	<5.82 U	<1.18 U	<1.26 U
2-BUTANONE	ug/kg	6100000	4.94 J	<604 U	<508 U	<6.1 U	NA	NA	<5.6 U	<5.84 U	<5.94 U	<29.2 U	<5.9 U	<6.32 U
2-CHLOROTOLUENE	ug/kg	200000	<1.07 U	<121 U	<102 U	<1.22 U	NA	NA	<1.12 U	<1.17 U	<1.19 U	<5.82 U	<1.18 U	<1.26 U
2-HEXANONE	ug/kg	610000	<5.32 U	<604 U	<508 U	<6.1 U	NA	NA	<5.6 U	<5.84 U	<5.94 U	<29.2 U	<5.9 U	<6.32 U
4-CHLOROTOLUENE	ug/kg	200000	<1.07 U	<121 U	<102 U	<1.22 U	NA	NA	<1.12 U	<1.17 U	<1.19 U	<5.82 U	<1.18 U	<1.26 U
4-METHYL-2-PENTANONE	ug/kg	820000	9.91 J	<604 U	<508 U	<6.1 U	NA	NA	<5.6 U	<5.84 U	<5.94 U	<29.2 U	<5.9 U	<6.32 U
ACETONE	ug/kg	920000	31	<1210 U	<1020 U	<12.2 U	NA	NA	<11.2 U	19.4 J	12.4 J	<58.2 U	<11.8 U	<12.6 U
BENZENE	ug/kg	500	<1.07 U	<121 U	<102 U	<1.22 U	NA	NA	<1.12 U	<1.17 U	<1.19 U	<5.82 U	<1.18 U	<1.26 U
BROMOBENZENE	ug/kg	200000	<1.07 U	<121 U	<102 U	<1.22 U	NA	NA	<1.12 U	<1.17 U	<1.19 U	<5.82 U	<1.18 U	<1.26 U
BROMOCHLOROMETHANE	ug/kg	410000	<2.14 U	<242 U	<204 U	<2.44 U	NA	NA	<2.24 U	<2.34 U	<2.38 U	<11.7 U	<2.36 U	<2.52 U
BROMODICHLOROMETHANE	ug/kg	460	<1.07 U	<121 U	<102 U	<1.22 U	NA	NA	<1.12 U	<1.17 U	<1.19 U	<5.82 U	<1.18 U	<1.26 U
BROMOFORM	ug/kg	3600	<1.07 U	<121 U	<102 U	<1.22 U	NA	NA	<1.12 U	<1.17 U	<1.19 U	<5.82 U	<1.18 U	<1.26 U
BROMOMETHANE	ug/kg	14000	<2.14 U	<242 U	<204 U	<2.44 U	NA	NA	<2.24 U	<2.34 U	<2.38 U	<11.7 U	<2.36 U	<2.52 U
CARBON DISULFIDE	ug/kg	1000000	<1.07 U	<121 U	<102 U	<1.22 U	NA	NA	<1.12 U	<1.17 U	1.01 J	<5.82 U	<1.18 U	<1.26 U
CARBON TETRACHLORIDE	ug/kg	500	<1.07 U	<121 U	<102 U	<1.22 U	NA	NA	<1.12 U	<1.17 U	<1.19 U	<5.82 U	<1.18 U	<1.26 U
CHLOROBENZENE	ug/kg	10000	<1.07 U	<121 U	<102 U	<1.22 U	NA	NA	<1.12 U	<1.17 U	<1.19 U	<5.82 U	<1.18 U	<1.26 U
CHLOROETHANE	ug/kg	4100000	<2.14 U	<242 U	<204 U	<2.44 U	NA	NA	<2.24 U	<2.34 U	<2.38 U	<11.7 U	<2.36 U	<2.52 U
CHLOROFORM	ug/kg	100000	<1.07 U	<121 U	<102 U	<1.22 U	NA	NA	<1.12 U	<1.17 U	<1.19 U	3.43 J	<1.18 U	<1.26 U
CHLOROMETHANE	ug/kg	22000	<4.26 U	<482 UJ	<408 U	<4.88 U	NA	NA	<4.48 U	<4.68 U	<4.76 U	<23.4 U	<4.72 U	<5.06 U
CIS-1,2-DICHLOROETHENE	ug/kg	7000	<1.07 U	<121 U	<102 U	<1.22 U	NA	NA	4.76 J	<1.17 U	<1.19 U	13.7 J	0.604 J	0.648 J
CIS-1,3-DICHLOROPROPENE	ug/kg	530	<1.07 U	<121 U	<102 U	<1.22 U	NA	NA	<1.12 U	<1.17 U	<1.19 U	<5.82 U	<1.18 U	<1.26 U
DIBROMOCHLOROMETHANE	ug/kg	3400	<1.07 U	<121 U	<102 U	<1.22 U	NA	NA	<1.12 U	<1.17 U	<1.19 U	<5.82 U	<1.18 U	<1.26 U

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Location ID: Sample Date:	Units	MCL/ MSC	18CPTUEP06 (47-48)190514 5/19/2014	18CPTUEP06 (54-55)190514 5/19/2014	18CPTUEP06 (61-62)190514 5/19/2014	18CPTUEP09 (19-20)300514 5/30/2014	18CPTUEP09 (27-28)300514 5/30/2014	18CPTUEP09 (34-35)300514 5/30/2014	18CPTUEP09 (35-36)300514 5/30/2014	18CPTUEP09 (50-51)300514 5/30/2014	18CPTUEP09 (58-59)300514 5/30/2014	18CPTUEP09 (7-8)300514 5/30/2014	18CPTUEP09 (7-8)300514 D 5/30/2014	18CPTUEP10 (12-13)300514 5/30/2014
Location Description:			UEP Area. MIP verification soil sampling.	UEP Area. MIP verification soil sampling.	UEP Area. MIP verification soil sampling.	UEP Area. MIP verification soil sampling.	UEP Area. MIP verification soil sampling.	UEP Area. MIP verification soil sampling.	UEP Area. MIP verification soil sampling.	UEP Area. MIP verification soil sampling.	UEP Area. MIP verification soil sampling.	UEP Area. MIP verification soil sampling.	UEP Area. MIP verification soil sampling.	UEP Area. MIP verification soil sampling.
DIBROMOMETHANE	ug/kg	38000	<1.07 U	<121 U	<102 U	<1.22 U	NA	NA	<1.12 U	<1.17 U	<1.19 U	<5.82 U	<1.18 U	<1.26 U
DICHLORODIFLUOROMETHANE	ug/kg	2000000	<2.14 U	<242 U	<204 UJ	<2.44 U	NA	NA	<2.24 U	<2.34 U	<2.38 U	<11.7 U	<2.36 U	<2.52 U
ETHYLBENZENE	ug/kg	70000	<1.07 U	<121 U	<102 U	<1.22 U	NA	NA	<1.12 U	<1.17 U	<1.19 U	<5.82 U	<1.18 U	<1.26 U
HEXACHLOROBUTADIENE	ug/kg	2000	<1.07 U	<121 U	<102 U	<1.22 U	NA	NA	<1.12 U	<1.17 U	<1.19 U	<5.82 U	<1.18 U	<1.26 U
ISOPROPYLBENZENE	ug/kg	1000000	<1.07 U	<121 U	<102 U	<1.22 U	NA	NA	<1.12 U	<1.17 U	<1.19 U	<5.82 U	<1.18 U	<1.26 U
M,P-XYLENE	ug/kg	1000000	<1.07 U	<121 U	<102 U	<1.22 U	NA	NA	<1.12 U	<1.17 U	<1.19 U	<5.82 U	<1.18 U	<1.26 U
METHYLENE CHLORIDE	ug/kg	500	61.8	3420	128 J	4.77 J	NA	NA	7.66	4.69 J	4.99 J	9.55 J	1.95 J	3.14 J
NAPHTHALENE	ug/kg	200000	15.6	<121 UJ	<102 U	<1.22 UJ	NA	NA	<1.12 UJ	<1.17 U	<1.19 UJ	<5.82 U	<1.18 UJ	<1.26 UJ
N-BUTYLBENZENE	ug/kg	410000	1.04 J	<121 U	<102 U	<1.22 U	NA	NA	<1.12 U	<1.17 U	<1.19 U	<5.82 U	<1.18 U	<1.26 U
N-PROPYLBENZENE	ug/kg	410000	<1.07 U	<121 U	<102 U	<1.22 U	NA	NA	<1.12 U	<1.17 U	<1.19 U	<5.82 U	<1.18 U	<1.26 U
O-XYLENE	ug/kg	1000000	<1.07 U	<121 U	<102 U	<1.22 U	NA	NA	<1.12 U	<1.17 U	<1.19 U	<5.82 U	<1.18 U	<1.26 U
P-ISOPROPYLTOLUENE	ug/kg	1000000	<1.07 U	<121 U	<102 U	<1.22 U	NA	NA	<1.12 U	<1.17 U	<1.19 U	<5.82 U	<1.18 U	<1.26 U
SEC-BUTYLBENZENE	ug/kg	410000	<1.07 U	<121 U	<102 U	<1.22 U	NA	NA	<1.12 U	<1.17 U	<1.19 U	<5.82 U	<1.18 U	<1.26 U
STYRENE	ug/kg	10000	19.9	187 J	<102 U	<1.22 U	NA	NA	<1.12 U	<1.17 U	<1.19 U	<5.82 U	<1.18 U	<1.26 U
TERT-BUTYLBENZENE	ug/kg	410000	<1.07 U	<121 U	<102 U	<1.22 U	NA	NA	<1.12 U	<1.17 U	<1.19 U	<5.82 U	<1.18 U	<1.26 U
TETRACHLOROETHENE	ug/kg	500	<1.07 U	<121 U	<102 U	<1.22 U	NA	NA	<1.12 U	<1.17 U	<1.19 U	<5.82 U	<1.18 U	<1.26 U
TOLUENE	ug/kg	100000	<1.07 U	<121 U	<102 U	<1.22 U	NA	NA	<1.12 U	<1.17 U	<1.19 U	<5.82 U	<1.18 U	<1.26 U
TRANS-1,2-DICHLOROETHENE	ug/kg	10000	<1.07 U	<121 U	<102 U	<1.22 U	NA	NA	<1.12 U	<1.17 U	<1.19 U	<5.82 U	<1.18 U	<1.26 U
TRANS-1,3-DICHLOROPROPENE	ug/kg	2900	<1.07 U	<121 U	<102 U	<1.22 U	NA	NA	<1.12 U	<1.17 U	<1.19 U	<5.82 U	<1.18 U	<1.26 U
TRICHLOROETHENE	ug/kg	500	17.6	338 J	4540	1.67 J	NA	NA	5.29 J	2.19 J	0.749 J	404	14.3	15.7
TRICHLOROFLUOROMETHANE	ug/kg	3100000	<2.14 U	<242 U	<204 U	<2.44 U	NA	NA	<2.24 U	<2.34 U	<2.38 U	<11.7 U	<2.36 U	<2.52 U
VINYL CHLORIDE	ug/kg	200	<2.14 U	<242 UJ	<204 U	<2.44 U	NA	NA	<2.24 U	<2.34 U	<2.38 U	<11.7 U	<2.36 U	<2.52 U
Percent Solids (D2216-90)														
Solids, Percent	%		91.7	87.1	94.5	80.2	83.7	83.1	82	81	78.2	80.2	81.5	78.7
Total Organic Carbon (LYDKHN)														
TOTAL ORGANIC CARBON (TOC)	mg/kg		NA	NA	NA	NA	<1000 UJ	<1000 UJ	NA	NA	NA	NA	NA	NA

Blue Highlighting Indicates concentrations above the MCL/MSC

Note: Some samples may have been diluted due to the concentration(s) of one or more analytes exceeding the upper limit of the calibration curve.

J - Estimated: The analyte was positively identified, the quantitation is an estimation due to discrepancies in meeting certain analyte-specific quality control criteria.

MCL/MSC - Maximum Contaminant Limit/Medium-Specific Concentrations

mg/kg - milligrams per kilogram

N/A - not analyzed

U - Undetected: The analyte was analyzed for, but not detected.

UJ - The analyte was not detected; however, the result is estimated due to discrepancies in meeting certain analyte-specific quality control criteria.

ug/kg - micrograms per kilogram

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May/June 2014

Location ID: Sample Date:	Units	MCL/ MSC	18CPTUEP10 (19-20)300514 5/30/2014	18CPTUEP10 (30-31)300514 5/30/2014	18CPTUEP10 (45-47)300514 5/30/2014	18CPTUEP10 (54-55)310514 5/31/2014	18CPTUEP11 (12-13)310514 5/31/2014	18CPTUEP11 (19-20)310514 5/31/2014	18CPTUEP11 (25-26)310514 5/31/2014	18CPTUEP11 (28-29)310514 5/31/2014	18CPTUEP11 (45-46)310514 5/31/2014	18CPTUEP11 (45-47)310514 5/31/2014	18CPTUEP11 (59-60)310514 5/31/2014	18CPTUEP12 (16-17)310514 5/31/2014
Location Description:			UEP Area. MIP verification soil sampling.	UEP Area. MIP verification soil sampling.	UEP Area. MIP verification soil sampling.	UEP Area. MIP verification soil sampling.	UEP Area. MIP verification soil sampling.	UEP Area. MIP verification soil sampling.	UEP Area. MIP verification soil sampling.	UEP Area. MIP verification soil sampling.	UEP Area. MIP verification soil sampling.	UEP Area. MIP verification soil sampling.	UEP Area. MIP verification soil sampling.	UEP Area. MIP verification soil sampling.
Perchlorate (6850)														
PERCHLORATE	ug/kg	7200	410	1700	2300	1.6	5.9	19	NA	5	NA	940	8.1	8.4
Volatile Organic Compounds (8260B)														
1,1,1,2-TETRACHLOROETHANE	ug/kg	11000	<1.22 U	<1.16 U	<141 UJ	<1.13 U	<128 UJ	<1.14 U	NA	<1.17 U	NA	<136 UJ	<1.21 U	<1.17 U
1,1,1-TRICHLOROETHANE	ug/kg	20000	<1.22 U	<1.16 U	<141 UJ	<1.13 U	<128 UJ	<1.14 U	NA	<1.17 U	NA	<136 UJ	<1.21 U	<1.17 U
1,1,2,2-TETRACHLOROETHANE	ug/kg	1400	<1.22 U	<1.16 U	<141 UJ	<1.13 U	<128 UJ	<1.14 U	NA	<1.17 U	NA	<136 UJ	<1.21 U	<1.17 U
1,1,2-TRICHLOROETHANE	ug/kg	500	<1.22 U	<1.16 U	<141 UJ	<1.13 U	<128 UJ	<1.14 U	NA	<1.17 U	NA	<136 UJ	<1.21 U	<1.17 U
1,1-DICHLOROETHANE	ug/kg	1000000	<2.44 U	<2.32 U	<282 UJ	<2.26 U	<256 UJ	<2.28 U	NA	<2.34 U	NA	<272 UJ	<2.42 U	<2.34 U
1,1-DICHLOROETHENE	ug/kg	700	<1.22 U	<1.16 U	<141 UJ	<1.13 U	<128 UJ	<1.14 U	NA	<1.17 U	NA	<136 UJ	<1.21 U	<1.17 U
1,1-DICHLOROPROPENE	ug/kg	290	<1.22 U	<1.16 U	<141 UJ	<1.13 U	<128 UJ	<1.14 U	NA	<1.17 U	NA	<136 UJ	<1.21 U	<1.17 U
1,2,3-TRICHLOROBENZENE	ug/kg	31000	<1.22 U	<1.16 U	<141 UJ	<1.13 U	<128 UJ	<1.14 U	NA	<1.17 U	NA	<136 UJ	<1.21 U	<1.17 U
1,2,3-TRICHLOROPROPANE	ug/kg	4.1	<2.44 U	<2.32 U	<282 UJ	<2.26 U	<256 UJ	<2.28 U	NA	<2.34 U	NA	<272 UJ	<2.42 U	<2.34 U
1,2,4-TRICHLOROBENZENE	ug/kg	7000	<1.22 U	<1.16 U	<141 UJ	<1.13 U	<128 UJ	<1.14 U	NA	<1.17 U	NA	<136 UJ	<1.21 U	<1.17 U
1,2,4-TRIMETHYLBENZENE	ug/kg	510000	<1.22 U	<1.16 U	<141 UJ	<1.13 U	<128 UJ	<1.14 U	NA	<1.17 U	NA	<136 UJ	<1.21 U	<1.17 U
1,2-DIBROMO-3-CHLOROPROPANE	ug/kg	20	<4.86 U	<4.64 U	<564 UJ	<4.52 U	<512 UJ	<4.56 U	NA	<4.68 U	NA	<544 UJ	<4.84 U	<4.7 U
1,2-DIBROMOETHANE	ug/kg	5	<1.22 U	<1.16 U	<141 UJ	<1.13 U	<128 UJ	<1.14 U	NA	<1.17 U	NA	<136 UJ	<1.21 U	<1.17 U
1,2-DICHLOROBENZENE	ug/kg	60000	<1.22 U	<1.16 U	<141 UJ	<1.13 U	<128 UJ	<1.14 U	NA	<1.17 U	NA	<136 UJ	<1.21 U	<1.17 U
1,2-DICHLOROETHANE	ug/kg	500	<1.22 U	6.35	<141 UJ	<1.13 U	<128 UJ	<1.14 U	NA	<1.17 U	NA	<136 UJ	<1.21 U	<1.17 U
1,2-DICHLOROPROPANE	ug/kg	500	<1.22 U	<1.16 U	<141 UJ	<1.13 U	<128 UJ	<1.14 U	NA	<1.17 U	NA	<136 UJ	<1.21 U	<1.17 U
1,3,5-TRIMETHYLBENZENE	ug/kg	510000	<1.22 U	<1.16 U	<141 UJ	<1.13 U	<128 UJ	<1.14 U	NA	<1.17 U	NA	<136 UJ	<1.21 U	<1.17 U
1,3-DICHLOROBENZENE	ug/kg	310000	<1.22 U	<1.16 U	<141 UJ	<1.13 U	<128 UJ	<1.14 U	NA	<1.17 U	NA	<136 UJ	<1.21 U	<1.17 U
1,3-DICHLOROPROPANE	ug/kg	2900	<1.22 U	<1.16 U	<141 UJ	<1.13 U	<128 UJ	<1.14 U	NA	<1.17 U	NA	<136 UJ	<1.21 U	<1.17 U
1,4-DICHLOROBENZENE	ug/kg	7500	<1.22 U	<1.16 U	<141 UJ	<1.13 U	<128 UJ	<1.14 U	NA	<1.17 U	NA	<136 UJ	<1.21 U	<1.17 U
2,2-DICHLOROPROPANE	ug/kg	4200	<1.22 U	<1.16 U	<141 UJ	<1.13 U	<128 UJ	<1.14 U	NA	<1.17 U	NA	<136 UJ	<1.21 U	<1.17 U
2-BUTANONE	ug/kg	6100000	<6.08 U	<5.78 U	<706 UJ	<5.66 U	<638 UJ	<5.7 U	NA	<5.86 U	NA	<680 UJ	<6.06 U	<5.86 U
2-CHLOROTOLUENE	ug/kg	200000	<1.22 U	<1.16 U	<141 UJ	<1.13 U	<128 UJ	<1.14 U	NA	<1.17 U	NA	<136 UJ	<1.21 U	<1.17 U
2-HEXANONE	ug/kg	610000	<6.08 U	<5.78 U	<706 UJ	<5.66 U	<638 UJ	<5.7 U	NA	<5.86 U	NA	<680 UJ	<6.06 U	<5.86 U
4-CHLOROTOLUENE	ug/kg	200000	<1.22 U	<1.16 U	<141 UJ	<1.13 U	<128 UJ	<1.14 U	NA	<1.17 U	NA	<136 UJ	<1.21 U	<1.17 U
4-METHYL-2-PENTANONE	ug/kg	820000	<6.08 U	<5.78 U	<706 UJ	<5.66 U	<638 UJ	<5.7 U	NA	<5.86 U	NA	<680 UJ	<6.06 U	<5.86 U
ACETONE	ug/kg	920000	<12.2 U	<11.6 U	<1410 UJ	20 J	<1280 UJ	<11.4 U	NA	<11.7 U	NA	<1360 UJ	17.3 J	<11.7 U
BENZENE	ug/kg	500	<1.22 U	1.44 J	<141 UJ	<1.13 U	<128 UJ	<1.14 U	NA	<1.17 U	NA	<136 UJ	<1.21 U	<1.17 U
BROMOBENZENE	ug/kg	200000	<1.22 U	<1.16 U	<141 UJ	<1.13 U	<128 UJ	<1.14 U	NA	<1.17 U	NA	<136 UJ	<1.21 U	<1.17 U
BROMOCHLOROMETHANE	ug/kg	410000	<2.44 U	<2.32 U	<282 UJ	<2.26 U	<256 UJ	<2.28 U	NA	<2.34 U	NA	<272 UJ	<2.42 U	<2.34 U
BROMODICHLOROMETHANE	ug/kg	460	<1.22 U	<1.16 U	<141 UJ	<1.13 U	<128 UJ	<1.14 U	NA	<1.17 U	NA	<136 UJ	<1.21 U	<1.17 U
BROMOFORM	ug/kg	3600	<1.22 U	<1.16 U	<141 UJ	<1.13 U	<128 UJ	<1.14 U	NA	<1.17 U	NA	<136 UJ	<1.21 U	<1.17 U
BROMOMETHANE	ug/kg	14000	<2.44 U	<2.32 U	<282 UJ	<2.26 U	<256 UJ	<2.28 U	NA	<2.34 U	NA	<272 UJ	<2.42 U	<2.34 U
CARBON DISULFIDE	ug/kg	1000000	<1.22 U	<1.16 U	<141 UJ	<1.13 U	<128 UJ	<1.14 U	NA	<1.17 U	NA	<136 UJ	<1.21 U	<1.17 U
CARBON TETRACHLORIDE	ug/kg	500	<1.22 U	<1.16 U	<141 UJ	<1.13 U	<128 UJ	<1.14 U	NA	<1.17 U	NA	<136 UJ	<1.21 U	<1.17 U
CHLOROBENZENE	ug/kg	10000	<1.22 U	<1.16 U	<141 UJ	<1.13 U	<128 UJ	<1.14 U	NA	<1.17 U	NA	<136 UJ	<1.21 U	<1.17 U
CHLOROETHANE	ug/kg	4100000	<2.44 U	<2.32 U	<282 UJ	<2.26 U	<256 UJ	<2.28 U	NA	<2.34 U	NA	<272 UJ	<2.42 U	<2.34 U
CHLOROFORM	ug/kg	100000	<1.22 U	1.59 J	<141 UJ	<1.13 U	<128 UJ	<1.14 U	NA	<1.17 U	NA	<136 UJ	<1.21 U	<1.17 U
CHLOROMETHANE	ug/kg	22000	<4.86 U	<4.64 U	<564 UJ	<4.52 U	<512 UJ	<4.56 U	NA	<4.68 U	NA	<544 UJ	<4.84 U	<4.7 U
CIS-1,2-DICHLOROETHENE	ug/kg	7000	3.06 J	8.5	<141 UJ	<1.13 U	<128 UJ	<1.14 U	NA	<1.17 U	NA	<136 UJ	<1.21 U	<1.17 U
CIS-1,3-DICHLOROPROPENE	ug/kg	530	<1.22 U	<1.16 U	<141 UJ	<1.13 U	<128 UJ	<1.14 U	NA	<1.17 U	NA	<136 UJ	<1.21 U	<1.17 U
DIBROMOCHLOROMETHANE	ug/kg	3400	<1.22 U	<1.16 U	<141 UJ	<1.13 U	<128 UJ	<1.14 U	NA	<1.17 U	NA	<136 UJ	<1.21 U	<1.17 U

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May/June 2014

Location ID: **Sample Date:**	**Units**	**MCL/ MSC**	**18CPTUEP10 (19-20)300514 5/30/2014**	**18CPTUEP10 (30-31)300514 5/30/2014**	**18CPTUEP10 (45-47)300514 5/30/2014**	**18CPTUEP10 (54-55)310514 5/31/2014**	**18CPTUEP11 (12-13)310514 5/31/2014**	**18CPTUEP11 (19-20)310514 5/31/2014**	**18CPTUEP11 (25-26)310514 5/31/2014**	**18CPTUEP11 (28-29)310514 5/31/2014**	**18CPTUEP11 (45-46)310514 5/31/2014**	**18CPTUEP11 (45-47)310514 5/31/2014**	**18CPTUEP11 (59-60)310514 5/31/2014**	**18CPTUEP12 (16-17)310514 5/31/2014**
Location Description:			UEP Area. MIP verification soil sampling.	UEP Area. MIP verification soil sampling.	UEP Area. MIP verification soil sampling.	UEP Area. MIP verification soil sampling.	UEP Area. MIP verification soil sampling.	UEP Area. MIP verification soil sampling.	UEP Area. MIP verification soil sampling.	UEP Area. MIP verification soil sampling.	UEP Area. MIP verification soil sampling.	UEP Area. MIP verification soil sampling.	UEP Area. MIP verification soil sampling.	UEP Area. MIP verification soil sampling.
DIBROMOMETHANE	ug/kg	38000	<1.22 U	<1.16 U	<141 UJ	<1.13 U	<128 UJ	<1.14 U	NA	<1.17 U	NA	<136 UJ	<1.21 U	<1.17 U
DICHLORODIFLUOROMETHANE	ug/kg	2000000	<2.44 U	<2.32 U	<282 UJ	<2.26 U	<256 UJ	<2.28 U	NA	<2.34 U	NA	<272 UJ	<2.42 U	<2.34 U
ETHYLBENZENE	ug/kg	70000	<1.22 U	<1.16 U	<141 UJ	<1.13 U	<128 UJ	<1.14 U	NA	<1.17 U	NA	<136 UJ	<1.21 U	<1.17 U
HEXACHLOROBUTADIENE	ug/kg	2000	<1.22 U	<1.16 U	<141 UJ	<1.13 U	<128 UJ	<1.14 U	NA	<1.17 U	NA	<136 UJ	<1.21 U	<1.17 U
ISOPROPYLBENZENE	ug/kg	1000000	<1.22 U	<1.16 U	<141 UJ	<1.13 U	<128 UJ	<1.14 U	NA	<1.17 U	NA	<136 UJ	<1.21 U	<1.17 U
M,P-XYLENE	ug/kg	1000000	<1.22 U	<1.16 U	<141 UJ	<1.13 U	128 J	<1.14 U	NA	<1.17 U	NA	<136 UJ	<1.21 U	<1.17 U
METHYLENE CHLORIDE	ug/kg	500	2.77 J	5.2 J	848 J	6.02	149 J	1.94 J	NA	2.63 J	NA	<272 UJ	5.13 J	8.97
NAPHTHALENE	ug/kg	200000	<1.22 UJ	<1.16 UJ	<141 UJ	<1.13 UJ	<128 UJ	<1.14 U	NA	<1.17 U	NA	<136 UJ	<1.21 U	<1.17 U
N-BUTYLBENZENE	ug/kg	410000	<1.22 U	<1.16 U	<141 UJ	<1.13 U	<128 UJ	<1.14 U	NA	<1.17 U	NA	<136 UJ	<1.21 U	<1.17 U
N-PROPYLBENZENE	ug/kg	410000	<1.22 U	<1.16 U	<141 UJ	<1.13 U	<128 UJ	<1.14 U	NA	<1.17 U	NA	<136 UJ	<1.21 U	<1.17 U
O-XYLENE	ug/kg	1000000	<1.22 U	<1.16 U	<141 UJ	<1.13 U	<128 UJ	<1.14 U	NA	<1.17 U	NA	<136 UJ	<1.21 U	<1.17 U
P-ISOPROPYLTOLUENE	ug/kg	1000000	<1.22 U	<1.16 U	<141 UJ	<1.13 U	<128 UJ	<1.14 U	NA	<1.17 U	NA	<136 UJ	<1.21 U	<1.17 U
SEC-BUTYLBENZENE	ug/kg	410000	<1.22 U	<1.16 U	<141 UJ	<1.13 U	<128 UJ	<1.14 U	NA	<1.17 U	NA	<136 UJ	<1.21 U	<1.17 U
STYRENE	ug/kg	10000	<1.22 U	<1.16 U	<141 UJ	<1.13 U	<128 UJ	<1.14 U	NA	<1.17 U	NA	<136 UJ	<1.21 U	<1.17 U
TERT-BUTYLBENZENE	ug/kg	410000	<1.22 U	<1.16 U	<141 UJ	<1.13 U	<128 UJ	<1.14 U	NA	<1.17 U	NA	<136 UJ	<1.21 U	<1.17 U
TETRACHLOROETHENE	ug/kg	500	<1.22 U	0.943 J	<141 UJ	<1.13 U	146 J	<1.14 U	NA	<1.17 U	NA	<136 UJ	<1.21 U	<1.17 U
TOLUENE	ug/kg	100000	<1.22 U	<1.16 U	<141 UJ	<1.13 U	<128 UJ	<1.14 U	NA	<1.17 U	NA	<136 UJ	<1.21 U	<1.17 U
TRANS-1,2-DICHLOROETHENE	ug/kg	10000	<1.22 U	<1.16 U	<141 UJ	<1.13 U	<128 UJ	<1.14 U	NA	<1.17 U	NA	<136 UJ	<1.21 U	<1.17 U
TRANS-1,3-DICHLOROPROPENE	ug/kg	2900	<1.22 U	<1.16 U	<141 UJ	<1.13 U	<128 UJ	<1.14 U	NA	<1.17 U	NA	<136 UJ	<1.21 U	<1.17 U
TRICHLOROETHENE	ug/kg	500	30.7	277	<141 UJ	4 J	<128 UJ	<1.14 U	NA	<1.17 U	NA	<136 UJ	<1.21 U	<1.17 U
TRICHLOROFLUOROMETHANE	ug/kg	3100000	<2.44 U	<2.32 U	<282 UJ	<2.26 U	<256 UJ	<2.28 U	NA	<2.34 U	NA	<272 UJ	<2.42 U	<2.34 U
VINYL CHLORIDE	ug/kg	200	<2.44 U	<2.32 U	<282 UJ	<2.26 U	<256 UJ	<2.28 U	NA	<2.34 U	NA	<272 UJ	<2.42 U	<2.34 U
Percent Solids (D2216-90)														
Solids, Percent	%		81.4	81.8	77.3	82.4	82.1	87.8	83.8	85.3	79.7	80	79	79.7
Total Organic Carbon (LYDKHN)														
TOTAL ORGANIC CARBON (TOC)	mg/kg		NA	NA	NA	NA	NA	NA	<1000 UJ	NA	1080 J	NA	NA	NA

Blue Highlighting Indicates concentrations above the MCL/MSC

Note: Some samples may have been diluted due to the concentration(s) of one or more analytes exceeding the upper limit of the calibration curve.

J - Estimated: The analyte was positively identified, the quantitation is an estimation due to discrepancies in meeting certain analyte-specific quality control criteria.

MCL/MSC - Maximum Contaminant Limit/Medium-Specific Concentrations

mg/kg - milligrams per kilogram

N/A - not analyzed

U - Undetected: The analyte was analyzed for, but not detected.

UJ - The analyte was not detected; however, the result is estimated due to discrepancies in meeting certain analyte-specific quality control criteria.

ug/kg - micrograms per kilogram

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Location ID: Sample Date:	Units	MCL/ MSC	18CPTUEP12 (45-46)010614 6/1/2014	18CPTUEP12 (55-56)010614 6/1/2014	18CPTUEP12 (8-9)310514 5/31/2014	18CPTUEP13 (42-43.5)010614 6/1/2014	18CPTUEP13 (48-49)010614 6/1/2014	18CPTUEP13 (59-60)010614 6/1/2014	18CPTUEP13 (7-8)010614 6/1/2014	18CPTUEP14 (30-32)010614 6/1/2014	18CPTUEP14 (45-46)010614 6/1/2014	18CPTUEP14 (54-55)010614 6/1/2014	18CPTUEP14 (5-7)010614 6/1/2014	18CPTUEP14 (59-60)010614 6/1/2014
Location Description:			UEP Area. MIP verification soil sampling.	UEP Area. MIP verification soil sampling.	UEP Area. MIP verification soil sampling.	UEP Area. MIP verification soil sampling.	UEP Area. MIP verification soil sampling.	UEP Area. MIP verification soil sampling.	UEP Area. MIP verification soil sampling.	UEP Area. MIP verification soil sampling.	UEP Area. MIP verification soil sampling.	UEP Area. MIP verification soil sampling.	UEP Area. MIP verification soil sampling.	UEP Area. MIP verification soil sampling.
Perchlorate (6850)														
PERCHLORATE	ug/kg	7200	20	16	4.3	2100	5.4	1.5 J	0.76 J	5600	79 J	1.5 J	<1.2 U	250 J
Volatile Organic Compounds (8260B)														
1,1,1,2-TETRACHLOROETHANE	ug/kg	11000	<680 U	<1.28 U	<1.27 UJ	<130 UJ	<137 U	<1.26 U	<1.19 U	<1.1 U	<1.3 UJ	<1.31 U	<1.13 U	<1.32 U
1,1,1-TRICHLOROETHANE	ug/kg	20000	<680 U	<1.28 U	<1.27 UJ	<130 UJ	<137 U	<1.26 U	<1.19 U	<1.1 U	<1.3 UJ	<1.31 U	<1.13 U	<1.32 U
1,1,2,2-TETRACHLOROETHANE	ug/kg	1400	<680 U	<1.28 U	<1.27 UJ	<130 UJ	<137 U	<1.26 U	<1.19 U	<1.1 U	<1.3 UJ	<1.31 U	<1.13 U	<1.32 U
1,1,2-TRICHLOROETHANE	ug/kg	500	<680 U	<1.28 U	<1.27 UJ	<130 UJ	<137 U	<1.26 U	<1.19 U	<1.1 U	<1.3 UJ	<1.31 U	<1.13 U	<1.32 U
1,1-DICHLOROETHANE	ug/kg	1000000	<1360 U	<2.56 U	<2.54 UJ	<260 UJ	<274 U	<2.52 U	<2.38 U	<2.2 U	<2.6 UJ	<2.62 U	<2.26 U	<2.64 U
1,1-DICHLOROETHENE	ug/kg	700	<680 U	<1.28 U	<1.27 UJ	<130 UJ	<137 U	<1.26 U	<1.19 U	<1.1 U	<1.3 UJ	<1.31 U	<1.13 U	<1.32 U
1,1-DICHLOROPROPENE	ug/kg	290	<680 U	<1.28 U	<1.27 UJ	<130 UJ	<137 U	<1.26 U	<1.19 U	<1.1 U	<1.3 UJ	<1.31 U	<1.13 U	<1.32 U
1,2,3-TRICHLOROBENZENE	ug/kg	31000	<680 U	<1.28 U	<1.27 UJ	<130 UJ	<137 U	<1.26 U	<1.19 U	<1.1 U	<1.3 UJ	<1.31 U	<1.13 U	<1.32 U
1,2,3-TRICHLOROPROPANE	ug/kg	4.1	<1360 U	<2.56 U	<2.54 UJ	<260 UJ	<274 U	<2.52 U	<2.38 U	<2.2 U	<2.6 UJ	<2.62 U	<2.26 U	<2.64 U
1,2,4-TRICHLOROBENZENE	ug/kg	7000	<680 U	<1.28 U	<1.27 UJ	<130 UJ	<137 U	<1.26 U	<1.19 U	<1.1 U	<1.3 UJ	<1.31 U	<1.13 U	<1.32 U
1,2,4-TRIMETHYLBENZENE	ug/kg	510000	<680 U	<1.28 U	<1.27 UJ	<130 UJ	164 J	<1.26 U	<1.19 U	<1.1 U	<1.3 UJ	<1.31 U	<1.13 U	<1.32 U
1,2-DIBROMO-3-CHLOROPROPANE	ug/kg	20	<2720 UJ	<5.1 U	<5.08 UJ	<520 UJ	<546 UJ	<5.04 U	<4.76 U	<4.4 U	<5.2 UJ	<5.24 U	<4.5 U	<5.26 U
1,2-DIBROMOETHANE	ug/kg	5	<680 U	<1.28 U	<1.27 UJ	<130 UJ	<137 U	<1.26 U	<1.19 U	<1.1 U	<1.3 UJ	<1.31 U	<1.13 U	<1.32 U
1,2-DICHLOROBENZENE	ug/kg	60000	<680 U	<1.28 U	<1.27 UJ	<130 UJ	<137 U	<1.26 U	<1.19 U	<1.1 U	<1.3 UJ	<1.31 U	<1.13 U	<1.32 U
1,2-DICHLOROETHANE	ug/kg	500	<680 U	<1.28 U	<1.27 UJ	<130 UJ	<137 U	<1.26 U	<1.19 U	1.7 J	<1.3 UJ	<1.31 U	<1.13 U	<1.32 U
1,2-DICHLOROPROPANE	ug/kg	500	<680 U	<1.28 U	<1.27 UJ	<130 UJ	<137 U	<1.26 U	<1.19 U	<1.1 U	<1.3 UJ	<1.31 U	<1.13 U	<1.32 U
1,3,5-TRIMETHYLBENZENE	ug/kg	510000	<680 U	<1.28 U	<1.27 UJ	<130 UJ	<137 U	<1.26 U	<1.19 U	<1.1 U	<1.3 UJ	<1.31 U	<1.13 U	<1.32 U
1,3-DICHLOROBENZENE	ug/kg	310000	<680 U	<1.28 U	<1.27 UJ	<130 UJ	<137 U	<1.26 U	<1.19 U	<1.1 U	<1.3 UJ	<1.31 U	<1.13 U	<1.32 U
1,3-DICHLOROPROPANE	ug/kg	2900	<680 U	<1.28 U	<1.27 UJ	<130 UJ	<137 U	<1.26 U	<1.19 U	<1.1 U	<1.3 UJ	<1.31 U	<1.13 U	<1.32 U
1,4-DICHLOROBENZENE	ug/kg	7500	<680 U	<1.28 U	<1.27 UJ	<130 UJ	<137 U	<1.26 U	<1.19 U	<1.1 U	<1.3 UJ	<1.31 U	<1.13 U	<1.32 U
2,2-DICHLOROPROPANE	ug/kg	4200	<680 U	<1.28 U	<1.27 UJ	<130 UJ	<137 U	<1.26 U	<1.19 U	<1.1 U	<1.3 UJ	<1.31 U	<1.13 U	<1.32 U
2-BUTANONE	ug/kg	6100000	<3400 UJ	<6.38 U	<6.36 UJ	<650 UJ	<682 UJ	<6.3 U	<5.94 U	<5.5 U	<6.5 UJ	<6.54 U	<5.64 U	<6.58 U
2-CHLOROTOLUENE	ug/kg	200000	<680 U	<1.28 U	<1.27 UJ	<130 UJ	<137 U	<1.26 U	<1.19 U	<1.1 U	<1.3 UJ	<1.31 U	<1.13 U	<1.32 U
2-HEXANONE	ug/kg	610000	<3400 UJ	<6.38 U	<6.36 UJ	<650 UJ	<682 UJ	<6.3 U	<5.94 U	<5.5 U	<6.5 UJ	<6.54 U	<5.64 U	<6.58 U
4-CHLOROTOLUENE	ug/kg	200000	<680 U	<1.28 U	<1.27 UJ	<130 UJ	<137 U	<1.26 U	<1.19 U	<1.1 U	<1.3 UJ	<1.31 U	<1.13 U	<1.32 U
4-METHYL-2-PENTANONE	ug/kg	820000	<3400 UJ	<6.38 U	<6.36 UJ	<650 UJ	<682 UJ	<6.3 U	<5.94 U	<5.5 U	<6.5 UJ	<6.54 U	<5.64 U	<6.58 U
ACETONE	ug/kg	920000	<6800 U	17.6 J	<12.7 UJ	<1300 UJ	<1370 U	9.46 J	<11.9 U	<11 U	11.9 J	8.91 J	<11.3 U	<13.2 U
BENZENE	ug/kg	500	<680 U	<1.28 U	<1.27 UJ	<130 UJ	<137 U	<1.26 U	<1.19 U	<1.1 U	<1.3 UJ	<1.31 U	<1.13 U	<1.32 U
BROMOBENZENE	ug/kg	200000	<680 U	<1.28 U	<1.27 UJ	<130 UJ	<137 U	<1.26 U	<1.19 U	<1.1 U	<1.3 UJ	<1.31 U	<1.13 U	<1.32 U
BROMOCHLOROMETHANE	ug/kg	410000	<1360 U	<2.56 U	<2.54 UJ	<260 UJ	<274 U	<2.52 U	<2.38 U	<2.2 U	<2.6 UJ	<2.62 U	<2.26 U	<2.64 U
BROMODICHLOROMETHANE	ug/kg	460	<680 U	<1.28 U	<1.27 UJ	<130 UJ	<137 U	<1.26 U	<1.19 U	<1.1 U	<1.3 UJ	<1.31 U	<1.13 U	<1.32 U
BROMOFORM	ug/kg	3600	<680 U	<1.28 U	<1.27 UJ	<130 UJ	<137 U	<1.26 U	<1.19 U	<1.1 U	<1.3 UJ	<1.31 U	<1.13 U	<1.32 U
BROMOMETHANE	ug/kg	14000	<1360 U	<2.56 U	<2.54 UJ	<260 UJ	<274 U	<2.52 U	<2.38 U	<2.2 U	<2.6 UJ	<2.62 U	<2.26 U	<2.64 U
CARBON DISULFIDE	ug/kg	1000000	<680 U	<1.28 U	<1.27 UJ	<130 UJ	<137 U	0.739 J	<1.19 U	<1.1 U	<1.3 UJ	<1.31 U	<1.13 U	1.27 J
CARBON TETRACHLORIDE	ug/kg	500	<680 U	<1.28 U	<1.27 UJ	<130 UJ	<137 U	<1.26 U	<1.19 U	<1.1 U	<1.3 UJ	<1.31 U	<1.13 U	<1.32 U
CHLOROBENZENE	ug/kg	10000	<680 U	<1.28 U	<1.27 UJ	<130 UJ	<137 U	<1.26 U	<1.19 U	<1.1 U	<1.3 UJ	<1.31 U	<1.13 U	<1.32 U
CHLOROETHANE	ug/kg	4100000	<1360 U	<2.56 U	<2.54 UJ	<260 UJ	<274 U	<2.52 U	<2.38 U	<2.2 U	<2.6 UJ	<2.62 U	<2.26 U	<2.64 U
CHLOROFORM	ug/kg	100000	<680 U	<1.28 U	<1.27 UJ	<130 UJ	<137 U	<1.26 U	<1.19 U	<1.1 U	<1.3 UJ	<1.31 U	<1.13 U	<1.32 U
CHLOROMETHANE	ug/kg	22000	<2720 U	<5.1 U	<5.08 UJ	<520 UJ	<546 U	<5.04 U	<4.76 U	<4.4 U	<5.2 UJ	<5.24 U	<4.5 U	<5.26 U
CIS-1,2-DICHLOROETHENE	ug/kg	7000	<680 U	<1.28 U	<1.27 UJ	<130 UJ	<137 U	<1.26 U	<1.19 U	1.16 J	<1.3 UJ	<1.31 U	<1.13 U	3.03 J
CIS-1,3-DICHLOROPROPENE	ug/kg	530	<680 U	<1.28 U	<1.27 UJ	<130 UJ	<137 U	<1.26 U	<1.19 U	<1.1 U	<1.3 UJ	<1.31 U	<1.13 U	<1.32 U
DIBROMOCHLOROMETHANE	ug/kg	3400	<680 U	<1.28 U	<1.27 UJ	<130 UJ	<137 U	<1.26 U	<1.19 U	<1.1 U	<1.3 UJ	<1.31 U	<1.13 U	<1.32 U

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Location ID: Sample Date:	Units	MCL/ MSC	18CPTUEP12 (45-46)010614 6/1/2014	18CPTUEP12 (55-56)010614 6/1/2014	18CPTUEP12 (8-9)310514 5/31/2014	18CPTUEP13 (42-43.5)010614 6/1/2014	18CPTUEP13 (48-49)010614 6/1/2014	18CPTUEP13 (59-60)010614 6/1/2014	18CPTUEP13 (7-8)010614 6/1/2014	18CPTUEP14 (30-32)010614 6/1/2014	18CPTUEP14 (45-46)010614 6/1/2014	18CPTUEP14 (54-55)010614 6/1/2014	18CPTUEP14 (5-7)010614 6/1/2014	18CPTUEP14 (59-60)010614 6/1/2014
Location Description:			UEP Area. MIP verification soil sampling.	UEP Area. MIP verification soil sampling.	UEP Area. MIP verification soil sampling.	UEP Area. MIP verification soil sampling.	UEP Area. MIP verification soil sampling.	UEP Area. MIP verification soil sampling.	UEP Area. MIP verification soil sampling.	UEP Area. MIP verification soil sampling.	UEP Area. MIP verification soil sampling.	UEP Area. MIP verification soil sampling.	UEP Area. MIP verification soil sampling.	UEP Area. MIP verification soil sampling.
DIBROMOMETHANE	ug/kg	38000	<680 U	<1.28 U	<1.27 UJ	<130 UJ	<137 U	<1.26 U	<1.19 U	<1.1 U	<1.3 UJ	<1.31 U	<1.13 U	<1.32 U
DICHLORODIFLUOROMETHANE	ug/kg	2000000	<1360 U	<2.56 U	<2.54 UJ	<260 UJ	<274 U	<2.52 U	<2.38 U	<2.2 U	<2.6 UJ	<2.62 U	<2.26 U	<2.64 U
ETHYLBENZENE	ug/kg	70000	<680 U	<1.28 U	<1.27 UJ	<130 UJ	<137 U	<1.26 U	<1.19 U	<1.1 U	<1.3 UJ	<1.31 U	<1.13 U	<1.32 U
HEXACHLOROBUTADIENE	ug/kg	2000	<680 U	<1.28 U	<1.27 UJ	<130 UJ	<137 U	<1.26 U	<1.19 U	<1.1 U	<1.3 UJ	<1.31 U	<1.13 U	<1.32 U
ISOPROPYLBENZENE	ug/kg	1000000	<680 U	<1.28 U	<1.27 UJ	<130 UJ	<137 U	<1.26 U	<1.19 U	<1.1 U	<1.3 UJ	<1.31 U	<1.13 U	<1.32 U
M,P-XYLENE	ug/kg	1000000	<680 U	<1.28 U	<1.27 UJ	<130 UJ	137 J	<1.26 U	<1.19 U	<1.1 U	<1.3 UJ	<1.31 U	<1.13 U	<1.32 U
METHYLENE CHLORIDE	ug/kg	500	77100	11.6	<2.54 UJ	<260 UJ	<274 U	5.46 J	3.73 J	6.59	44.6 J	6.72	4.02 J	36.7
NAPHTHALENE	ug/kg	200000	<680 U	<1.28 U	<1.27 UJ	<130 UJ	93.6 J	<1.26 U	<1.19 U	<1.1 U	<1.3 UJ	<1.31 U	<1.13 U	<1.32 U
N-BUTYLBENZENE	ug/kg	410000	<680 U	<1.28 U	<1.27 UJ	<130 UJ	<137 U	<1.26 U	<1.19 U	<1.1 U	<1.3 UJ	<1.31 U	<1.13 U	<1.32 U
N-PROPYLBENZENE	ug/kg	410000	<680 U	<1.28 U	<1.27 UJ	<130 UJ	<137 U	<1.26 U	<1.19 U	<1.1 U	<1.3 UJ	<1.31 U	<1.13 U	<1.32 U
O-XYLENE	ug/kg	1000000	<680 U	<1.28 U	<1.27 UJ	<130 UJ	72.3 J	<1.26 U	<1.19 U	<1.1 U	<1.3 UJ	<1.31 U	<1.13 U	<1.32 U
P-ISOPROPYLTOLUENE	ug/kg	1000000	<680 U	<1.28 U	<1.27 UJ	<130 UJ	<137 U	<1.26 U	<1.19 U	<1.1 U	<1.3 UJ	<1.31 U	<1.13 U	<1.32 U
SEC-BUTYLBENZENE	ug/kg	410000	<680 U	<1.28 U	<1.27 UJ	<130 UJ	<137 U	<1.26 U	<1.19 U	<1.1 U	<1.3 UJ	<1.31 U	<1.13 U	<1.32 U
STYRENE	ug/kg	10000	<680 U	<1.28 U	<1.27 UJ	<130 UJ	<137 U	<1.26 U	<1.19 U	<1.1 U	<1.3 UJ	<1.31 U	<1.13 U	<1.32 U
TERT-BUTYLBENZENE	ug/kg	410000	<680 U	<1.28 U	<1.27 UJ	<130 UJ	<137 U	<1.26 U	<1.19 U	<1.1 U	<1.3 UJ	<1.31 U	<1.13 U	<1.32 U
TETRACHLOROETHENE	ug/kg	500	<680 U	<1.28 U	<1.27 UJ	<130 UJ	<137 U	<1.26 U	<1.19 U	<1.1 U	<1.3 UJ	<1.31 U	<1.13 U	<1.32 U
TOLUENE	ug/kg	100000	<680 U	<1.28 U	<1.27 UJ	<130 UJ	69.7 J	<1.26 U	<1.19 U	<1.1 U	<1.3 UJ	<1.31 U	<1.13 U	<1.32 U
TRANS-1,2-DICHLOROETHENE	ug/kg	10000	<680 U	<1.28 U	<1.27 UJ	<130 UJ	<137 U	<1.26 U	<1.19 U	<1.1 U	<1.3 UJ	<1.31 U	<1.13 U	<1.32 U
TRANS-1,3-DICHLOROPROPENE	ug/kg	2900	<680 U	<1.28 U	<1.27 UJ	<130 UJ	<137 U	<1.26 U	<1.19 U	<1.1 U	<1.3 UJ	<1.31 U	<1.13 U	<1.32 U
TRICHLOROETHENE	ug/kg	500	1460 J	1.91 J	<1.27 UJ	<130 UJ	192 J	<1.26 U	<1.19 U	28.3	1.21 J	0.799 J	<1.13 U	38.4
TRICHLOROFLUOROMETHANE	ug/kg	3100000	<1360 U	<2.56 U	<2.54 UJ	<260 UJ	<274 U	<2.52 U	<2.38 U	<2.2 U	<2.6 UJ	<2.62 U	<2.26 U	<2.64 U
VINYL CHLORIDE	ug/kg	200	<1360 U	<2.56 U	<2.54 UJ	<260 UJ	<274 U	<2.52 U	<2.38 U	<2.2 U	<2.6 UJ	<2.62 U	<2.26 U	<2.64 U
Percent Solids (D2216-90)														
Solids, Percent	%		78.9	77.7	81.5	80.9	77.1 J	79	78.8	85	78.4	75	83.6	78.9
Total Organic Carbon (LYDKHN)														
TOTAL ORGANIC CARBON (TOC)	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Blue Highlighting Indicates concentrations above the MCL/MSC

Note: Some samples may have been diluted due to the concentration(s) of one or more analytes exceeding the upper limit of the calibration curve.

J - Estimated: The analyte was positively identified, the quantitation is an estimation due to discrepancies in meeting certain analyte-specific quality control criteria.

MCL/MSC - Maximum Contaminant Limit/Medium-Specific Concentrations

mg/kg - milligrams per kilogram

N/A - not analyzed

U - Undetected: The analyte was analyzed for, but not detected.

UJ - The analyte was not detected; however, the result is estimated due to discrepancies in meeting certain analyte-specific quality control criteria.

ug/kg - micrograms per kilogram

LHAAP-18/24 PSI Work Plan Field Work
May/June 2014

Location ID: Sample Date:	Units	MCL/ MSC	18CPTUEP15 (19-20)020614 6/2/2014	18CPTUEP15 (45-46)020614 6/2/2014	18CPTUEP15 (7-8)020614 6/2/2014	18CPTUEP15 (7-8)020614D 6/2/2014	18CPTUEP16 (20-21)020614 6/2/2014	18CPTUEP16 (52-53)020614 6/2/2014	18CPTUEP16 (54-55)020614 6/2/2014	18CPTUEP17 (22-24)040614 6/4/2014	18CPTUEP17 (47-48)040614 6/4/2014	18CPTUEP17 (54-55)040614 6/4/2014	18CPTUEP18 (17-18)040614 6/4/2014	18CPTUEP18 (23-24)040614 6/4/2014
Location Description:			UEP Area. MIP verification soil sampling.	UEP Area. MIP verification soil sampling.	UEP Area. MIP verification soil sampling.	UEP Area. MIP verification soil sampling.	UEP Area. MIP verification soil sampling.	UEP Area. MIP verification soil sampling.	UEP Area. MIP verification soil sampling.	UEP Area. MIP verification soil sampling.	UEP Area. MIP verification soil sampling.	UEP Area. MIP verification soil sampling.	UEP Area. MIP verification soil sampling.	UEP Area. MIP verification soil sampling.
Perchlorate (6850)														
PERCHLORATE	ug/kg	7200	190 J	1000 J	400 J	430 J	480 J	<1.3 UJ	<1.2 UJ	1.2	1.8	0.62 J	8	8.2
Volatile Organic Compounds (8260B)														
1,1,1,2-TETRACHLOROETHANE	ug/kg	11000	<1.22 U	<1.22 UJ	<1.27 U	<1.19 U	<1.26 U	<1.18 UJ	<1.22 U	<1.13 U	<1.29 U	<1.11 U	<1.12 U	<6.56 U
1,1,1-TRICHLOROETHANE	ug/kg	20000	<1.22 U	<1.22 UJ	<1.27 U	<1.19 U	<1.26 U	<1.18 UJ	<1.22 U	<1.13 U	<1.29 U	<1.11 U	<1.12 U	<6.56 U
1,1,2,2-TETRACHLOROETHANE	ug/kg	1400	<1.22 U	<1.22 UJ	<1.27 U	<1.19 U	<1.26 U	<1.18 UJ	<1.22 U	<1.13 UJ	<1.29 U	<1.11 UJ	<1.12 UJ	<6.56 UJ
1,1,2-TRICHLOROETHANE	ug/kg	500	<1.22 U	<1.22 UJ	<1.27 U	<1.19 U	<1.26 U	<1.18 UJ	<1.22 U	<1.13 U	<1.29 U	<1.11 U	<1.12 U	<6.56 U
1,1-DICHLOROETHANE	ug/kg	1000000	<2.44 U	<2.44 UJ	<2.54 U	<2.38 U	<2.52 U	<2.36 UJ	<2.44 U	<2.26 U	<2.58 U	<2.22 U	<2.24 U	<13.1 U
1,1-DICHLOROETHENE	ug/kg	700	<1.22 U	<1.22 UJ	<1.27 U	<1.19 U	<1.26 U	<1.18 UJ	<1.22 U	<1.13 U	<1.29 U	<1.11 U	<1.12 U	<6.56 U
1,1-DICHLOROPROPENE	ug/kg	290	<1.22 U	<1.22 UJ	<1.27 U	<1.19 U	<1.26 U	<1.18 UJ	<1.22 U	<1.13 U	<1.29 U	<1.11 U	<1.12 U	<6.56 U
1,2,3-TRICHLOROBENZENE	ug/kg	31000	<1.22 U	<1.22 UJ	<1.27 U	<1.19 U	<1.26 U	<1.18 UJ	<1.22 U	<1.13 UJ	<1.29 U	<1.11 UJ	<1.12 UJ	<6.56 UJ
1,2,3-TRICHLOROPROPANE	ug/kg	4.1	<2.44 U	<2.44 UJ	<2.54 U	<2.38 U	<2.52 U	<2.36 UJ	<2.44 U	<2.26 UJ	<2.58 U	<2.22 UJ	<2.24 UJ	<13.1 UJ
1,2,4-TRICHLOROBENZENE	ug/kg	7000	<1.22 U	<1.22 UJ	<1.27 U	<1.19 U	<1.26 U	<1.18 UJ	<1.22 U	<1.13 U	<1.29 U	<1.11 U	<1.12 U	<6.56 U
1,2,4-TRIMETHYLBENZENE	ug/kg	510000	<1.22 U	<1.22 UJ	<1.27 U	<1.19 U	<1.26 U	<1.18 UJ	<1.22 U	<1.13 U	<1.29 U	<1.11 U	<1.12 U	<6.56 U
1,2-DIBROMO-3-CHLOROPROPANE	ug/kg	20	<4.86 U	<4.88 UJ	<5.08 U	<4.74 U	<5.04 U	<4.72 UJ	<4.86 U	<4.52 U	<5.18 U	<4.44 U	<4.5 U	<26.2 U
1,2-DIBROMOETHANE	ug/kg	5	<1.22 U	<1.22 UJ	<1.27 U	<1.19 U	<1.26 U	<1.18 UJ	<1.22 U	<1.13 U	<1.29 U	<1.11 U	<1.12 U	<6.56 U
1,2-DICHLOROBENZENE	ug/kg	60000	<1.22 U	<1.22 UJ	<1.27 U	<1.19 U	<1.26 U	<1.18 UJ	<1.22 U	<1.13 U	<1.29 U	<1.11 U	<1.12 U	<6.56 U
1,2-DICHLOROETHANE	ug/kg	500	<1.22 U	<1.22 UJ	<1.27 U	<1.19 U	<1.26 U	<1.18 UJ	<1.22 U	<1.13 U	<1.29 U	<1.11 U	<1.12 U	<6.56 U
1,2-DICHLOROPROPANE	ug/kg	500	<1.22 U	<1.22 UJ	<1.27 U	<1.19 U	<1.26 U	<1.18 UJ	<1.22 U	<1.13 U	<1.29 U	<1.11 U	<1.12 U	<6.56 U
1,3,5-TRIMETHYLBENZENE	ug/kg	510000	<1.22 U	<1.22 UJ	<1.27 U	<1.19 U	<1.26 U	<1.18 UJ	<1.22 U	<1.13 U	<1.29 U	<1.11 U	<1.12 U	<6.56 U
1,3-DICHLOROBENZENE	ug/kg	310000	<1.22 U	<1.22 UJ	<1.27 U	<1.19 U	<1.26 U	<1.18 UJ	<1.22 U	<1.13 U	<1.29 U	<1.11 U	<1.12 U	<6.56 U
1,3-DICHLOROPROPANE	ug/kg	2900	<1.22 U	<1.22 UJ	<1.27 U	<1.19 U	<1.26 U	<1.18 UJ	<1.22 U	<1.13 U	<1.29 U	<1.11 U	<1.12 U	<6.56 U
1,4-DICHLOROBENZENE	ug/kg	7500	<1.22 U	<1.22 UJ	<1.27 U	<1.19 U	<1.26 U	<1.18 UJ	<1.22 U	<1.13 U	<1.29 U	<1.11 U	<1.12 U	<6.56 U
2,2-DICHLOROPROPANE	ug/kg	4200	<1.22 U	<1.22 UJ	<1.27 U	<1.19 U	<1.26 U	<1.18 UJ	<1.22 U	<1.13 U	<1.29 U	<1.11 U	<1.12 U	<6.56 U
2-BUTANONE	ug/kg	6100000	<6.08 U	<6.1 UJ	<6.36 U	<5.92 U	<6.3 U	<5.9 UJ	<6.08 U	<5.66 U	<6.46 U	<5.56 U	<5.62 U	<32.8 U
2-CHLOROTOLUENE	ug/kg	200000	<1.22 U	<1.22 UJ	<1.27 U	<1.19 U	<1.26 U	<1.18 UJ	<1.22 U	<1.13 U	<1.29 U	<1.11 U	<1.12 U	<6.56 U
2-HEXANONE	ug/kg	610000	<6.08 U	<6.1 UJ	<6.36 U	<5.92 U	<6.3 U	<5.9 UJ	<6.08 U	<5.66 U	<6.46 U	<5.56 U	<5.62 U	<32.8 U
4-CHLOROTOLUENE	ug/kg	200000	<1.22 U	<1.22 UJ	<1.27 U	<1.19 U	<1.26 U	<1.18 UJ	<1.22 U	<1.13 U	<1.29 U	<1.11 U	<1.12 U	<6.56 U
4-METHYL-2-PENTANONE	ug/kg	820000	<6.08 U	<6.1 UJ	<6.36 U	<5.92 U	<6.3 U	<5.9 UJ	<6.08 U	<5.66 U	<6.46 U	<5.56 U	<5.62 U	<32.8 U
ACETONE	ug/kg	920000	<12.2 U	<12.2 UJ	<12.7 U	<11.9 U	<12.6 U	34.9 J	14.4 J	7.75 J	7.98 J	9.86 J	<11.2 U	<65.6 U
BENZENE	ug/kg	500	<1.22 U	<1.22 UJ	<1.27 U	<1.19 U	<1.26 U	<1.18 UJ	<1.22 U	<1.13 U	<1.29 U	<1.11 U	<1.12 U	<6.56 U
BROMOBENZENE	ug/kg	200000	<1.22 U	<1.22 UJ	<1.27 U	<1.19 U	<1.26 U	<1.18 UJ	<1.22 U	<1.13 U	<1.29 U	<1.11 U	<1.12 U	<6.56 U
BROMOCHLOROMETHANE	ug/kg	410000	<2.44 U	<2.44 UJ	<2.54 U	<2.38 U	<2.52 U	<2.36 UJ	<2.44 U	<2.26 U	<2.58 U	<2.22 U	<2.24 U	<13.1 U
BROMODICHLOROMETHANE	ug/kg	460	<1.22 U	<1.22 UJ	<1.27 U	<1.19 U	<1.26 U	<1.18 UJ	<1.22 U	<1.13 U	<1.29 U	<1.11 U	<1.12 U	<6.56 U
BROMOFORM	ug/kg	3600	<1.22 U	<1.22 UJ	<1.27 U	<1.19 U	<1.26 U	<1.18 UJ	<1.22 U	<1.13 U	<1.29 U	<1.11 U	<1.12 U	<6.56 U
BROMOMETHANE	ug/kg	14000	<2.44 U	<2.44 UJ	<2.54 U	<2.38 U	<2.52 U	<2.36 UJ	<2.44 U	<2.26 UJ	<2.58 U	<2.22 UJ	<2.24 UJ	<13.1 UJ
CARBON DISULFIDE	ug/kg	1000000	<1.22 U	<1.22 UJ	<1.27 U	<1.19 U	<1.26 U	0.761 J	0.856 J	<1.13 U	<1.29 U	<1.11 U	<1.12 U	<6.56 U
CARBON TETRACHLORIDE	ug/kg	500	<1.22 U	<1.22 UJ	<1.27 U	<1.19 U	<1.26 U	<1.18 UJ	<1.22 U	<1.13 U	<1.29 U	<1.11 U	<1.12 U	4.72 J
CHLOROBENZENE	ug/kg	10000	<1.22 U	<1.22 UJ	<1.27 U	<1.19 U	<1.26 U	<1.18 UJ	<1.22 U	<1.13 U	<1.29 U	<1.11 U	<1.12 U	<6.56 U
CHLOROETHANE	ug/kg	4100000	<2.44 U	<2.44 UJ	<2.54 U	<2.38 U	<2.52 U	<2.36 UJ	<2.44 U	<2.26 U	<2.58 U	<2.22 U	<2.24 U	<13.1 U
CHLOROFORM	ug/kg	100000	<1.22 U	<1.22 UJ	<1.27 U	<1.19 U	<1.26 U	<1.18 UJ	<1.22 U	<1.13 U	<1.29 U	<1.11 U	<1.12 U	<6.56 U
CHLOROMETHANE	ug/kg	22000	<4.86 U	<4.88 UJ	<5.08 U	<4.74 U	<5.04 U	<4.72 UJ	<4.86 U	<4.52 U	<5.18 U	<4.44 U	<4.5 U	<26.2 U
CIS-1,2-DICHLOROETHENE	ug/kg	7000	<1.22 U	<1.22 UJ	<1.27 U	<1.19 U	<1.26 U	<1.18 UJ	<1.22 U	<1.13 U	<1.29 U	<1.11 U	<1.12 U	23.4 J
CIS-1,3-DICHLOROPROPENE	ug/kg	530	<1.22 U	<1.22 UJ	<1.27 U	<1.19 U	<1.26 U	<1.18 UJ	<1.22 U	<1.13 U	<1.29 U	<1.11 U	<1.12 U	<6.56 U
DIBROMOCHLOROMETHANE	ug/kg	3400	<1.22 U	<1.22 UJ	<1.27 U	<1.19 U	<1.26 U	<1.18 UJ	<1.22 U	<1.13 U	<1.29 U	<1.11 U	<1.12 U	<6.56 U

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Location ID: **Sample Date:**	**Units**	**MCL/ MSC**	**18CPTUEP15 (19-20)020614 6/2/2014**	**18CPTUEP15 (45-46)020614 6/2/2014**	**18CPTUEP15 (7-8)020614 6/2/2014**	**18CPTUEP15 (7-8)020614D 6/2/2014**	**18CPTUEP16 (20-21)020614 6/2/2014**	**18CPTUEP16 (52-53)020614 6/2/2014**	**18CPTUEP16 (54-55)020614 6/2/2014**	**18CPTUEP17 (22-24)040614 6/4/2014**	**18CPTUEP17 (47-48)040614 6/4/2014**	**18CPTUEP17 (54-55)040614 6/4/2014**	**18CPTUEP18 (17-18)040614 6/4/2014**	**18CPTUEP18 (23-24)040614 6/4/2014**
Location Description:			UEP Area. MIP verification soil sampling.	UEP Area. MIP verification soil sampling.	UEP Area. MIP verification soil sampling.	UEP Area. MIP verification soil sampling.	UEP Area. MIP verification soil sampling.	UEP Area. MIP verification soil sampling.	UEP Area. MIP verification soil sampling.	UEP Area. MIP verification soil sampling.	UEP Area. MIP verification soil sampling.	UEP Area. MIP verification soil sampling.	UEP Area. MIP verification soil sampling.	UEP Area. MIP verification soil sampling.
DIBROMOMETHANE	ug/kg	38000	<1.22 U	<1.22 UJ	<1.27 U	<1.19 U	<1.26 U	<1.18 UJ	<1.22 U	<1.13 U	<1.29 U	<1.11 U	<1.12 U	<6.56 U
DICHLORODIFLUOROMETHANE	ug/kg	2000000	<2.44 UJ	<2.44 UJ	<2.54 U	<2.38 U	<2.52 U	<2.36 UJ	<2.44 U	<2.26 U	<2.58 U	<2.22 U	<2.24 U	<13.1 U
ETHYLBENZENE	ug/kg	70000	<1.22 U	<1.22 UJ	<1.27 U	<1.19 U	<1.26 U	<1.18 UJ	<1.22 U	<1.13 U	<1.29 U	<1.11 U	<1.12 U	<6.56 U
HEXACHLOROBUTADIENE	ug/kg	2000	<1.22 U	<1.22 UJ	<1.27 U	<1.19 U	<1.26 U	<1.18 UJ	<1.22 U	<1.13 U	<1.29 U	<1.11 U	<1.12 U	<6.56 U
ISOPROPYLBENZENE	ug/kg	1000000	<1.22 U	<1.22 UJ	<1.27 U	<1.19 U	<1.26 U	<1.18 UJ	<1.22 U	<1.13 U	<1.29 U	<1.11 U	<1.12 U	<6.56 U
M,P-XYLENE	ug/kg	1000000	<1.22 U	<1.22 UJ	<1.27 U	<1.19 U	<1.26 U	<1.18 UJ	<1.22 U	<1.13 U	<1.29 U	<1.11 U	<1.12 U	<6.56 U
METHYLENE CHLORIDE	ug/kg	500	2.11 J	27.7 J	3.94 J	3.56 J	5.92 J	39.3 J	16.7	12.3	70.1	23	3.42 J	662
NAPHTHALENE	ug/kg	200000	<1.22 U	<1.22 UJ	<1.27 U	<1.19 U	<1.26 U	<1.18 UJ	<1.22 U	<1.13 UJ	<1.29 U	<1.11 UJ	<1.12 UJ	<6.56 UJ
N-BUTYLBENZENE	ug/kg	410000	<1.22 U	<1.22 UJ	<1.27 U	<1.19 U	<1.26 U	<1.18 UJ	<1.22 U	<1.13 U	<1.29 U	<1.11 U	<1.12 U	<6.56 U
N-PROPYLBENZENE	ug/kg	410000	<1.22 U	<1.22 UJ	<1.27 U	<1.19 U	<1.26 U	<1.18 UJ	<1.22 U	<1.13 U	<1.29 U	<1.11 U	<1.12 U	<6.56 U
O-XYLENE	ug/kg	1000000	<1.22 U	<1.22 UJ	<1.27 U	<1.19 U	<1.26 U	<1.18 UJ	<1.22 U	<1.13 U	<1.29 U	<1.11 U	<1.12 U	<6.56 U
P-ISOPROPYLTOLUENE	ug/kg	1000000	<1.22 U	<1.22 UJ	<1.27 U	<1.19 U	<1.26 U	<1.18 UJ	<1.22 U	<1.13 U	<1.29 U	<1.11 U	<1.12 U	<6.56 U
SEC-BUTYLBENZENE	ug/kg	410000	<1.22 U	<1.22 UJ	<1.27 U	<1.19 U	<1.26 U	<1.18 UJ	<1.22 U	<1.13 U	<1.29 U	<1.11 U	<1.12 U	<6.56 U
STYRENE	ug/kg	10000	<1.22 U	<1.22 UJ	<1.27 U	<1.19 U	<1.26 U	<1.18 UJ	<1.22 U	<1.13 U	<1.29 U	<1.11 U	<1.12 U	<6.56 U
TERT-BUTYLBENZENE	ug/kg	410000	<1.22 U	<1.22 UJ	<1.27 U	<1.19 U	<1.26 U	<1.18 UJ	<1.22 U	<1.13 U	<1.29 U	<1.11 U	<1.12 U	<6.56 U
TETRACHLOROETHENE	ug/kg	500	<1.22 U	<1.22 UJ	<1.27 U	<1.19 U	<1.26 U	<1.18 UJ	<1.22 U	<1.13 U	<1.29 U	<1.11 U	<1.12 U	<6.56 U
TOLUENE	ug/kg	100000	<1.22 U	<1.22 UJ	<1.27 U	<1.19 U	<1.26 U	<1.18 UJ	<1.22 U	<1.13 U	<1.29 U	<1.11 U	<1.12 U	<6.56 U
TRANS-1,2-DICHLOROETHENE	ug/kg	10000	<1.22 U	<1.22 UJ	<1.27 U	<1.19 U	<1.26 U	<1.18 UJ	<1.22 U	<1.13 U	<1.29 U	<1.11 U	<1.12 U	<6.56 U
TRANS-1,3-DICHLOROPROPENE	ug/kg	2900	<1.22 U	<1.22 UJ	<1.27 U	<1.19 U	<1.26 U	<1.18 UJ	<1.22 U	<1.13 U	<1.29 U	<1.11 U	<1.12 U	<6.56 U
TRICHLOROETHENE	ug/kg	500	<1.22 U	1.71 J	<1.27 U	<1.19 U	1.27 J	14.1 J	4.54 J	49.7	2.05 J	2.16 J	0.809 J	583
TRICHLOROFLUOROMETHANE	ug/kg	3100000	<2.44 U	<2.44 UJ	<2.54 U	<2.38 U	<2.52 U	<2.36 UJ	<2.44 U	<2.26 U	<2.58 U	<2.22 U	<2.24 U	<13.1 U
VINYL CHLORIDE	ug/kg	200	<2.44 U	<2.44 UJ	<2.54 U	<2.38 U	<2.52 U	<2.36 UJ	<2.44 U	<2.26 U	<2.58 U	<2.22 U	<2.24 U	<13.1 U
Percent Solids (D2216-90)														
Solids, Percent	%		82.8	80.1	80.7	81.6	78.9	78.3	82.4	81	81.6	82.6	83.5	78.5
Total Organic Carbon (LYDKHN)														
TOTAL ORGANIC CARBON (TOC)	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Blue Highlighting Indicates concentrations above the MCL/MSC

Note: Some samples may have been diluted due to the concentration(s) of one or more analytes exceeding the upper limit of the calibration curve.

J - Estimated: The analyte was positively identified, the quantitation is an estimation due to discrepancies in meeting certain analyte-specific quality control criteria.

MCL/MSC - Maximum Contaminant Limit/Medium-Specific Concentrations

mg/kg - milligrams per kilogram

N/A - not analyzed

U - Undetected: The analyte was analyzed for, but not detected.

UJ - The analyte was not detected; however, the result is estimated due to discrepancies in meeting certain analyte-specific quality control criteria.

ug/kg - micrograms per kilogram

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Location ID: Sample Date:	Units	MCL/ MSC	18CPTUEP18 (43-44)040614 6/4/2014	18CPTUEP07 (16-17)200514 5/20/2014	18CPTUEP07 (47.5-48.5)200514 5/20/2014	18CPTUEP07 (55-56.5)200514 5/20/2014	18CPTUEP07 (59-60)200514 5/20/2014	18CPTUEP07 (6-7)200514 5/20/2014	18CPTUEP08 (19-20)200514 5/20/2014	18CPTUEP08 (41-42)200514 5/20/2014	18CPTUEP08 (49-50)200514 5/20/2014	18CPTUEP08 (54-55)200514 5/20/2014	18CPTUEP08 (6-7)200514 5/20/2014	18CPTUEP08 (6-7)200514-D 5/20/2014
Location Description:			UEP Area. MIP verification soil sampling.	UEP Area. MIP verification soil sampling.	UEP Area. MIP verification soil sampling.	UEP Area. MIP verification soil sampling.	UEP Area. MIP verification soil sampling.	UEP Area. MIP verification soil sampling.	UEP Area. MIP verification soil sampling.	UEP Area. MIP verification soil sampling.	UEP Area. MIP verification soil sampling.	UEP Area. MIP verification soil sampling.	UEP Area. MIP verification soil sampling.	UEP Area. MIP verification soil sampling.
Perchlorate (6850)														
PERCHLORATE	ug/kg	7200	3100	4.59 J	492	41.1	6.73	<2.34 U	133 J	19600	192	95.6	<2.44 U	<2.32 U
Volatile Organic Compounds (8260B)														
1,1,1,2-TETRACHLOROETHANE	ug/kg	11000	<1.34 U	<1.13 U	<212 U	<5.36 U	<116 U	<1.09 U	<1.09 U	<238 U	<124 U	<5.76 U	<1.11 U	<1.13 U
1,1,1-TRICHLOROETHANE	ug/kg	20000	<1.34 U	<1.13 U	<212 U	<5.36 U	<116 U	<1.09 U	<1.09 U	<238 U	<124 U	<5.76 U	<1.11 U	<1.13 U
1,1,2,2-TETRACHLOROETHANE	ug/kg	1400	<1.34 U	<1.13 U	<212 U	<5.36 U	<116 U	<1.09 U	<1.09 U	<238 U	<124 U	<5.76 U	<1.11 U	<1.13 U
1,1,2-TRICHLOROETHANE	ug/kg	500	<1.34 U	<1.13 U	<212 U	<5.36 U	<116 U	<1.09 U	<1.09 U	<238 U	<124 U	<5.76 U	<1.11 U	<1.13 U
1,1-DICHLOROETHANE	ug/kg	1000000	<2.68 U	<2.26 U	<426 U	<10.7 U	<232 U	<2.18 U	<2.18 U	<476 U	<248 U	<11.5 U	<2.22 U	<2.26 U
1,1-DICHLOROETHENE	ug/kg	700	<1.34 U	<1.13 U	<212 U	<5.36 U	<116 U	<1.09 U	<1.09 U	<238 U	<124 U	<5.76 U	<1.11 U	<1.13 U
1,1-DICHLOROPROPENE	ug/kg	290	<1.34 U	<1.13 U	<212 U	<5.36 U	<116 U	<1.09 U	<1.09 U	<238 U	<124 U	<5.76 U	<1.11 U	<1.13 U
1,2,3-TRICHLOROBENZENE	ug/kg	31000	<1.34 U	<1.13 U	<212 U	<5.36 U	<116 U	<1.09 U	<1.09 U	<238 U	<124 U	<5.76 U	<1.11 U	<1.13 U
1,2,3-TRICHLOROPROPANE	ug/kg	4.1	<2.68 U	<2.26 U	<426 U	<10.7 U	<232 U	<2.18 U	<2.18 U	<476 U	<248 U	<11.5 U	<2.22 U	<2.26 U
1,2,4-TRICHLOROBENZENE	ug/kg	7000	<1.34 U	<1.13 U	<212 U	<5.36 U	<116 U	<1.09 U	<1.09 U	<238 U	<124 U	<5.76 U	<1.11 U	<1.13 U
1,2,4-TRIMETHYLBENZENE	ug/kg	510000	<1.34 U	<1.13 U	<212 U	6.6 J	<116 U	<1.09 U	<1.09 U	<238 U	<124 U	<5.76 U	<1.11 U	<1.13 U
1,2-DIBROMO-3-CHLOROPROPANE	ug/kg	20	<5.36 U	<4.5 U	<852 U	<21.4 U	<464 U	<4.38 U	<4.36 U	<950 U	<498 U	<23 U	<4.44 U	<4.54 U
1,2-DIBROMOETHANE	ug/kg	5	<1.34 U	<1.13 U	<212 U	<5.36 U	<116 U	<1.09 U	<1.09 UJ	<238 U	<124 U	<5.76 U	<1.11 U	<1.13 U
1,2-DICHLOROBENZENE	ug/kg	60000	<1.34 U	<1.13 U	<212 U	<5.36 U	<116 U	<1.09 U	<1.09 UJ	<238 U	<124 U	<5.76 U	<1.11 U	<1.13 U
1,2-DICHLOROETHANE	ug/kg	500	<1.34 U	<1.13 U	<212 U	<5.36 U	<116 U	<1.09 U	<1.09 U	<238 U	<124 U	<5.76 U	<1.11 U	<1.13 U
1,2-DICHLOROPROPANE	ug/kg	500	<1.34 U	<1.13 U	<212 U	<5.36 U	<116 U	<1.09 U	<1.09 U	<238 U	<124 U	<5.76 U	<1.11 U	<1.13 U
1,3,5-TRIMETHYLBENZENE	ug/kg	510000	<1.34 U	<1.13 U	<212 U	<5.36 U	<116 U	<1.09 U	<1.09 U	<238 U	<124 U	<5.76 U	<1.11 U	<1.13 U
1,3-DICHLOROBENZENE	ug/kg	310000	<1.34 U	<1.13 U	<212 U	<5.36 U	<116 U	<1.09 U	<1.09 U	<238 U	<124 U	<5.76 U	<1.11 U	<1.13 U
1,3-DICHLOROPROPANE	ug/kg	2900	<1.34 U	<1.13 U	<212 U	<5.36 U	<116 U	<1.09 U	<1.09 UJ	<238 U	<124 U	<5.76 U	<1.11 U	<1.13 U
1,4-DICHLOROBENZENE	ug/kg	7500	<1.34 U	<1.13 U	<212 U	<5.36 U	<116 U	<1.09 U	<1.09 U	<238 U	<124 U	<5.76 U	<1.11 U	<1.13 U
2,2-DICHLOROPROPANE	ug/kg	4200	<1.34 U	<1.13 U	<212 U	<5.36 U	<116 U	<1.09 U	<1.09 U	<238 U	<124 U	<5.76 U	<1.11 U	<1.13 U
2-BUTANONE	ug/kg	6100000	<6.72 U	<5.62 U	<1060 U	<26.8 U	<580 U	<5.46 U	<5.46 UJ	<1190 U	<622 U	<28.8 U	<5.56 U	<5.68 U
2-CHLOROTOLUENE	ug/kg	200000	<1.34 U	<1.13 U	<212 U	<5.36 U	<116 U	<1.09 U	<1.09 U	<238 U	<124 U	<5.76 U	<1.11 U	<1.13 U
2-HEXANONE	ug/kg	610000	<6.72 U	<5.62 U	<1060 U	<26.8 U	<580 U	<5.46 U	<5.46 U	<1190 U	<622 U	<28.8 U	<5.56 U	<5.68 U
4-CHLOROTOLUENE	ug/kg	200000	<1.34 U	<1.13 U	<212 U	<5.36 U	<116 U	<1.09 U	<1.09 U	<238 U	<124 U	<5.76 U	<1.11 U	<1.13 U
4-METHYL-2-PENTANONE	ug/kg	820000	<6.72 U	<5.62 U	<1060 U	<26.8 U	<580 U	<5.46 U	<5.46 U	<1190 U	<622 U	<28.8 U	<5.56 U	<5.68 U
ACETONE	ug/kg	920000	<13.4 U	<11.3 U	<2120 U	<53.6 U	<1160 U	<10.9 U	<10.9 U	<2380 U	<1240 U	<57.6 U	<11.1 U	<11.3 U
BENZENE	ug/kg	500	<1.34 U	<1.13 U	<212 U	<5.36 U	<116 U	<1.09 U	<1.09 U	<238 U	<124 U	<5.76 U	<1.11 U	<1.13 U
BROMOBENZENE	ug/kg	200000	<1.34 U	<1.13 U	<212 U	<5.36 U	<116 U	<1.09 U	<1.09 U	<238 U	<124 U	<5.76 U	<1.11 U	<1.13 U
BROMOCHLOROMETHANE	ug/kg	410000	<2.68 U	<2.26 U	<426 U	<10.7 U	<232 U	<2.18 U	<2.18 U	<476 U	<248 U	<11.5 U	<2.22 U	<2.26 U
BROMODICHLOROMETHANE	ug/kg	460	<1.34 U	<1.13 U	<212 U	<5.36 U	<116 U	<1.09 U	<1.09 U	<238 U	<124 U	<5.76 U	<1.11 U	<1.13 U
BROMOFORM	ug/kg	3600	<1.34 U	<1.13 U	<212 U	<5.36 U	<116 U	<1.09 U	<1.09 U	<238 U	<124 U	<5.76 U	<1.11 U	<1.13 U
BROMOMETHANE	ug/kg	14000	<2.68 U	<2.26 U	<426 U	<10.7 U	<232 U	<2.18 U	<2.18 U	<476 U	<248 U	<11.5 U	<2.22 U	<2.26 U
CARBON DISULFIDE	ug/kg	1000000	<1.34 U	<1.13 U	<212 U	<5.36 U	<116 U	<1.09 U	<1.09 UJ	<238 U	<124 U	<5.76 U	<1.11 U	<1.13 U
CARBON TETRACHLORIDE	ug/kg	500	<1.34 U	<1.13 U	<212 U	<5.36 U	<116 U	<1.09 U	<1.09 U	<238 U	<124 U	<5.76 U	<1.11 U	<1.13 U
CHLOROBENZENE	ug/kg	10000	<1.34 U	<1.13 U	<212 U	<5.36 U	<116 U	<1.09 U	<1.09 U	<238 U	<124 U	<5.76 U	<1.11 U	<1.13 U
CHLOROETHANE	ug/kg	4100000	<2.68 U	<2.26 U	<426 U	<10.7 U	<232 U	<2.18 U	<2.18 U	<476 U	<248 U	<11.5 U	<2.22 U	<2.26 U
CHLOROFORM	ug/kg	100000	<1.34 U	<1.13 U	<212 U	4.54 J	<116 U	<1.09 U	<1.09 U	<238 U	<124 U	<5.76 U	<1.11 U	0.998 J
CHLOROMETHANE	ug/kg	22000	<5.36 U	<4.5 UJ	<852 U	<21.4 U	<464 UJ	<4.38 U	<4.36 U	<950 UJ	<498 UJ	<23 UJ	<4.44 U	<4.54 U
CIS-1,2-DICHLOROETHENE	ug/kg	7000	<1.34 U	<1.13 U	<212 U	<5.36 U	<116 U	<1.09 U	<1.09 U	<238 U	<124 U	<5.76 U	<1.11 U	<1.13 U
CIS-1,3-DICHLOROPROPENE	ug/kg	530	<1.34 U	<1.13 U	<212 U	<5.36 U	<116 U	<1.09 U	<1.09 U	<238 U	<124 U	<5.76 U	<1.11 U	<1.13 U
DIBROMOCHLOROMETHANE	ug/kg	3400	<1.34 U	<1.13 U	<212 U	<5.36 U	<116 U	<1.09 U	<1.09 U	<238 U	<124 U	<5.76 U	<1.11 U	<1.13 U

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Location ID: Sample Date:	Units	MCL/ MSC	18CPTUEP18 (43-44)040614 6/4/2014	18CPTUEP07 (16-17)200514 5/20/2014	18CPTUEP07 (47.5-48.5)200514 5/20/2014	18CPTUEP07 (55-56.5)200514 5/20/2014	18CPTUEP07 (59-60)200514 5/20/2014	18CPTUEP07 (6-7)200514 5/20/2014	18CPTUEP08 (19-20)200514 5/20/2014	18CPTUEP08 (41-42)200514 5/20/2014	18CPTUEP08 (49-50)200514 5/20/2014	18CPTUEP08 (54-55)200514 5/20/2014	18CPTUEP08 (6-7)200514 5/20/2014	18CPTUEP08 (6-7)200514-D 5/20/2014
Location Description:			UEP Area. MIP verification soil sampling.	UEP Area. MIP verification soil sampling.	UEP Area. MIP verification soil sampling.	UEP Area. MIP verification soil sampling.	UEP Area. MIP verification soil sampling.	UEP Area. MIP verification soil sampling.	UEP Area. MIP verification soil sampling.	UEP Area. MIP verification soil sampling.	UEP Area. MIP verification soil sampling.	UEP Area. MIP verification soil sampling.	UEP Area. MIP verification soil sampling.	UEP Area. MIP verification soil sampling.
DIBROMOMETHANE	ug/kg	38000	<1.34 U	<1.13 U	<212 U	<5.36 U	<116 U	<1.09 U	<1.09 U	<238 U	<124 U	<5.76 U	<1.11 U	<1.13 U
DICHLORODIFLUOROMETHANE	ug/kg	2000000	<2.68 U	<2.26 UJ	<426 U	<10.7 U	<232 UJ	<2.18 U	<2.18 U	<476 UJ	<248 UJ	<11.5 U	<2.22 U	<2.26 U
ETHYLBENZENE	ug/kg	70000	<1.34 U	<1.13 U	<212 U	<5.36 U	<116 U	<1.09 U	<1.09 U	<238 U	<124 U	<5.76 U	<1.11 U	<1.13 U
HEXACHLOROBUTADIENE	ug/kg	2000	<1.34 U	<1.13 U	<212 U	<5.36 U	<116 U	<1.09 U	<1.09 U	<238 U	<124 U	<5.76 U	<1.11 U	<1.13 U
ISOPROPYLBENZENE	ug/kg	1000000	<1.34 U	<1.13 U	<212 U	<5.36 U	<116 U	<1.09 U	<1.09 U	<238 U	<124 U	<5.76 U	<1.11 U	<1.13 U
M,P-XYLENE	ug/kg	1000000	<1.34 U	<1.13 U	<212 U	3.99 J	<116 U	<1.09 U	<1.09 U	<238 U	<124 U	<5.76 U	<1.11 U	<1.13 U
METHYLENE CHLORIDE	ug/kg	500	21.8	10.1	25200	50.8	275 J	6.46	10.7	132000	272 J	21.5 J	6.66	17.8
NAPHTHALENE	ug/kg	200000	<1.34 U	<1.13 UJ	<212 U	9 J	<116 UJ	<1.09 U	<1.09 U	<238 UJ	<124 UJ	<5.76 U	<1.11 U	<1.13 U
N-BUTYLBENZENE	ug/kg	410000	<1.34 U	<1.13 U	<212 U	<5.36 U	<116 U	<1.09 U	<1.09 U	<238 U	<124 U	<5.76 U	<1.11 U	<1.13 U
N-PROPYLBENZENE	ug/kg	410000	<1.34 U	<1.13 U	<212 U	<5.36 U	<116 U	<1.09 U	<1.09 U	<238 U	<124 U	<5.76 U	<1.11 U	<1.13 U
O-XYLENE	ug/kg	1000000	<1.34 U	<1.13 U	<212 U	<5.36 U	<116 U	<1.09 U	<1.09 U	<238 U	<124 U	<5.76 U	<1.11 U	<1.13 U
P-ISOPROPYLTOLUENE	ug/kg	1000000	<1.34 U	<1.13 U	<212 U	<5.36 U	<116 U	<1.09 U	<1.09 U	<238 U	<124 U	<5.76 U	<1.11 U	<1.13 U
SEC-BUTYLBENZENE	ug/kg	410000	<1.34 U	<1.13 U	<212 U	<5.36 U	<116 U	<1.09 U	<1.09 U	<238 U	<124 U	<5.76 U	<1.11 U	<1.13 U
STYRENE	ug/kg	10000	<1.34 U	<1.13 U	<212 U	<5.36 U	<116 U	<1.09 U	<1.09 U	<238 U	<124 U	<5.76 U	<1.11 U	<1.13 U
TERT-BUTYLBENZENE	ug/kg	410000	<1.34 U	<1.13 U	<212 U	<5.36 U	<116 U	<1.09 U	<1.09 U	<238 U	<124 U	<5.76 U	<1.11 U	<1.13 U
TETRACHLOROETHENE	ug/kg	500	<1.34 U	<1.13 U	<212 U	<5.36 U	<116 U	<1.09 U	<1.09 U	<238 U	<124 U	<5.76 U	<1.11 U	<1.13 U
TOLUENE	ug/kg	100000	<1.34 U	<1.13 U	<212 U	<5.36 U	<116 U	<1.09 U	<1.09 U	<238 U	<124 U	<5.76 U	<1.11 U	<1.13 U
TRANS-1,2-DICHLOROETHENE	ug/kg	10000	<1.34 U	<1.13 U	<212 U	<5.36 U	<116 U	<1.09 U	<1.09 UJ	<238 U	<124 U	<5.76 U	<1.11 U	<1.13 U
TRANS-1,3-DICHLOROPROPENE	ug/kg	2900	<1.34 U	<1.13 U	<212 U	<5.36 U	<116 U	<1.09 U	<1.09 U	<238 U	<124 U	<5.76 U	<1.11 U	<1.13 U
TRICHLOROETHENE	ug/kg	500	2.57 J	1.78 J	442 J	10.5 J	<116 U	<1.09 U	1.49 J	7260	<124 U	4.77 J	<1.11 U	20.5
TRICHLOROFLUOROMETHANE	ug/kg	3100000	<2.68 U	<2.26 U	<426 U	<10.7 U	<232 U	<2.18 U	<2.18 U	<476 U	<248 U	<11.5 U	<2.22 U	<2.26 U
VINYL CHLORIDE	ug/kg	200	<2.68 U	<2.26 UJ	<426 U	<10.7 U	<232 UJ	<2.18 U	<2.18 U	<476 UJ	<248 UJ	<11.5 U	<2.22 U	<2.26 U
Percent Solids (D2216-90)														
Solids, Percent	%		79.8	91.8	91.7	92.3	90	93.2	92.5	90	90	92.3	90.3	95.4
Total Organic Carbon (LYDKHN)														
TOTAL ORGANIC CARBON (TOC)	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Blue Highlighting Indicates concentrations above the MCL/MSC

Note: Some samples may have been diluted due to the concentration(s) of one or more analytes exceeding the upper limit of the calibration curve.

J - Estimated: The analyte was positively identified, the quantitation is an estimation due to discrepancies in meeting certain analyte-specific quality control criteria.

MCL/MSC - Maximum Contaminant Limit/Medium-Specific Concentrations

mg/kg - milligrams per kilogram

N/A - not analyzed

U - Undetected: The analyte was analyzed for, but not detected.

UJ - The analyte was not detected; however, the result is estimated due to discrepancies in meeting certain analyte-specific quality control criteria.

ug/kg - micrograms per kilogram

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Location ID: Sample Date:	Units	MCL/ MSC	18WW2306 070514 5/7/2014	18WW2312 070514 5/7/2014	18WW23120 70514D 5/7/2014	18WW2316 070514 5/7/2014	18CPTPB10 (20-21)280514 5/28/2014	18CPTPB10 (26-27)280514 5/28/2014	18CPTPB10 (27-28)280514 5/28/2014	18CPTPB10 (4-5)280514 5/28/2014	18CPTPB12 (20-21)280514 5/28/2014	18CPTPB12 (25-26)280514 5/28/2014	18CPTPB12 (28-29)280514 5/28/2014
Location Description:			Near C-01, south of containment area boundary. Soil Sample.	Near C-01, south of containment area boundary. Soil Sample.	Near C-01, south of containment area boundary. Soil Sample.	Near C-01, south of containment area boundary. Soil Sample.	UEP Area vadose zone MIP verification soil sample.	UEP Area vadose zone MIP verification soil sample.	UEP Area vadose zone MIP verification soil sample.	UEP Area vadose zone MIP verification soil sample.	UEP Area vadose zone MIP verification soil sample.	UEP Area vadose zone MIP verification soil sample.	UEP Area vadose zone MIP verification soil sample.
Perchlorate (6850)													
PERCHLORATE	ug/kg	7200	<2.08 U	<2.08 U	<2.1 U	<2.4 U	<2.34 U	4.11 J	48.8	<2.46 U	285	529	1620
Volatile Organic Compounds (8260B)													
1,1,1,2-TETRACHLOROETHANE	ug/kg	11000	NA	NA	NA	NA	<1.17 U	<1.17 U	<1.14 U	<1.16 U	<1.11 U	<1.2 U	<148 U
1,1,1-TRICHLOROETHANE	ug/kg	20000	NA	NA	NA	NA	<1.17 U	<1.17 U	<1.14 U	<1.16 U	<1.11 U	<1.2 U	<148 U
1,1,2,2-TETRACHLOROETHANE	ug/kg	1400	NA	NA	NA	NA	<1.17 U	<1.17 U	<1.14 U	<1.16 U	<1.11 U	<1.2 U	<148 U
1,1,2-TRICHLOROETHANE	ug/kg	500	NA	NA	NA	NA	<1.17 U	<1.17 U	<1.14 U	<1.16 U	<1.11 U	<1.2 U	<148 U
1,1-DICHLOROETHANE	ug/kg	1000000	NA	NA	NA	NA	<2.34 U	<2.34 U	<2.28 U	<2.32 U	<2.22 U	<2.4 U	<296 U
1,1-DICHLOROETHENE	ug/kg	700	NA	NA	NA	NA	<1.17 U	<1.17 U	<1.14 U	<1.16 U	<1.11 U	<1.2 U	<148 U
1,1-DICHLOROPROPENE	ug/kg	290	NA	NA	NA	NA	<1.17 U	<1.17 U	<1.14 U	<1.16 U	<1.11 U	<1.2 U	<148 U
1,2,3-TRICHLOROBENZENE	ug/kg	31000	NA	NA	NA	NA	<1.17 U	<1.17 U	<1.14 U	<1.16 U	<1.11 U	<1.2 U	<148 U
1,2,3-TRICHLOROPROPANE	ug/kg	4.1	NA	NA	NA	NA	<2.34 U	<2.34 U	<2.28 U	<2.32 U	<2.22 U	<2.4 U	<296 U
1,2,4-TRICHLOROBENZENE	ug/kg	7000	NA	NA	NA	NA	<1.17 U	<1.17 U	<1.14 U	<1.16 U	<1.11 U	<1.2 U	<148 U
1,2,4-TRIMETHYLBENZENE	ug/kg	510000	NA	NA	NA	NA	<1.17 U	<1.17 U	<1.14 U	<1.16 U	<1.11 U	<1.2 U	<148 U
1,2-DIBROMO-3-CHLOROPROPANE	ug/kg	20	NA	NA	NA	NA	<4.66 U	<4.68 U	<4.56 U	<4.66 U	<4.44 U	<4.8 U	<592 U
1,2-DIBROMOETHANE	ug/kg	5	NA	NA	NA	NA	<1.17 U	<1.17 U	<1.14 U	<1.16 U	<1.11 U	<1.2 U	<148 U
1,2-DICHLOROBENZENE	ug/kg	60000	NA	NA	NA	NA	<1.17 U	<1.17 U	<1.14 U	<1.16 U	<1.11 U	<1.2 U	<148 U
1,2-DICHLOROETHANE	ug/kg	500	NA	NA	NA	NA	<1.17 U	<1.17 U	<1.14 U	<1.16 U	<1.11 U	<1.2 U	<148 U
1,2-DICHLOROPROPANE	ug/kg	500	NA	NA	NA	NA	<1.17 U	<1.17 U	<1.14 U	<1.16 U	<1.11 U	<1.2 U	<148 U
1,3,5-TRIMETHYLBENZENE	ug/kg	510000	NA	NA	NA	NA	<1.17 U	<1.17 U	<1.14 U	<1.16 U	<1.11 U	<1.2 U	<148 U
1,3-DICHLOROBENZENE	ug/kg	310000	NA	NA	NA	NA	<1.17 U	<1.17 U	<1.14 U	<1.16 U	<1.11 U	<1.2 U	<148 U
1,3-DICHLOROPROPANE	ug/kg	2900	NA	NA	NA	NA	<1.17 U	<1.17 U	<1.14 U	<1.16 U	<1.11 U	<1.2 U	<148 U
1,4-DICHLOROBENZENE	ug/kg	7500	NA	NA	NA	NA	<1.17 U	<1.17 U	<1.14 U	<1.16 U	<1.11 U	<1.2 U	<148 U
2,2-DICHLOROPROPANE	ug/kg	4200	NA	NA	NA	NA	<1.17 U	<1.17 U	<1.14 U	<1.16 U	<1.11 U	<1.2 U	<148 U
2-BUTANONE	ug/kg	6100000	NA	NA	NA	NA	<5.84 U	<5.86 U	<5.7 U	<5.82 U	<5.54 U	<6 U	<740 U
2-CHLOROTOLUENE	ug/kg	200000	NA	NA	NA	NA	<1.17 U	<1.17 U	<1.14 U	<1.16 U	<1.11 U	<1.2 U	<148 U
2-HEXANONE	ug/kg	610000	NA	NA	NA	NA	<5.84 U	<5.86 U	<5.7 U	<5.82 U	<5.54 U	<6 U	<740 U
4-CHLOROTOLUENE	ug/kg	200000	NA	NA	NA	NA	<1.17 U	<1.17 U	<1.14 U	<1.16 U	<1.11 U	<1.2 U	<148 U
4-METHYL-2-PENTANONE	ug/kg	820000	NA	NA	NA	NA	<5.84 U	<5.86 U	<5.7 U	<5.82 U	<5.54 U	<6 U	<740 U
ACETONE	ug/kg	920000	NA	NA	NA	NA	<11.7 U	<11.7 U	<11.4 U	24.7	<11.1 U	<12 U	<1480 U
BENZENE	ug/kg	500	NA	NA	NA	NA	<1.17 U	<1.17 U	<1.14 U	<1.16 U	<1.11 U	<1.2 U	<148 U
BROMOBENZENE	ug/kg	200000	NA	NA	NA	NA	<1.17 U	<1.17 U	<1.14 U	<1.16 U	<1.11 U	<1.2 U	<148 U
BROMOCHLOROMETHANE	ug/kg	410000	NA	NA	NA	NA	<2.34 U	<2.34 U	<2.28 U	<2.32 U	<2.22 U	<2.4 U	<296 U
BROMODICHLOROMETHANE	ug/kg	460	NA	NA	NA	NA	<1.17 U	<1.17 U	<1.14 U	<1.16 U	<1.11 U	<1.2 U	<148 U
BROMOFORM	ug/kg	3600	NA	NA	NA	NA	<1.17 U	<1.17 U	<1.14 U	<1.16 U	<1.11 U	<1.2 U	<148 U
BROMOMETHANE	ug/kg	14000	NA	NA	NA	NA	<2.34 U	<2.34 U	<2.28 U	<2.32 U	<2.22 U	<2.4 U	<296 U
CARBON DISULFIDE	ug/kg	1000000	NA	NA	NA	NA	<1.17 U	<1.17 U	<1.14 U	<1.16 U	<1.11 U	<1.2 U	<148 U
CARBON TETRACHLORIDE	ug/kg	500	NA	NA	NA	NA	<1.17 U	<1.17 U	<1.14 U	<1.16 U	<1.11 U	<1.2 U	<148 U
CHLOROBENZENE	ug/kg	10000	NA	NA	NA	NA	<1.17 U	<1.17 U	<1.14 U	<1.16 U	<1.11 U	<1.2 U	<148 U
CHLOROETHANE	ug/kg	4100000	NA	NA	NA	NA	<2.34 U	<2.34 U	<2.28 U	<2.32 U	<2.22 U	<2.4 U	<296 U
CHLOROFORM	ug/kg	100000	NA	NA	NA	NA	<1.17 U	<1.17 U	<1.14 U	<1.16 U	<1.11 U	<1.2 U	<148 U
CHLOROMETHANE	ug/kg	22000	NA	NA	NA	NA	<4.66 U	<4.68 U	<4.56 U	<4.66 U	<4.44 U	<4.8 U	<592 U
CIS-1,2-DICHLOROETHENE	ug/kg	7000	NA	NA	NA	NA	<1.17 U	<1.17 U	<1.14 U	<1.16 U	3.07 J	1.52 J	1960
CIS-1,3-DICHLOROPROPENE	ug/kg	530	NA	NA	NA	NA	<1.17 U	<1.17 U	<1.14 U	<1.16 U	<1.11 U	<1.2 U	<148 U
DIBROMOCHLOROMETHANE	ug/kg	3400	NA	NA	NA	NA	<1.17 U	<1.17 U	<1.14 U	<1.16 U	<1.11 U	<1.2 U	<148 U

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Location ID: **Sample Date:**	**Units**	**MCL/ MSC**	**18WW2306 070514 5/7/2014**	**18WW2312 070514 5/7/2014**	**18WW23120 70514D 5/7/2014**	**18WW2316 070514 5/7/2014**	**18CPTPB10 (20-21)280514 5/28/2014**	**18CPTPB10 (26-27)280514 5/28/2014**	**18CPTPB10 (27-28)280514 5/28/2014**	**18CPTPB10 (4-5)280514 5/28/2014**	**18CPTPB12 (20-21)280514 5/28/2014**	**18CPTPB12 (25-26)280514 5/28/2014**	**18CPTPB12 (28-29)280514 5/28/2014**
Location Description:			Near C-01, south of containment area boundary. Soil Sample.	Near C-01, south of containment area boundary. Soil Sample.	Near C-01, south of containment area boundary. Soil Sample.	Near C-01, south of containment area boundary. Soil Sample.	UEP Area vadose zone MIP verification soil sample.	UEP Area vadose zone MIP verification soil sample.	UEP Area vadose zone MIP verification soil sample.	UEP Area vadose zone MIP verification soil sample.	UEP Area vadose zone MIP verification soil sample.	UEP Area vadose zone MIP verification soil sample.	UEP Area vadose zone MIP verification soil sample.
DIBROMOMETHANE	ug/kg	38000	NA	NA	NA	NA	<1.17 U	<1.17 U	<1.14 U	<1.16 U	<1.11 U	<1.2 U	<148 U
DICHLORODIFLUOROMETHANE	ug/kg	2000000	NA	NA	NA	NA	<2.34 U	<2.34 U	<2.28 U	<2.32 U	<2.22 U	<2.4 U	<296 U
ETHYLBENZENE	ug/kg	70000	NA	NA	NA	NA	<1.17 U	<1.17 U	<1.14 U	<1.16 U	<1.11 U	<1.2 U	<148 U
HEXACHLOROBUTADIENE	ug/kg	2000	NA	NA	NA	NA	<1.17 U	<1.17 U	<1.14 U	<1.16 U	<1.11 U	<1.2 U	<148 U
ISOPROPYLBENZENE	ug/kg	1000000	NA	NA	NA	NA	<1.17 U	<1.17 U	<1.14 U	<1.16 U	<1.11 U	<1.2 U	<148 U
M,P-XYLENE	ug/kg	1000000	NA	NA	NA	NA	<1.17 U	<1.17 U	<1.14 U	<1.16 U	<1.11 U	<1.2 U	<148 U
METHYLENE CHLORIDE	ug/kg	500	NA	NA	NA	NA	1.76 J	1.27 J	1.75 J	1.93 J	<2.22 U	<2.4 U	<296 U
NAPHTHALENE	ug/kg	200000	NA	NA	NA	NA	<1.17 U	<1.17 U	<1.14 U	<1.16 U	<1.11 U	<1.2 U	<148 U
N-BUTYLBENZENE	ug/kg	410000	NA	NA	NA	NA	<1.17 U	<1.17 U	<1.14 U	<1.16 U	<1.11 U	<1.2 U	<148 U
N-PROPYLBENZENE	ug/kg	410000	NA	NA	NA	NA	<1.17 U	<1.17 U	<1.14 U	<1.16 U	<1.11 U	<1.2 U	<148 U
O-XYLENE	ug/kg	1000000	NA	NA	NA	NA	<1.17 U	<1.17 U	<1.14 U	<1.16 U	<1.11 U	<1.2 U	<148 U
P-ISOPROPYLTOLUENE	ug/kg	1000000	NA	NA	NA	NA	<1.17 U	<1.17 U	<1.14 U	0.836 J	<1.11 U	<1.2 U	<148 U
SEC-BUTYLBENZENE	ug/kg	410000	NA	NA	NA	NA	<1.17 U	<1.17 U	<1.14 U	<1.16 U	<1.11 U	<1.2 U	<148 U
STYRENE	ug/kg	10000	NA	NA	NA	NA	<1.17 U	<1.17 U	<1.14 U	<1.16 U	<1.11 U	<1.2 U	<148 U
TERT-BUTYLBENZENE	ug/kg	410000	NA	NA	NA	NA	<1.17 U	<1.17 U	<1.14 U	<1.16 U	<1.11 U	<1.2 U	<148 U
TETRACHLOROETHENE	ug/kg	500	NA	NA	NA	NA	<1.17 U	<1.17 U	<1.14 U	<1.16 U	<1.11 U	<1.2 U	<148 U
TOLUENE	ug/kg	100000	NA	NA	NA	NA	<1.17 U	<1.17 U	<1.14 U	<1.16 U	<1.11 U	<1.2 U	<148 U
TRANS-1,2-DICHLOROETHENE	ug/kg	10000	NA	NA	NA	NA	<1.17 U	<1.17 U	<1.14 U	<1.16 U	<1.11 U	<1.2 U	<148 U
TRANS-1,3-DICHLOROPROPENE	ug/kg	2900	NA	NA	NA	NA	<1.17 U	<1.17 U	<1.14 U	<1.16 U	<1.11 U	<1.2 U	<148 U
TRICHLOROETHENE	ug/kg	500	NA	NA	NA	NA	<1.17 U	<1.17 U	<1.14 U	0.795 J	16.2	4.48 J	4100
TRICHLOROFLUOROMETHANE	ug/kg	3100000	NA	NA	NA	NA	<2.34 U	<2.34 U	<2.28 U	<2.32 U	<2.22 U	<2.4 U	<296 U
VINYL CHLORIDE	ug/kg	200	NA	NA	NA	NA	<2.34 U	<2.34 U	<2.28 U	<2.32 U	<2.22 U	<2.4 U	<296 U
Percent Solids (D2216-90)													
Solids, Percent	%		93.8	94.5	93.6	82.8	NA	82.9	81.7	80.8	84.1	81	76
Total Organic Carbon (LYDKHN)													
TOTAL ORGANIC CARBON (TOC)	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Blue Highlighting Indicates concentrations above the MCL/MSC

Note: Some samples may have been diluted due to the concentration(s) of one or more analytes exceeding the upper limit of the calibration curve.

J - Estimated: The analyte was positively identified, the quantitation is an estimation due to discrepancies in meeting certain analyte-specific quality control criteria.

MCL/MSC - Maximum Contaminant Limit/Medium-Specific Concentrations

mg/kg - milligrams per kilogram

N/A - not analyzed

U - Undetected: The analyte was analyzed for, but not detected.

UJ - The analyte was not detected; however, the result is estimated due to discrepancies in meeting certain analyte-specific quality control criteria.

ug/kg - micrograms per kilogram

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May/June 2014

Location ID: **Sample Date:**	**Units**	**MCL/ MSC**	**18CPTPB12 (6-7)280514 5/28/2014**	**18CPTPB12 (6-7)280514D 5/28/2014**	**18CPTPB15 (18-19)290514 5/29/2014**	**18CPTPB15 (19-20)290514 5/29/2014**	**18CPTPB15 (25-26)290514 5/29/2014**	**18CPTPB15 (9-10)290514 5/29/2014**	**18CPTPB16 (14-15)290514 5/29/2014**	**18CPTPB16 (21-22)290514 5/29/2014**	**18CPTPB16 (23-24)290514 5/29/2014**	**18CPTPB16 (26-27)290514 5/29/2014**	**18CPTPB16 (5-6)290514 5/29/2014**
Location Description:			UEP Area vadose zone MIP verification soil sample.	UEP Area vadose zone MIP verification soil sample.	UEP Area vadose zone MIP verification soil sample.	UEP Area vadose zone MIP verification soil sample.	UEP Area vadose zone MIP verification soil sample.	UEP Area vadose zone MIP verification soil sample.	UEP Area vadose zone MIP verification soil sample.	UEP Area vadose zone MIP verification soil sample.	UEP Area vadose zone MIP verification soil sample.	UEP Area vadose zone MIP verification soil sample.	UEP Area vadose zone MIP verification soil sample.
Perchlorate (6850)													
PERCHLORATE	ug/kg	7200	2.07 J	<2.28 U	179	458	19.8	1.87 J	<2.4 U	<2.48 U	<2.34 U	<2.3 U	2.44 J
Volatile Organic Compounds (8260B)													
1,1,1,2-TETRACHLOROETHANE	ug/kg	11000	<1.19 UJ	<1.08 U	<1.25 U	<130 U	<1.29 U	<1.2 U	<123 U	<1.17 U	<1.12 U	<1.09 U	<1.15 U
1,1,1-TRICHLOROETHANE	ug/kg	20000	<1.19 UJ	<1.08 U	<1.25 U	<130 U	<1.29 U	<1.2 U	<123 U	<1.17 U	<1.12 U	<1.09 U	<1.15 U
1,1,2,2-TETRACHLOROETHANE	ug/kg	1400	<1.19 UJ	<1.08 U	<1.25 U	<130 U	<1.29 U	<1.2 U	<123 U	<1.17 U	<1.12 U	<1.09 U	<1.15 U
1,1,2-TRICHLOROETHANE	ug/kg	500	<1.19 UJ	<1.08 U	<1.25 U	<130 U	<1.29 U	<1.2 U	<123 U	<1.17 U	<1.12 U	<1.09 U	<1.15 U
1,1-DICHLOROETHANE	ug/kg	1000000	<1.19 UJ	<2.16 U	<2.5 U	<260 U	<2.58 U	<2.4 U	<246 U	<2.34 U	<2.24 U	<2.18 U	<2.3 U
1,1-DICHLOROETHENE	ug/kg	700	<2.38 UJ	<1.08 U	<1.25 U	<130 U	<1.29 U	<1.2 U	<123 U	<1.17 U	<1.12 U	<1.09 U	<1.15 U
1,1-DICHLOROPROPENE	ug/kg	290	<1.19 UJ	<1.08 U	<1.25 U	<130 U	<1.29 U	<1.2 U	<123 U	<1.17 U	<1.12 U	<1.09 U	<1.15 U
1,2,3-TRICHLOROBENZENE	ug/kg	31000	<1.19 UJ	<1.08 U	<1.25 U	<130 U	<1.29 U	<1.2 U	<123 U	<1.17 U	<1.12 U	<1.09 U	<1.15 U
1,2,3-TRICHLOROPROPANE	ug/kg	4.1	<2.38 UJ	2.16 U	<2.5 U	<260 U	<2.58 U	<2.4 U	<246 U	<2.34 U	<2.24 U	<2.18 U	<2.3 U
1,2,4-TRICHLOROBENZENE	ug/kg	7000	<1.19 UJ	<1.08 U	<1.25 U	<130 U	<1.29 U	<1.2 U	<123 U	<1.17 U	<1.12 U	<1.09 U	<1.15 U
1,2,4-TRIMETHYLBENZENE	ug/kg	510000	<1.19 UJ	<1.08 U	<1.25 U	<130 U	<1.29 U	<1.2 U	<123 U	<1.17 U	<1.12 U	<1.09 U	<1.15 U
1,2-DIBROMO-3-CHLOROPROPANE	ug/kg	20	<4.76 UJ	<4.3 U	<5 U	<518 U	<5.18 U	<4.82 U	<494 U	<4.68 U	<4.5 U	<4.36 U	<4.6 U
1,2-DIBROMOETHANE	ug/kg	5	<1.19 UJ	<1.08 U	<1.25 U	<130 U	<1.29 U	<1.2 U	<123 U	<1.17 U	<1.12 U	<1.09 U	<1.15 U
1,2-DICHLOROBENZENE	ug/kg	60000	<1.19 UJ	<1.08 U	<1.25 U	<130 U	<1.29 U	<1.2 U	<123 U	<1.17 U	<1.12 U	<1.09 U	<1.15 U
1,2-DICHLOROETHANE	ug/kg	500	<1.19 UJ	<1.08 U	<1.25 U	<130 U	<1.29 U	<1.2 U	<123 U	<1.17 U	<1.12 U	<1.09 U	<1.15 U
1,2-DICHLOROPROPANE	ug/kg	500	<1.19 UJ	<1.08 U	<1.25 U	<130 U	<1.29 U	<1.2 U	<123 U	<1.17 U	<1.12 U	<1.09 U	<1.15 U
1,3,5-TRIMETHYLBENZENE	ug/kg	510000	<1.19 UJ	<1.08 U	<1.25 U	<130 U	<1.29 U	<1.2 U	<123 U	<1.17 U	<1.12 U	<1.09 U	<1.15 U
1,3-DICHLOROBENZENE	ug/kg	310000	<1.19 UJ	<1.08 U	<1.25 U	<130 U	<1.29 U	<1.2 U	<123 U	<1.17 U	<1.12 U	<1.09 U	<1.15 U
1,3-DICHLOROPROPANE	ug/kg	2900	<1.19 UJ	<1.08 U	<1.25 U	<130 U	<1.29 U	<1.2 U	<123 U	<1.17 U	<1.12 U	<1.09 U	<1.15 U
1,4-DICHLOROBENZENE	ug/kg	7500	<1.19 UJ	<1.08 U	<1.25 U	<130 U	<1.29 U	<1.2 U	<123 U	<1.17 U	<1.12 U	<1.09 U	<1.15 U
2,2-DICHLOROPROPANE	ug/kg	4200	<1.19 UJ	<1.08 U	<1.25 U	<130 U	<1.29 U	<1.2 U	<123 U	<1.17 U	<1.12 U	<1.09 U	<1.15 U
2-BUTANONE	ug/kg	6100000	3.57 J	12.1	<6.24 U	<648 U	<6.48 U	<6.02 U	<616 U	<5.86 U	<5.62 U	<5.44 U	<5.76 U
2-CHLOROTOLUENE	ug/kg	200000	<1.19 UJ	<1.08 U	<1.25 U	<130 U	<1.29 U	<1.2 U	<123 U	<1.17 U	<1.12 U	<1.09 U	<1.15 U
2-HEXANONE	ug/kg	610000	<5.96 UJ	<5.38 U	<6.24 U	<648 U	<6.48 U	<6.02 U	<616 U	<5.86 U	<5.62 U	<5.44 U	<5.76 U
4-CHLOROTOLUENE	ug/kg	200000	<1.19 UJ	<1.08 U	<1.25 U	<130 U	<1.29 U	<1.2 U	<123 U	<1.17 U	<1.12 U	<1.09 U	<1.15 U
4-METHYL-2-PENTANONE	ug/kg	820000	<5.96 UJ	<5.38 U	<6.24 U	<648 U	<6.48 U	<6.02 U	<616 U	<5.86 U	<5.62 U	<5.44 U	<5.76 U
ACETONE	ug/kg	920000	38.5 J	105	<12.5 U	<1300 U	<12.9 U	<12 U	<1230 U	<11.7 U	<11.2 U	<10.9 U	<11.5 U
BENZENE	ug/kg	500	<1.19 UJ	<1.08 U	<1.25 U	<130 U	<1.29 U	<1.2 U	<123 U	<1.17 U	<1.12 U	<1.09 U	<1.15 U
BROMOBENZENE	ug/kg	200000	<1.19 UJ	<1.08 U	<1.25 U	<130 U	<1.29 U	<1.2 U	<123 U	<1.17 U	<1.12 U	<1.09 U	<1.15 U
BROMOCHLOROMETHANE	ug/kg	410000	<1.19 UJ	<2.16 U	<2.5 U	<260 U	<2.58 U	<2.4 U	<246 U	<2.34 U	<2.24 U	<2.18 U	<2.3 U
BROMODICHLOROMETHANE	ug/kg	460	<2.38 UJ	<1.08 U	<1.25 U	<130 U	<1.29 U	<1.2 U	<123 U	<1.17 U	<1.12 U	<1.09 U	<1.15 U
BROMOFORM	ug/kg	3600	<1.19 UJ	<1.08 U	<1.25 U	<130 U	<1.29 U	<1.2 U	<123 U	<1.17 U	<1.12 U	<1.09 U	<1.15 U
BROMOMETHANE	ug/kg	14000	<1.19 UJ	<2.16 U	<2.5 U	<260 U	<2.58 U	<2.4 U	<246 U	<2.34 U	<2.24 U	<2.18 U	<2.3 U
CARBON DISULFIDE	ug/kg	1000000	<1.19 UJ	2.3 J	<1.25 U	<130 U	<1.29 U	<1.2 U	<123 U	<1.17 U	<1.12 U	<1.09 U	<1.15 U
CARBON TETRACHLORIDE	ug/kg	500	<1.19 UJ	<1.08 U	<1.25 U	<130 U	<1.29 U	<1.2 U	<123 U	<1.17 U	<1.12 U	<1.09 U	<1.15 U
CHLOROBENZENE	ug/kg	10000	<1.19 UJ	<1.08 U	<1.25 U	<130 U	<1.29 U	<1.2 U	<123 U	<1.17 U	<1.12 U	<1.09 U	<1.15 U
CHLOROETHANE	ug/kg	4100000	<2.38 UJ	<2.16 U	<2.5 U	<260 U	<2.58 U	<2.4 U	<246 U	<2.34 U	<2.24 U	<2.18 U	<2.3 U
CHLOROFORM	ug/kg	100000	<1.19 UJ	<1.08 U	<1.25 U	<130 U	<1.29 U	<1.2 U	<123 U	<1.17 U	<1.12 U	<1.09 U	<1.15 U
CHLOROMETHANE	ug/kg	22000	<4.76 UJ	<4.3 U	<5 U	<518 U	<5.18 U	<4.82 U	<494 U	<4.68 U	<4.5 U	<4.36 U	<4.6 U
CIS-1,2-DICHLOROETHENE	ug/kg	7000	0.695 J	<14.9	<1.25 U	<130 U	<1.29 U	<1.2 U	<123 U	<1.17 U	<1.12 U	<1.09 U	<1.15 U
CIS-1,3-DICHLOROPROPENE	ug/kg	530	<1.19 UJ	<1.08 U	<1.25 U	<130 U	<1.29 U	<1.2 U	<123 U	<1.17 U	<1.12 U	<1.09 U	<1.15 U
DIBROMOCHLOROMETHANE	ug/kg	3400	<1.19 UJ	<1.08 U	<1.25 U	<130 U	<1.29 U	<1.2 U	<123 U	<1.17 U	<1.12 U	<1.09 U	<1.15 U

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May/June 2014

Location ID: Sample Date:	Units	MCL/ MSC	18CPTPB12 (6-7)280514 5/28/2014	18CPTPB12 (6-7)280514D 5/28/2014	18CPTPB15 (18-19)290514 5/29/2014	18CPTPB15 (19-20)290514 5/29/2014	18CPTPB15 (25-26)290514 5/29/2014	18CPTPB15 (9-10)290514 5/29/2014	18CPTPB16 (14-15)290514 5/29/2014	18CPTPB16 (21-22)290514 5/29/2014	18CPTPB16 (23-24)290514 5/29/2014	18CPTPB16 (26-27)290514 5/29/2014	18CPTPB16 (5-6)290514 5/29/2014
Location Description:			UEP Area vadose zone MIP verification soil sample.	UEP Area vadose zone MIP verification soil sample.	UEP Area vadose zone MIP verification soil sample.	UEP Area vadose zone MIP verification soil sample.	UEP Area vadose zone MIP verification soil sample.	UEP Area vadose zone MIP verification soil sample.	UEP Area vadose zone MIP verification soil sample.	UEP Area vadose zone MIP verification soil sample.	UEP Area vadose zone MIP verification soil sample.	UEP Area vadose zone MIP verification soil sample.	UEP Area vadose zone MIP verification soil sample.
DIBROMOMETHANE	ug/kg	38000	<1.19 UJ	<1.08 U	<1.25 U	<130 U	<1.29 U	<1.2 U	<123 U	<1.17 U	<1.12 U	<1.09 U	<1.15 U
DICHLORODIFLUOROMETHANE	ug/kg	2000000	<2.38 UJ	<2.16 U	<2.5 U	<260 U	<2.58 U	<2.4 U	<246 U	<2.34 U	<2.24 U	<2.18 U	<2.3 U
ETHYLBENZENE	ug/kg	70000	<1.19 UJ	<1.08 U	<1.25 U	<130 U	<1.29 U	<1.2 U	<123 U	<1.17 U	<1.12 U	<1.09 U	<1.15 U
HEXACHLOROBUTADIENE	ug/kg	2000	<1.19 UJ	<1.08 U	<1.25 U	<130 U	<1.29 U	<1.2 U	<123 U	<1.17 U	<1.12 U	<1.09 U	<1.15 U
ISOPROPYLBENZENE	ug/kg	1000000	<1.19 UJ	<1.08 U	<1.25 U	<130 U	<1.29 U	<1.2 U	<123 U	<1.17 U	<1.12 U	<1.09 U	<1.15 U
M,P-XYLENE	ug/kg	1000000	<1.19 UJ	<1.08 U	<1.25 U	<130 U	<1.29 U	<1.2 U	<123 U	<1.17 U	<1.12 U	<1.09 U	<1.15 U
METHYLENE CHLORIDE	ug/kg	500	5.7 J	1.46 J	3.93 J	<260 U	21.3	4.17 J	<246 U	6.66	7.21	4.52 J	2.48 J
NAPHTHALENE	ug/kg	200000	<1.19 UJ	<1.08 U	<1.25 U	<130 U	<1.29 U	<1.2 U	<123 U	<1.17 U	<1.12 U	<1.09 U	<1.15 U
N-BUTYLBENZENE	ug/kg	410000	<1.19 UJ	<1.08 U	<1.25 U	<130 U	<1.29 U	<1.2 U	<123 U	<1.17 U	<1.12 U	<1.09 U	<1.15 U
N-PROPYLBENZENE	ug/kg	410000	<1.19 UJ	<1.08 U	<1.25 U	<130 U	<1.29 U	<1.2 U	<123 U	<1.17 U	<1.12 U	<1.09 U	<1.15 U
O-XYLENE	ug/kg	1000000	<1.19 UJ	<1.08 U	<1.25 U	<130 U	<1.29 U	<1.2 U	<123 U	<1.17 U	<1.12 U	<1.09 U	<1.15 U
P-ISOPROPYLTOLUENE	ug/kg	1000000	<1.19 UJ	<1.08 U	<1.25 U	<130 U	<1.29 U	<1.2 U	<123 U	<1.17 U	<1.12 U	<1.09 U	<1.15 U
SEC-BUTYLBENZENE	ug/kg	410000	<1.19 UJ	<1.08 U	<1.25 U	<130 U	<1.29 U	<1.2 U	<123 U	<1.17 U	<1.12 U	<1.09 U	<1.15 U
STYRENE	ug/kg	10000	<1.19 UJ	<1.08 U	<1.25 U	<130 U	<1.29 U	<1.2 U	<123 U	<1.17 U	<1.12 U	<1.09 U	<1.15 U
TERT-BUTYLBENZENE	ug/kg	410000	<1.19 UJ	<1.08 U	<1.25 U	<130 U	<1.29 U	<1.2 U	<123 U	<1.17 U	<1.12 U	<1.09 U	<1.15 U
TETRACHLOROETHENE	ug/kg	500	0.667 J	3.26 J	<1.25 U	<130 U	<1.29 U	<1.2 U	<123 U	<1.17 U	<1.12 U	<1.09 U	<1.15 U
TOLUENE	ug/kg	100000	<1.19 UJ	0.603 J	<1.25 U	<130 U	<1.29 U	<1.2 U	<123 U	<1.17 U	<1.12 U	<1.09 U	<1.15 U
TRANS-1,2-DICHLOROETHENE	ug/kg	10000	<1.19 UJ	<1.08 U	<1.25 U	<130 U	<1.29 U	<1.2 U	<123 U	<1.17 U	<1.12 U	<1.09 U	<1.15 U
TRANS-1,3-DICHLOROPROPENE	ug/kg	2900	<1.19 UJ	<1.08 U	<1.25 U	<130 U	<1.29 U	<1.2 U	<123 U	<1.17 U	<1.12 U	<1.09 U	<1.15 U
TRICHLOROETHENE	ug/kg	500	9.48 J	151	2.63 J	496 J	3.37 J	1.71 J	422 J	1.15 J	2.53 J	<1.09 U	10.4
TRICHLOROFLUOROMETHANE	ug/kg	3100000	<2.38 UJ	<2.16 U	<2.5 U	<260 U	<2.58 U	<2.4 U	<246 U	<2.34 U	<2.24 U	<2.18 U	<2.3 U
VINYL CHLORIDE	ug/kg	200	<2.38 UJ	<2.16 U	<2.5 U	<260 U	<2.58 U	<2.4 U	<246 U	<2.34 U	<2.24 U	<2.18 U	<2.3 U
Percent Solids (D2216-90)													
Solids, Percent	%		81.1	87.3	83.2	80.3	79.6	81.4	82.5	80.5	84.5	86.4	86
Total Organic Carbon (LYDKHN)													
TOTAL ORGANIC CARBON (TOC)	mg/kg		NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Blue Highlighting Indicates concentrations above the MCL/MSC

Note: Some samples may have been diluted due to the concentration(s) of one or more analytes exceeding the upper limit of the calibration curve.

J - Estimated: The analyte was positively identified, the quantitation is an estimation due to discrepancies in meeting certain analyte-specific quality control criteria.

MCL/MSC - Maximum Contaminant Limit/Medium-Specific Concentrations

mg/kg - milligrams per kilogram

N/A - not analyzed

U - Undetected: The analyte was analyzed for, but not detected.

UJ - The analyte was not detected; however, the result is estimated due to discrepancies in meeting certain analyte-specific quality control criteria.

ug/kg - micrograms per kilogram

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May/June 2014

Location ID: Sample Date:	Units	MCL/ MSC	18CPTPB17 (16-17)290514 5/29/2014	18CPTPB17 (22-23)290514 5/29/2014	18CPTPB17 (26-27)290514 5/29/2014	18CPTPB17 (4.5-5.5)290514 5/29/2014
Location Description:			UEP Area vadose zone MIP verification soil sample.	UEP Area vadose zone MIP verification soil sample.	UEP Area vadose zone MIP verification soil sample.	UEP Area vadose zone MIP verification soil sample.
Perchlorate (6850)						
PERCHLORATE	ug/kg	7200	<2.48 U	4.86	142	<2.38 U
Volatile Organic Compounds (8260B)						
1,1,1,2-TETRACHLOROETHANE	ug/kg	11000	<136 U	<119 U	<1.2 U	<1.19 U
1,1,1-TRICHLOROETHANE	ug/kg	20000	<136 U	<119 U	<1.2 U	<1.19 U
1,1,2,2-TETRACHLOROETHANE	ug/kg	1400	<136 U	<119 U	<1.2 U	<1.19 U
1,1,2-TRICHLOROETHANE	ug/kg	500	<136 U	<119 U	<1.2 U	<1.19 U
1,1-DICHLOROETHANE	ug/kg	1000000	<272 U	<238 U	<2.4 U	<2.38 U
1,1-DICHLOROETHENE	ug/kg	700	<136 U	<119 U	<1.2 U	<1.19 U
1,1-DICHLOROPROPENE	ug/kg	290	<136 U	<119 U	<1.2 U	<1.19 U
1,2,3-TRICHLOROBENZENE	ug/kg	31000	<136 U	<119 U	<1.2 U	<1.19 U
1,2,3-TRICHLOROPROPANE	ug/kg	4.1	<272 U	<238 U	<2.4 U	<2.38 U
1,2,4-TRICHLOROBENZENE	ug/kg	7000	<136 U	<119 U	<1.2 U	<1.19 U
1,2,4-TRIMETHYLBENZENE	ug/kg	510000	<136 U	<119 U	<1.2 U	<1.19 U
1,2-DIBROMO-3-CHLOROPROPANE	ug/kg	20	<544 U	<476 U	<4.78 U	<4.74 U
1,2-DIBROMOETHANE	ug/kg	5	<136 U	<119 U	<1.2 U	<1.19 U
1,2-DICHLOROBENZENE	ug/kg	60000	<136 U	<119 U	<1.2 U	<1.19 U
1,2-DICHLOROETHANE	ug/kg	500	<136 U	<119 U	<1.2 U	<1.19 U
1,2-DICHLOROPROPANE	ug/kg	500	<136 U	<119 U	<1.2 U	<1.19 U
1,3,5-TRIMETHYLBENZENE	ug/kg	510000	<136 U	<119 U	<1.2 U	<1.19 U
1,3-DICHLOROBENZENE	ug/kg	310000	<136 U	<119 U	<1.2 U	<1.19 U
1,3-DICHLOROPROPANE	ug/kg	2900	<136 U	<119 U	<1.2 U	<1.19 U
1,4-DICHLOROBENZENE	ug/kg	7500	<136 U	<119 U	<1.2 U	<1.19 U
2,2-DICHLOROPROPANE	ug/kg	4200	<136 U	<119 U	<1.2 U	<1.19 U
2-BUTANONE	ug/kg	6100000	<680 U	<596 U	<5.98 U	<5.92 U
2-CHLOROTOLUENE	ug/kg	200000	<136 U	<119 U	<1.2 U	<1.19 U
2-HEXANONE	ug/kg	610000	<680 U	<596 U	<5.98 U	<5.92 U
4-CHLOROTOLUENE	ug/kg	200000	<136 U	<119 U	<1.2 U	<1.19 U
4-METHYL-2-PENTANONE	ug/kg	820000	<680 U	<596 U	<5.98 U	<5.92 U
ACETONE	ug/kg	920000	<1360 U	<1190 U	6.44 J	<11.9 U
BENZENE	ug/kg	500	<136 U	<119 U	<1.2 U	<1.19 U
BROMOBENZENE	ug/kg	200000	<136 U	<119 U	<1.2 U	<1.19 U
BROMOCHLOROMETHANE	ug/kg	410000	<272 U	<238 U	<2.4 U	<2.38 U
BROMODICHLOROMETHANE	ug/kg	460	<136 U	<119 U	<1.2 U	<1.19 U
BROMOFORM	ug/kg	3600	<136 U	<119 U	<1.2 U	<1.19 U
BROMOMETHANE	ug/kg	14000	<272 U	<238 U	<2.4 U	<2.38 U
CARBON DISULFIDE	ug/kg	1000000	<136 U	<119 U	<1.2 U	<1.19 U
CARBON TETRACHLORIDE	ug/kg	500	<136 U	<119 U	<1.2 U	<1.19 U
CHLOROBENZENE	ug/kg	10000	<136 U	<119 U	<1.2 U	<1.19 U
CHLOROETHANE	ug/kg	4100000	<272 U	<238 U	<2.4 U	<2.38 U
CHLOROFORM	ug/kg	100000	<136 U	<119 U	<1.2 U	<1.19 U
CHLOROMETHANE	ug/kg	22000	<544 U	<476 U	<4.78 U	<4.74 U
CIS-1,2-DICHLOROETHENE	ug/kg	7000	<136 U	<119 U	<1.2 U	<1.19 U
CIS-1,3-DICHLOROPROPENE	ug/kg	530	<136 U	<119 U	<1.2 U	<1.19 U
DIBROMOCHLOROMETHANE	ug/kg	3400	<136 U	<119 U	<1.2 U	<1.19 U

LHAAP-18/24 PSI Work Plan Field Work
May/June 2014

Location ID: **Sample Date:**	**Units**	**MCL/ MSC**	**18CPTPB17 (16-17)290514 5/29/2014**	**18CPTPB17 (22-23)290514 5/29/2014**	**18CPTPB17 (26-27)290514 5/29/2014**	**18CPTPB17 (4.5-5.5)290514 5/29/2014**
Location Description:			UEP Area vadose zone MIP verification soil sample.	UEP Area vadose zone MIP verification soil sample.	UEP Area vadose zone MIP verification soil sample.	UEP Area vadose zone MIP verification soil sample.
DIBROMOMETHANE	ug/kg	38000	<136 U	<119 U	<1.2 U	<1.19 U
DICHLORODIFLUOROMETHANE	ug/kg	2000000	<272 U	<238 U	<2.4 U	<2.38 U
ETHYLBENZENE	ug/kg	70000	<136 U	<119 U	<1.2 U	<1.19 U
HEXACHLOROBUTADIENE	ug/kg	2000	<136 U	<119 U	<1.2 U	<1.19 U
ISOPROPYLBENZENE	ug/kg	1000000	<136 U	<119 U	<1.2 U	<1.19 U
M,P-XYLENE	ug/kg	1000000	<136 U	<119 U	<1.2 U	<1.19 U
METHYLENE CHLORIDE	ug/kg	500	<272 U	474 J	4.23 J	12.9
NAPHTHALENE	ug/kg	200000	<136 U	<119 U	<1.2 U	<1.19 U
N-BUTYLBENZENE	ug/kg	410000	<136 U	<119 U	<1.2 U	<1.19 U
N-PROPYLBENZENE	ug/kg	410000	<136 U	<119 U	<1.2 U	<1.19 U
O-XYLENE	ug/kg	1000000	<136 U	<119 U	<1.2 U	<1.19 U
P-ISOPROPYLTOLUENE	ug/kg	1000000	<136 U	<119 U	<1.2 U	<1.19 U
SEC-BUTYLBENZENE	ug/kg	410000	<136 U	<119 U	<1.2 U	<1.19 U
STYRENE	ug/kg	10000	<136 U	<119 U	<1.2 U	<1.19 U
TERT-BUTYLBENZENE	ug/kg	410000	<136 U	<119 U	<1.2 U	<1.19 U
TETRACHLOROETHENE	ug/kg	500	<136 U	<119 U	<1.2 U	<1.19 U
TOLUENE	ug/kg	100000	<136 U	<119 U	<1.2 U	<1.19 U
TRANS-1,2-DICHLOROETHENE	ug/kg	10000	<136 U	<119 U	<1.2 U	<1.19 U
TRANS-1,3-DICHLOROPROPENE	ug/kg	2900	<136 U	<119 U	<1.2 U	<1.19 U
TRICHLOROETHENE	ug/kg	500	531 J	<119 U	0.774 J	6.99
TRICHLOROFLUOROMETHANE	ug/kg	3100000	<272 U	<238 U	<2.4 U	<2.38 U
VINYL CHLORIDE	ug/kg	200	<272 U	<238 U	<2.4 U	<2.38 U
Percent Solids (D2216-90)						
Solids, Percent	%		79.4	88.9	82.9	83.7
Total Organic Carbon (LYDKHN)						
TOTAL ORGANIC CARBON (TOC)	mg/kg		NA	NA	NA	NA

Blue Highlighting Indicates concentrations above the MCL/MSC

Note: Some samples may have been diluted due to the concentration(s) of one or more analytes exceeding the upper limit of the calibration curve.

J - Estimated: The analyte was positively identified, the quantitation is an estimation due to discrepancies in meeting certain analyte-specific quality control criteria.

MCL/MSC - Maximum Contaminant Limit/Medium-Specific Concentrations

mg/kg - milligrams per kilogram

N/A - not analyzed

U - Undetected: The analyte was analyzed for, but not detected.

UJ - The analyte was not detected; however, the result is estimated due to discrepancies in meeting certain analyte-specific quality control criteria.

ug/kg - micrograms per kilogram

LHAAP-46 Quarterly MNA Sampling
July 2014

Location ID: **Sample Date:**	**Units**	**MCL/ MSC**	**46SW09-071814** **7/18/2014**	**46WW02-071514** **7/15/2014**	**46WW02F-071514** **7/15/2014**	**46WW03-071714** **7/17/2014**	**46WW04-071814** **7/18/2014**	**46WW05-071614** **7/16/2014**	**46WW05F-071614** **7/16/2014**	**46WW06-071714** **7/17/2014**	**46WW06FD-071714** **7/17/2014**	**46WW07-071814** **7/18/2014**	**46WW07FD-071814** **7/18/2014**	**46WW08-071814** **7/18/2014**	**46WW09-071514** **7/15/2014**	**46WW09F-071514** **7/15/2014**
ID Location:			Intermittant Tributary of Goose Prairie Creek - Grab sample, collected from East side of Karnack Avenue bridge. Outside site boundary. Sampled Quarterly for 2 years.	Site 46 - Central, inside site boundary. Intermediate zone. Sampled quarterly.	Site 46 - Central, inside site boundary. Intermediate zone. Sampled quarterly. Filtered.	Site 46 - Central, inside site boundary. Sampled quarterly.	Site 46 - W, inside site boundary. Sampled quarterly.	Site 46 - N, inside site boundary. Intermediate zone.Sampled quarterly.	Site 46 - N, inside site boundary. Intermediate zone. Sampled quarterly. Filtered.	Site 46 - W, inside site boundary. Intermediate zone. Sampled quarterly.	Site 46 - W, inside site boundary. Intermediate zone. Sampled quarterly.	Site 46 - N, inside site boundary. Intermediate zone. Sampled quarterly.	Site 46 - N, inside site boundary. Intermediate zone. Sampled quarterly.	Site 46 - NNW, inside site boundary. Intermediate zone. Sampled quarterly.	Site 46 - Central, within site boundary. Intermediate zone. Sampled quarterly.	Site 46 - Central, within site boundary. Intermediate zone. Sampled quarterly. Filtered.
Alkalinity (310.2)																
ALKALINITY, TOTAL	mg/L		NA	45.6	NA	NA	NA	70.4	NA	NA	NA	NA	NA	NA	176	NA
Phosphours (365.4)																
PHOSPHORUS	mg/L		NA	0.457	NA	NA	NA	0.164 J	NA	NA	NA	NA	NA	NA	1.14	NA
TOC (415.1)																
TOTAL ORGANIC CARBON (TOC)	mg/L		NA	7.86	NA	NA	NA	11.7	NA	NA	NA	NA	NA	NA	7.06	NA
Metals (6010C)																
IRON	mg/L		NA	NA	0.631	NA	NA	NA	30.8	NA	NA	NA	NA	NA	NA	0.301
MANGANESE	mg/L	14	NA	NA	0.236	NA	NA	NA	17	NA	NA	NA	NA	NA	NA	1.72
Metals (6020A)																
MANGANESE	mg/L	14	NA	NA	0.236	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1.72
Volatile Organic Compounds (8260B)																
1,1,1,2-TETRACHLOROETHANE	ug/L	110	<0.5 U	<0.5 U	NA	<0.5 U	<0.5 U	<0.5 U	NA	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	NA
1,1,1-TRICHLOROETHANE	ug/L	200	<0.5 U	<0.5 U	NA	<0.5 U	<0.5 U	<0.5 U	NA	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	NA
1,1,2,2-TETRACHLOROETHANE	ug/L	14	<0.4 U	<0.4 U	NA	<0.4 U	<0.4 U	<0.4 U	NA	<0.4 U	<0.4 U	<0.4 U	<0.4 U	<0.4 U	<0.4 U	NA
1,1,2-TRICHLOROETHANE	ug/L	5	<0.5 U	<0.5 U	NA	<0.5 U	<0.5 U	<0.5 U	NA	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	NA
1,1-DICHLOROETHANE	ug/L	10000	<0.25 U	<0.25 U	NA	<0.25 U	<0.25 U	1.09	NA	<0.25 U	<0.25 U	<0.25 U	<0.25 U	<0.25 U	<0.25 U	NA
1,1-DICHLOROETHENE	ug/L	7	<1 U	1.79 J	NA	<1 U	<1 U	9.58	NA	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	NA
1,1-DICHLOROPROPENE	ug/L	2.9	<0.5 U	<0.5 U	NA	<0.5 U	<0.5 U	<0.5 U	NA	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	NA
1,2,3-TRICHLOROBENZENE	ug/L	310	<0.3 U	<0.3 U	NA	<0.3 U	<0.3 U	<0.3 U	NA	<0.3 U	<0.3 U	<0.3 U	<0.3 U	<0.3 U	<0.3 U	NA
1,2,3-TRICHLOROPROPANE	ug/L	0.004	<1 U	<1 U	NA	<1 U	<1 U	<1 U	NA	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	NA
1,2,4-TRICHLOROBENZENE	ug/L	70	<0.4 U	<0.4 U	NA	<0.4 U	<0.4 U	<0.4 U	NA	<0.4 U	<0.4 U	<0.4 U	<0.4 U	<0.4 U	<0.4 U	NA
1,2,4-TRIMETHYLBENZENE	ug/L	5100	<0.5 U	<0.5 U	NA	<0.5 U	<0.5 U	<0.5 U	NA	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	NA
1,2-DIBROMO-3-CHLOROPROPANE	ug/L	0.2	<2 U	<2 U	NA	<2 U	<2 U	<2 U	NA	<2 U	<2 U	<2 U	<2 U	<2 U	<2 U	NA
1,2-DIBROMOETHANE	ug/L	0.005	<0.5 U	<0.5 U	NA	<0.5 U	<0.5 U	<0.5 U	NA	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	NA
1,2-DICHLOROBENZENE	ug/L	600	<0.25 U	<0.25 U	NA	<0.25 U	<0.25 U	<0.25 U	NA	<0.25 U	<0.25 U	<0.25 U	<0.25 U	<0.25 U	<0.25 U	NA
1,2-DICHLOROETHANE	ug/L	5	<0.5 U	<0.5 U	NA	<0.5 U	<0.5 U	<0.5 U	NA	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	NA
1,2-DICHLOROPROPANE	ug/L	5	<0.4 U	<0.4 U	NA	<0.4 U	<0.4 U	<0.4 U	NA	<0.4 U	<0.4 U	<0.4 U	<0.4 U	<0.4 U	<0.4 U	NA
1,3,5-TRIMETHYLBENZENE	ug/L	5100	<0.5 U	<0.5 U	NA	<0.5 U	<0.5 U	<0.5 U	NA	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	NA
1,3-DICHLOROBENZENE	ug/L	3100	<0.5 U	<0.5 U	NA	<0.5 U	<0.5 U	<0.5 U	NA	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	NA
1,3-DICHLOROPROPANE	ug/L	29	<0.4 U	<0.4 U	NA	<0.4 U	<0.4 U	<0.4 U	NA	<0.4 U	<0.4 U	<0.4 U	<0.4 U	<0.4 U	<0.4 U	NA
1,4-DICHLOROBENZENE	ug/L	75	<0.25 U	<0.25 U	NA	<0.25 U	<0.25 U	<0.25 U	NA	<0.25 U	<0.25 U	<0.25 U	<0.25 U	<0.25 U	<0.25 U	NA
2,2-DICHLOROPROPANE	ug/L	42	<0.5 U	<0.5 U	NA	<0.5 U	<0.5 U	<0.5 U	NA	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	NA
2-BUTANONE	ug/L	61000	<5 U	<5 U	NA	<5 U	<5 U	<5 U	NA	<5 U	<5 U	<5 U	<5 U	<5 U	<5 U	NA
2-CHLOROTOLUENE	ug/L	2000	<0.25 U	<0.25 U	NA	<0.25 U	<0.25 U	<0.25 U	NA	<0.25 U	<0.25 U	<0.25 U	<0.25 U	<0.25 U	<0.25 U	NA
2-HEXANONE	ug/L	6100	<5 U	<5 U	NA	<5 U	<5 U	<5 U	NA	<5 U	<5 U	<5 U	<5 U	<5 U	<5 U	NA
4-CHLOROTOLUENE	ug/L	2000	<0.5 U	<0.5 U	NA	<0.5 U	<0.5 U	<0.5 U	NA	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	NA
4-METHYL-2-PENTANONE	ug/L	8200	<5 UJ	<5 U	NA	<5 UJ	<5 UJ	<5 U	NA	<5 UJ	<5 UJ	<5 UJ	<5 UJ	<5 UJ	<5 U	NA
ACETONE	ug/L	92000	<5 U	<5 U	NA	<5 U	<5 U	<5 U	NA	<5 U	<5 U	<5 U	<5 U	<5 U	<5 U	NA
BENZENE	ug/L	5	<0.25 U	<0.25 U	NA	<0.25 U	<0.25 U	<0.25 U	NA	<0.25 U	<0.25 U	<0.25 U	<0.25 U	<0.25 U	<0.25 U	NA
BROMOBENZENE	ug/L	2000	<0.25 U	<0.25 U	NA	<0.25 U	<0.25 U	<0.25 U	NA	<0.25 U	<0.25 U	<0.25 U	<0.25 U	<0.25 U	<0.25 U	NA
BROMOCHLOROMETHANE	ug/L	4100	<0.4 U	<0.4 U	NA	<0.4 U	<0.4 U	<0.4 U	NA	<0.4 U	<0.4 U	<0.4 U	<0.4 U	<0.4 U	<0.4 U	NA
BROMODICHLOROMETHANE	ug/L	4.6	<0.5 U	<0.5 U	NA	<0.5 U	<0.5 U	<0.5 U	NA	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	NA
BROMOFORM	ug/L	36	<1 U	<1 U	NA	<1 U	<1 U	<1 U	NA	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	NA
BROMOMETHANE	ug/L	140	<1 U	<1 U	NA	<1 U	<1 U	<1 U	NA	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	NA
CARBON DISULFIDE	ug/L	10000	<1 U	<1 U	NA	<1 U	<1 U	<1 U	NA	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	NA
CARBON TETRACHLORIDE	ug/L	5	<0.5 U	<0.5 U	NA	<0.5 U	<0.5 U	<0.5 U	NA	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	NA
CHLOROBENZENE	ug/L	100	<0.25 U	<0.25 U	NA	<0.25 U	<0.25 U	<0.25 U	NA	<0.25 U	<0.25 U	<0.25 U	<0.25 U	<0.25 U	<0.25 U	NA
CHLOROETHANE	ug/L	41000	<1 U	<1 U	NA	<1 U	<1 U	<1 U	NA	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	NA

LHAAP-46 Quarterly MNA Sampling
July 2014

Location ID: Sample Date:	Units	MCL/ MSC	46SW09-071814 7/18/2014	46WW02-071514 7/15/2014	46WW02F-071514 7/15/2014	46WW03-071714 7/17/2014	46WW04-071814 7/18/2014	46WW05-071614 7/16/2014	46WW05F-071614 7/16/2014	46WW06-071714 7/17/2014	46WW06FD-071714 7/17/2014	46WW07-071814 7/18/2014	46WW07FD-071814 7/18/2014	46WW08-071814 7/18/2014	46WW09-071514 7/15/2014	46WW09F-071514 7/15/2014
ID Location:			Intermittant Tributary of Goose Prairie Creek - Grab sample, collected from East side of Karnack Avenue bridge. Outside site boundary. Sampled Quarterly for 2 years.	Site 46 - Central, inside site boundary. Intermediate zone. Sampled quarterly.	Site 46 - Central, inside site boundary. Intermediate zone. Sampled quarterly. Filtered.	Site 46 - Central, inside site boundary. Sampled quarterly.	Site 46 - W, inside site boundary. Sampled quarterly.	Site 46 - N, inside site boundary. Intermediate zone.Sampled quarterly.	Site 46 - N, inside site boundary. Intermediate zone. Sampled quarterly. Filtered.	Site 46 - W, inside site boundary. Intermediate zone. Sampled quarterly.	Site 46 - W, inside site boundary. Intermediate zone. Sampled quarterly.	Site 46 - N, inside site boundary. Intermediate zone. Sampled quarterly.	Site 46 - N, inside site boundary. Intermediate zone. Sampled quarterly.	Site 46 - NNW, inside site boundary. Intermediate zone. Sampled quarterly.	Site 46 - Central, within site boundary. Intermediate zone. Sampled quarterly.	Site 46 - Central, within site boundary. Intermediate zone. Sampled quarterly. Filtered.
CHLOROFORM	ug/L	1000	<0.25 U	<0.25 U	NA	<0.25 U	<0.25 U	<0.25 U	NA	<0.25 U	<0.25 U	<0.25 U	<0.25 U	<0.25 U	<0.25 U	NA
CHLOROMETHANE	ug/L	220	<1 U	<1 U	NA	<1 U	<1 U	<1 U	NA	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	NA
CIS-1,2-DICHLOROETHENE	ug/L	70	<0.5 U	1.72	NA	<0.5 U	<0.5 U	9.74	NA	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	NA
CIS-1,3-DICHLOROPROPENE	ug/L	5.3	<0.5 U	<0.5 U	NA	<0.5 U	<0.5 U	<0.5 U	NA	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	NA
DIBROMOCHLOROMETHANE	ug/L	34	<0.5 U	<0.5 U	NA	<0.5 U	<0.5 U	<0.5 U	NA	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	NA
DIBROMOMETHANE	ug/L	380	<0.5 U	<0.5 U	NA	<0.5 U	<0.5 U	<0.5 U	NA	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	NA
DICHLORODIFLUOROMETHANE	ug/L	20000	<0.5 U	<0.5 U	NA	<0.5 U	<0.5 U	<0.5 U	NA	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	NA
ETHYLBENZENE	ug/L	700	<0.5 U	<0.5 U	NA	<0.5 U	<0.5 U	<0.5 U	NA	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	NA
HEXACHLOROBUTADIENE	ug/L	20	<0.5 U	<0.5 U	NA	<0.5 U	<0.5 U	<0.5 U	NA	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	NA
ISOPROPYLBENZENE	ug/L	1000	<0.5 U	<0.5 U	NA	<0.5 U	<0.5 U	<0.5 U	NA	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	NA
M,P-XYLENE	ug/L	10000	<1 U	<1 U	NA	<1 U	<1 U	<1 U	NA	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	NA
METHYLENE CHLORIDE	ug/L	5	<0.5 U	<0.5 U	NA	<0.5 U	<0.5 U	<0.5 U	NA	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	NA
NAPHTHALENE	ug/L	2000	<0.4 U	<0.4 U	NA	<0.4 U	<0.4 U	<0.4 U	NA	<0.4 U	<0.4 U	<0.4 U	<0.4 U	<0.4 U	<0.4 U	NA
N-BUTYLBENZENE	ug/L	4100	<0.5 U	<0.5 U	NA	<0.5 U	<0.5 U	<0.5 U	NA	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	NA
N-PROPYLBENZENE	ug/L	4100	<0.25 U	<0.25 U	NA	<0.25 U	<0.25 U	<0.25 U	NA	<0.25 U	<0.25 U	<0.25 U	<0.25 U	<0.25 U	<0.25 U	NA
O-XYLENE	ug/L	10000	<0.5 U	<0.5 U	NA	<0.5 U	<0.5 U	<0.5 U	NA	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	NA
P-ISOPROPYLTOLUENE	ug/L	10000	<0.5 U	<0.5 U	NA	<0.5 U	<0.5 U	<0.5 U	NA	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	NA
SEC-BUTYLBENZENE	ug/L	4100	<0.5 U	<0.5 U	NA	<0.5 U	<0.5 U	<0.5 U	NA	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	NA
STYRENE	ug/L	100	<0.25 U	<0.25 U	NA	<0.25 U	<0.25 U	<0.25 U	NA	<0.25 U	<0.25 U	<0.25 U	<0.25 U	<0.25 U	<0.25 U	NA
TERT-BUTYLBENZENE	ug/L	4100	<0.5 U	<0.5 U	NA	<0.5 U	<0.5 U	<0.5 U	NA	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	NA
TETRACHLOROETHENE	ug/L	5	<0.5 U	<0.5 U	NA	<0.5 U	<0.5 U	<0.5 U	NA	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	NA
TOLUENE	ug/L	1000	<0.5 U	<0.5 U	NA	<0.5 U	<0.5 U	<0.5 U	NA	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	NA
TRANS-1,2-DICHLOROETHENE	ug/L	100	<0.5 U	<0.5 U	NA	<0.5 U	<0.5 U	0.39 J	NA	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	NA
TRANS-1,3-DICHLOROPROPENE	ug/L	29	<1 U	<1 U	NA	<1 U	<1 U	<1 U	NA	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	NA
TRICHLOROETHENE	ug/L	5	<0.5 U	32.8	NA	<0.5 U	<0.5 U	130	NA	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	NA
TRICHLOROFLUOROMETHANE	ug/L	31000	<0.5 U	<0.5 U	NA	<0.5 U	<0.5 U	<0.5 U	NA	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	NA
VINYL CHLORIDE	ug/L	2	<0.5 U	0.493 J	NA	<0.5 U	<0.5 U	2.09	NA	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	NA
Inorganic Anions (9056)																
CHLORIDE	mg/L		NA	27.1	NA	NA	NA	298	NA	NA	NA	NA	NA	NA	394	NA
NITRATE	mg/L	10	NA	<2 U	NA	NA	NA	<10 U	NA	NA	NA	NA	NA	NA	<20 U	NA
NITRITE	mg/L	1	NA	<2 U	NA	NA	NA	<10 U	NA	NA	NA	NA	NA	NA	<20 U	NA
SULFIDE	mg/L		NA	0.784 J	NA	NA	NA	<1 U	NA	NA	NA	NA	NA	NA	0.711 J	NA
Sulfide (SM4500-S)																
SULFATE	mg/L		NA	172	NA	NA	NA	3950	NA	NA	NA	NA	NA	NA	1980	NA
Dissolved Gases (RSK-175)																
CARBON DIOXIDE	ug/L		NA	75100	NA	NA	NA	221000	NA	NA	NA	NA	NA	NA	94900	NA
ETHANE	ug/L		NA	<2 U	NA	NA	NA	<2 U	NA	NA	NA	NA	NA	NA	<2 U	NA
ETHENE	ug/L		NA	<2 U	NA	NA	NA	<2 U	NA	NA	NA	NA	NA	NA	<2 U	NA
METHANE	ug/L		NA	<2 U	NA	NA	NA	23.5	NA	NA	NA	NA	NA	NA	<2 U	NA

Blue Highlighting Indicates concentrations above the MCL/MSC

J - Estimated: The analyte was positively identified, the quantitation is an estimation due to discrepancies in meeting certain analyte-specific quality control criteria.

MCL/MSC - Maximum Contaminant Limit/Medium-Specific Concentrations

mg/L - milligrams per liter

N/A - not analyzed

U - Undetected: The analyte was analyzed for, but not detected.

UJ - The analyte was not detected; however, the result is estimated due to discrepancies in meeting certain analyte-specific quality control criteria.

ug/L - micrograms per liter

LHAAP-46 Quarterly MNA Sampling
July 2014

Location ID: Sample Date:	Units	MCL/ MSC	46WW10-071714 7/17/2014	46WW11-071614 7/16/2014	46WW11F-071614 7/16/2014	46WW14-071514 7/15/2014	46WW14F-071514 7/15/2014	46WW16-071614 7/16/2014	46WW16F-071614 7/16/2014	LHSMW19-071614 7/16/2014	LHSMW19F-071614 7/16/2014	LHSMW25-071814 7/18/2014
ID Location:			Site 46 - W, within site boundary. Sampled quarterly.	Site 46 - Central, within site boundary. Sampled quarterly.	Site 46 - Central, within site boundary. Sampled quarterly. Filtered.	Site 46 - NE, within site boundary. Intermediate zone. Sampled quarterly.	Site 46 - NE, within site boundary. Intermediate zone. Sampled quarterly. Filtered.	Site 46 - N, within site boundary. Intermediate zone. Intermediate zone. Sampled quarterly.	Site 46 - N, within site boundary. Intermediate zone. Intermediate zone. Sampled quarterly. Filtered.	Site 46 - Central, within site boundary. Sampled quarterly.	Site 46 - Central, within site boundary. Sampled quarterly. Filtered	Site 46 - E, within site boundary. Intermediate zone. Sampled quarterly.
Alkalinity (310.2)												
ALKALINITY, TOTAL	mg/L		NA	39.5	NA	266	NA	189	NA	NA	NA	NA
Phosphours (365.4)												
PHOSPHORUS	mg/L		NA	0.391 J	NA	<0.2 U	NA	<0.2 U	NA	0.134 J	NA	NA
TOC (415.1)												
TOTAL ORGANIC CARBON (TOC)	mg/L		NA	3.75	NA	2.42 J	NA	5.94	NA	4.68	NA	NA
Metals (6010C)												
IRON	mg/L		NA	NA	<0.1 U	NA	1.51	NA	28	NA	<0.1 U	NA
MANGANESE	mg/L	14	NA	NA	0.048	NA	0.348	NA	2.06	NA	0.0562	NA
Metals (6020A)												
MANGANESE	mg/L	14	NA	NA	NA	NA	0.348	NA	NA	NA	NA	NA
Volatile Organic Compounds (8260B)												
1,1,1,2-TETRACHLOROETHANE	ug/L	110	<0.5 U	<0.5 U	NA	<0.5 U	NA	<0.5 U	NA	<0.5 U	NA	<0.5 U
1,1,1-TRICHLOROETHANE	ug/L	200	<0.5 U	<0.5 U	NA	<0.5 U	NA	<0.5 U	NA	<0.5 U	NA	<0.5 U
1,1,2,2-TETRACHLOROETHANE	ug/L	14	<0.4 U	<0.4 U	NA	<0.4 U	NA	<0.4 U	NA	<0.4 U	NA	<0.4 U
1,1,2-TRICHLOROETHANE	ug/L	5	<0.5 U	<0.5 U	NA	<0.5 U	NA	<0.5 U	NA	<0.5 U	NA	<0.5 U
1,1-DICHLOROETHANE	ug/L	10000	<0.25 U	0.141 J	NA	<0.25 U	NA	<0.25 U	NA	<0.25 U	NA	<0.25 U
1,1-DICHLOROETHENE	ug/L	7	<1 U	<1 U	NA	<1 U	NA	<1 U	NA	<1 U	NA	<1 U
1,1-DICHLOROPROPENE	ug/L	2.9	<0.5 U	<0.5 U	NA	<0.5 U	NA	<0.5 U	NA	<0.5 U	NA	<0.5 U
1,2,3-TRICHLOROBENZENE	ug/L	310	<0.3 U	<0.3 U	NA	<0.3 U	NA	<0.3 U	NA	<0.3 U	NA	<0.3 U
1,2,3-TRICHLOROPROPANE	ug/L	0.004	<1 U	<1 U	NA	<1 U	NA	<1 U	NA	<1 U	NA	<1 U
1,2,4-TRICHLOROBENZENE	ug/L	70	<0.4 U	<0.4 U	NA	<0.4 U	NA	<0.4 U	NA	<0.4 U	NA	<0.4 U
1,2,4-TRIMETHYLBENZENE	ug/L	5100	<0.5 U	<0.5 U	NA	<0.5 U	NA	<0.5 U	NA	<0.5 U	NA	<0.5 U
1,2-DIBROMO-3-CHLOROPROPANE	ug/L	0.2	<2 U	<2 U	NA	<2 U	NA	<2 U	NA	<2 U	NA	<2 U
1,2-DIBROMOETHANE	ug/L	0.005	<0.5 U	<0.5 U	NA	<0.5 U	NA	<0.5 U	NA	<0.5 U	NA	<0.5 U
1,2-DICHLOROBENZENE	ug/L	600	<0.25 U	<0.25 U	NA	<0.25 U	NA	<0.25 U	NA	<0.25 U	NA	<0.25 U
1,2-DICHLOROETHANE	ug/L	5	<0.5 U	<0.5 U	NA	<0.5 U	NA	<0.5 U	NA	<0.5 U	NA	<0.5 U
1,2-DICHLOROPROPANE	ug/L	5	<0.4 U	<0.4 U	NA	<0.4 U	NA	<0.4 U	NA	<0.4 U	NA	<0.4 U
1,3,5-TRIMETHYLBENZENE	ug/L	5100	<0.5 U	<0.5 U	NA	<0.5 U	NA	<0.5 U	NA	<0.5 U	NA	<0.5 U
1,3-DICHLOROBENZENE	ug/L	3100	<0.5 U	<0.5 U	NA	<0.5 U	NA	<0.5 U	NA	<0.5 U	NA	<0.5 U
1,3-DICHLOROPROPANE	ug/L	29	<0.4 U	<0.4 U	NA	<0.4 U	NA	<0.4 U	NA	<0.4 U	NA	<0.4 U
1,4-DICHLOROBENZENE	ug/L	75	<0.25 U	<0.25 U	NA	<0.25 U	NA	<0.25 U	NA	<0.25 U	NA	<0.25 U
2,2-DICHLOROPROPANE	ug/L	42	<0.5 U	<0.5 U	NA	<0.5 U	NA	<0.5 U	NA	<0.5 U	NA	<0.5 U
2-BUTANONE	ug/L	61000	<5 U	<5 U	NA	<5 U	NA	<5 U	NA	<5 U	NA	<5 U
2-CHLOROTOLUENE	ug/L	2000	<0.25 U	<0.25 U	NA	<0.25 U	NA	<0.25 U	NA	<0.25 U	NA	<0.25 U
2-HEXANONE	ug/L	6100	<5 U	<5 U	NA	<5 U	NA	<5 U	NA	<5 U	NA	<5 U
4-CHLOROTOLUENE	ug/L	2000	<0.5 U	<0.5 U	NA	<0.5 U	NA	<0.5 U	NA	<0.5 U	NA	<0.5 U
4-METHYL-2-PENTANONE	ug/L	8200	<5 UJ	<5 U	NA	<5 U	NA	<5 U	NA	<5 U	NA	<5 UJ
ACETONE	ug/L	92000	<5 U	<5 U	NA	<5 U	NA	2.87 J	NA	<5 U	NA	<5 U
BENZENE	ug/L	5	<0.25 U	<0.25 U	NA	<0.25 U	NA	<0.25 U	NA	<0.25 U	NA	<0.25 U
BROMOBENZENE	ug/L	2000	<0.25 U	<0.25 U	NA	<0.25 U	NA	<0.25 U	NA	<0.25 U	NA	<0.25 U
BROMOCHLOROMETHANE	ug/L	4100	<0.4 U	<0.4 U	NA	<0.4 U	NA	<0.4 U	NA	<0.4 U	NA	<0.4 U
BROMODICHLOROMETHANE	ug/L	4.6	<0.5 U	<0.5 U	NA	<0.5 U	NA	<0.5 U	NA	<0.5 U	NA	<0.5 U
BROMOFORM	ug/L	36	<1 U	<1 U	NA	<1 U	NA	<1 U	NA	<1 U	NA	<1 U
BROMOMETHANE	ug/L	140	<1 U	<1 U	NA	<1 U	NA	<1 U	NA	<1 U	NA	<1 U
CARBON DISULFIDE	ug/L	10000	<1 U	<1 U	NA	<1 U	NA	<1 U	NA	<1 U	NA	<1 U
CARBON TETRACHLORIDE	ug/L	5	<0.5 U	<0.5 U	NA	<0.5 U	NA	<0.5 U	NA	<0.5 U	NA	<0.5 U
CHLOROBENZENE	ug/L	100	<0.25 U	<0.25 U	NA	<0.25 U	NA	<0.25 U	NA	<0.25 U	NA	<0.25 U
CHLOROETHANE	ug/L	41000	<1 U	<1 U	NA	<1 U	NA	<1 U	NA	<1 U	NA	<1 U

LHAAP-46 Quarterly MNA Sampling
July 2014

Location ID: Sample Date:	Units	MCL/ MSC	46WW10-071714 7/17/2014	46WW11-071614 7/16/2014	46WW11F-071614 7/16/2014	46WW14-071514 7/15/2014	46WW14F-071514 7/15/2014	46WW16-071614 7/16/2014	46WW16F-071614 7/16/2014	LHSMW19-071614 7/16/2014	LHSMW19F-071614 7/16/2014	LHSMW25-071814 7/18/2014
ID Location:			Site 46 - W, within site boundary. Sampled quarterly.	Site 46 - Central, within site boundary. Sampled quarterly.	Site 46 - Central, within site boundary. Sampled quarterly. Filtered.	Site 46 - NE, within site boundary. Intermediate zone. Sampled quarterly.	Site 46 - NE, within site boundary. Intermediate zone. Sampled quarterly. Filtered.	Site 46 - N, within site boundary. Intermediate zone. Intermediate zone. Sampled quarterly.	Site 46 - N, within site boundary. Intermediate zone. Intermediate zone. Sampled quarterly. Filtered.	Site 46 - Central, within site boundary. Sampled quarterly.	Site 46 - Central, within site boundary. Sampled quarterly. Filtered	Site 46 - E, within site boundary. Intermediate zone. Sampled quarterly.
CHLOROFORM	ug/L	1000	<0.25 U	<0.25 U	NA	<0.25 U	NA	<0.25 U	NA	<0.25 U	NA	<0.25 U
CHLOROMETHANE	ug/L	220	<1 U	<1 U	NA	<1 U	NA	<1 U	NA	<1 U	NA	<1 U
CIS-1,2-DICHLOROETHENE	ug/L	70	<0.5 U	2.12	NA	<0.5 U	NA	<0.5 U	NA	1.52	NA	<0.5 U
CIS-1,3-DICHLOROPROPENE	ug/L	5.3	<0.5 U	<0.5 U	NA	<0.5 U	NA	<0.5 U	NA	<0.5 U	NA	<0.5 U
DIBROMOCHLOROMETHANE	ug/L	34	<0.5 U	<0.5 U	NA	<0.5 U	NA	<0.5 U	NA	<0.5 U	NA	<0.5 U
DIBROMOMETHANE	ug/L	380	<0.5 U	<0.5 U	NA	<0.5 U	NA	<0.5 U	NA	<0.5 U	NA	<0.5 U
DICHLORODIFLUOROMETHANE	ug/L	20000	<0.5 U	<0.5 U	NA	<0.5 U	NA	<0.5 U	NA	<0.5 U	NA	<0.5 U
ETHYLBENZENE	ug/L	700	<0.5 U	<0.5 U	NA	<0.5 U	NA	<0.5 U	NA	<0.5 U	NA	<0.5 U
HEXACHLOROBUTADIENE	ug/L	20	<0.5 U	<0.5 U	NA	<0.5 U	NA	<0.5 U	NA	<0.5 U	NA	<0.5 U
ISOPROPYLBENZENE	ug/L	1000	<0.5 U	<0.5 U	NA	<0.5 U	NA	<0.5 U	NA	<0.5 U	NA	<0.5 U
M,P-XYLENE	ug/L	10000	<1 U	<1 U	NA	<1 U	NA	<1 U	NA	<1 U	NA	<1 U
METHYLENE CHLORIDE	ug/L	5	<0.5 U	<0.5 U	NA	<0.5 U	NA	<0.5 U	NA	<0.5 U	NA	<0.5 U
NAPHTHALENE	ug/L	2000	<0.4 U	<0.4 U	NA	<0.4 U	NA	<0.4 U	NA	<0.4 U	NA	<0.4 U
N-BUTYLBENZENE	ug/L	4100	<0.5 U	<0.5 U	NA	<0.5 U	NA	<0.5 U	NA	<0.5 U	NA	<0.5 U
N-PROPYLBENZENE	ug/L	4100	<0.25 U	<0.25 U	NA	<0.25 U	NA	<0.25 U	NA	<0.25 U	NA	<0.25 U
O-XYLENE	ug/L	10000	<0.5 U	<0.5 U	NA	<0.5 U	NA	<0.5 U	NA	<0.5 U	NA	<0.5 U
P-ISOPROPYLTOLUENE	ug/L	10000	<0.5 U	<0.5 U	NA	<0.5 U	NA	<0.5 U	NA	<0.5 U	NA	<0.5 U
SEC-BUTYLBENZENE	ug/L	4100	<0.5 U	<0.5 U	NA	<0.5 U	NA	<0.5 U	NA	<0.5 U	NA	<0.5 U
STYRENE	ug/L	100	<0.25 U	<0.25 U	NA	<0.25 U	NA	<0.25 U	NA	<0.25 U	NA	<0.25 U
TERT-BUTYLBENZENE	ug/L	4100	<0.5 U	<0.5 U	NA	<0.5 U	NA	<0.5 U	NA	<0.5 U	NA	<0.5 U
TETRACHLOROETHENE	ug/L	5	<0.5 U	<0.5 U	NA	<0.5 U	NA	<0.5 U	NA	<0.5 U	NA	<0.5 U
TOLUENE	ug/L	1000	<0.5 U	<0.5 U	NA	<0.5 U	NA	<0.5 U	NA	<0.5 U	NA	<0.5 U
TRANS-1,2-DICHLOROETHENE	ug/L	100	<0.5 U	0.734 J	NA	<0.5 U	NA	<0.5 U	NA	<0.5 U	NA	<0.5 U
TRANS-1,3-DICHLOROPROPENE	ug/L	29	<1 U	<1 U	NA	<1 U	NA	<1 U	NA	<1 U	NA	<1 U
TRICHLOROETHENE	ug/L	5	<0.5 U	90.6	NA	<0.5 U	NA	<0.5 U	NA	28.6	NA	<0.5 U
TRICHLOROFLUOROMETHANE	ug/L	31000	<0.5 U	<0.5 U	NA	<0.5 U	NA	<0.5 U	NA	<0.5 U	NA	<0.5 U
VINYL CHLORIDE	ug/L	2	<0.5 U	<0.5 U	NA	<0.5 U	NA	<0.5 U	NA	<0.5 U	NA	<0.5 U
Inorganic Anions (9056)												
CHLORIDE	mg/L		NA	212	NA	118	NA	229	NA	271	NA	NA
NITRATE	mg/L	10	NA	<2 U	NA	<1 U	NA	<4 U	NA	<4 U	NA	NA
NITRITE	mg/L	1	NA	<2 U	NA	<1 U	NA	<4 U	NA	<4 U	NA	NA
SULFIDE	mg/L		NA	<1 U	NA	<1 U	NA	<1 U	NA	<1 U	NA	NA
Sulfide (SM4500-S)												
SULFATE	mg/L		NA	378	NA	23.9	NA	678	NA	555	NA	NA
Dissolved Gases (RSK-175)												
CARBON DIOXIDE	ug/L		NA	73900	NA	44800	NA	72800	NA	62800	NA	NA
ETHANE	ug/L		NA	<2 U	NA	<2 U	NA	<2 U	NA	<2 U	NA	NA
ETHENE	ug/L		NA	<2 U	NA	<2 U	NA	<2 U	NA	<2 U	NA	NA
METHANE	ug/L		NA	6.29	NA	1260 J	NA	6.82	NA	<2 U	NA	NA

Blue Highlighting Indicates concentrations above the MCL/MSC

J - Estimated: The analyte was positively identified, the quantitation is an estimation due to discrepancies in meeting certain analyte-specific quality control criteria.

MCL/MSC - Maximum Contaminant Limit/Medium-Specific Concentrations

mg/L - milligrams per liter

N/A - not analyzed

U - Undetected: The analyte was analyzed for, but not detected.

UJ - The analyte was not detected; however, the result is estimated due to discrepancies in meeting certain analyte-specific quality control criteria.

ug/L - micrograms per liter

LHAAP-50 Remedial Action Field Work
July 2014

Location ID: **Sample Date:**	**Units**	**MCL/MSC**	**50WW28-070914** **7/9/2014**
ID Location:			Site 50 - N, upper shallow, outside site boundary, south of 51st St. Sampled quarterly.
Perchlorate (6850)			
PERCHLORATE	ug/L	72	2.57
Volatile Organic Compounds (8260B)			
1,1,1,2-TETRACHLOROETHANE	ug/L	110	<0.5 U
1,1,1-TRICHLOROETHANE	ug/L	200	<0.5 U
1,1,2,2-TETRACHLOROETHANE	ug/L	14	<0.4 U
1,1,2-TRICHLOROETHANE	ug/L	5	<0.5 U
1,1-DICHLOROETHANE	ug/L	10000	<0.25 U
1,1-DICHLOROETHENE	ug/L	7	<1 U
1,1-DICHLOROPROPENE	ug/L	2.9	<0.5 U
1,2,3-TRICHLOROBENZENE	ug/L	310	<0.3 U
1,2,3-TRICHLOROPROPANE	ug/L	0.0041	<1 U
1,2,4-TRICHLOROBENZENE	ug/L	70	<0.4 U
1,2,4-TRIMETHYLBENZENE	ug/L	5100	<0.5 U
1,2-DIBROMO-3-CHLOROPROPANE	ug/L	0.2	<2 U
1,2-DIBROMOETHANE	ug/L	0.005	<0.5 U
1,2-DICHLOROBENZENE	ug/L	600	<0.25 U
1,2-DICHLOROETHANE	ug/L	5	<0.5 U
1,2-DICHLOROPROPANE	ug/L	5	<0.4 U
1,3,5-TRIMETHYLBENZENE	ug/L	5100	<0.5 U
1,3-DICHLOROBENZENE	ug/L	3100	<0.5 U
1,3-DICHLOROPROPANE	ug/L	29	<0.4 U
1,4-DICHLOROBENZENE	ug/L	75	<0.25 U
2,2-DICHLOROPROPANE	ug/L	42	<0.5 U
2-BUTANONE	ug/L	61000	<5 U
2-CHLOROTOLUENE	ug/L	2000	<0.25 U
2-HEXANONE	ug/L	6100	<5 U
4-CHLOROTOLUENE	ug/L	2000	<0.5 U
4-METHYL-2-PENTANONE	ug/L	8200	<5 U
ACETONE	ug/L	92000	<5 U
BENZENE	ug/L	5	<0.25 U
BROMOBENZENE	ug/L	2000	<0.25 U
BROMOCHLOROMETHANE	ug/L	4100	<0.4 U
BROMODICHLOROMETHANE	ug/L	4.6	<0.5 U
BROMOFORM	ug/L	36	<1 U
BROMOMETHANE	ug/L	140	<1 U
CARBON DISULFIDE	ug/L	10000	<1 U
CARBON TETRACHLORIDE	ug/L	5	<0.5 U
CHLOROBENZENE	ug/L	100	<0.25 U
CHLOROETHANE	ug/L	41000	<1 U
CHLOROFORM	ug/L	1000	<0.25 U

LHAAP-50 Remedial Action Field Work
July 2014

Location ID: **Sample Date:**	**Units**	**MCL/MSC**	**50WW28-070914** **7/9/2014**
ID Location:			Site 50 - N, upper shallow, outside site boundary, south of 51st St. Sampled quarterly.
CHLOROMETHANE	ug/L	220	<1 U
CIS-1,2-DICHLOROETHENE	ug/L	70	<0.5 U
CIS-1,3-DICHLOROPROPENE	ug/L	5.3	<0.5 U
DIBROMOCHLOROMETHANE	ug/L	34	<0.5 U
DIBROMOMETHANE	ug/L	380	<0.5 U
DICHLORODIFLUOROMETHANE	ug/L	20000	<0.5 U
ETHYLBENZENE	ug/L	700	<0.5 U
HEXACHLOROBUTADIENE	ug/L	20	<0.5 U
ISOPROPYLBENZENE	ug/L	1000	<0.5 U
M,P-XYLENE	ug/L	10000	<1 U
METHYLENE CHLORIDE	ug/L	5	<0.5 U
NAPHTHALENE	ug/L	2000	<0.4 U
N-BUTYLBENZENE	ug/L	4100	<0.5 U
N-PROPYLBENZENE	ug/L	4100	<0.25 U
O-XYLENE	ug/L	10000	<0.5 U
P-ISOPROPYLTOLUENE	ug/L	10000	<0.5 U
SEC-BUTYLBENZENE	ug/L	4100	<0.5 U
STYRENE	ug/L	100	<0.25 U
TERT-BUTYLBENZENE	ug/L	4100	<0.5 U
TETRACHLOROETHENE	ug/L	5	<0.5 U
TOLUENE	ug/L	1000	<0.5 U
TRANS-1,2-DICHLOROETHENE	ug/L	100	<0.5 U
TRANS-1,3-DICHLOROPROPENE	ug/L	29	<1 U
TRICHLOROETHENE	ug/L	5	<0.5 U
TRICHLOROFLUOROMETHANE	ug/L	31000	<0.5 U
VINYL CHLORIDE	ug/L	2	<0.5 U

ug/L - milligrams per liter

U - Undetected: The analyte was analyzed for, but not detected.

LHAAP-67 Quarterly MNA Sampling
July 2014

Location ID: Sample Date:	Units	MCL/ MSC	67WW01-072514 7/25/2014	67WW02-072414 7/24/2014	67WW05-072414 7/24/2014	67WW07-072514 7/25/2014	67WW08-072414 7/24/2014	67WW09-072514 7/25/2014	67WW09A-072414 7/24/2014	67WW09AFD-072414 7/24/2014	67WW10-072414 7/24/2014	67WW11-072414 7/24/2014	67WW12-072514 7/25/2014	67WW13-072514 7/25/2014	67WW13FD-072514 7/25/2014	67WW14-072514 7/25/2014
			Site 67 - SW, within site boundary. Sampled quarterly.	Site 67 - NW, within site boundary. Sampled quarterly.	Site 67 - WNW, outside site boundary. Sampled quarterly.	Site 67 - E, outside site boundary. Sampled quarterly.	Site 67 - SSE, within the site boundary. Sampled quarterly.	Site 67 - WSW, within the site boundary. Sampled quarterly.	Site 67 - S, outside site boundary. Sampled quarterly.	Site 67 - S, outside site boundary. Sampled quarterly.	Site 67 - SE, outside site boundary. Sampled quarterly.	Site 67 - S, within the site boundary, outer region. Sampled quarterly.	Site 67 - NNE, outside site boundary. Sampled quarterly.	Site 67 - WSW, within site boundary. Sampled quarterly.	Site 67 - WSW, within site boundary. Sampled quarterly.	Site 67 - SW, outside the site boundary beside Ignatius Avenue. Sampled quarterly.
Total Carbon (415.1)																
TOTAL INORGANIC CARBON (TIC)	mg/L		NA	NA	NA	NA	70.9	NA	NA	NA	NA	49.4	NA	NA	NA	NA
TOTAL ORGANIC CARBON (TOC)	mg/L		NA	NA	NA	NA	7.58	NA	NA	NA	NA	8.7	NA	NA	NA	NA
Volatile Organic Compounds (8260B)																
1,1,1,2-TETRACHLOROETHANE	ug/L	110	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
1,1,1-TRICHLOROETHANE	ug/L	200	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
1,1,2,2-TETRACHLOROETHANE	ug/L	14	<0.4 U	<0.4 U	<0.4 U	<0.4 U	<4 U	<0.4 U	<0.4 U	<0.4 U	<0.4 U	<0.4 U	<0.4 U	<0.4 U	<0.4 U	<0.4 U
1,1,2-TRICHLOROETHANE	ug/L	5	0.29 J	<0.5 U	<0.5 U	<0.5 U	7.74 J	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	3.48	3.56	<0.5 U
1,1-DICHLOROETHANE	ug/L	10000	9.2	0.335 J	<0.25 U	<0.25 U	56.7	3.03	<0.25 U	<0.25 U	<0.25 U	10.4	<0.25 U	21.9	22.1	0.58 J
1,1-DICHLOROETHENE	ug/L	7	224	<1 U	<1 U	<1 U	1890	8.93	<1 U	<1 U	<1 U	34.5	<1 U	353	362	3.57
1,1-DICHLOROPROPENE	ug/L	2.9	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
1,2,3-TRICHLOROBENZENE	ug/L	310	<0.3 U	<0.3 U	<0.3 U	<0.3 U	<3 U	<0.3 U	<0.3 U	<0.3 U	<0.3 U	<0.3 U	<0.3 U	<0.3 U	<0.3 U	<0.3 U
1,2,3-TRICHLOROPROPANE	ug/L	0.0041	<1 U	<1 U	<1 U	<1 U	<10 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U
1,2,4-TRICHLOROBENZENE	ug/L	70	<0.4 U	<0.4 U	<0.4 U	<0.4 U	<4 U	<0.4 U	<0.4 U	<0.4 U	<0.4 U	<0.4 U	<0.4 U	<0.4 U	<0.4 U	<0.4 U
1,2,4-TRIMETHYLBENZENE	ug/L	5100	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
1,2-DIBROMO-3-CHLOROPROPANE	ug/L	0.2	<2 U	<2 U	<2 U	<2 U	<20 U	<2 U	<2 U	<2 U	<2 U	<2 U	<2 U	<2 U	<2 U	<2 U
1,2-DIBROMOETHANE	ug/L	0.005	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
1,2-DICHLOROBENZENE	ug/L	600	<0.25 U	<0.25 U	<0.25 U	<0.25 U	<2.5 U	<0.25 U	<0.25 U	<0.25 U	<0.25 U	<0.25 U	<0.25 U	<0.25 U	<0.25 U	<0.25 U
1,2-DICHLOROETHANE	ug/L	5	10.7	<0.5 U	<0.5 U	1.39	98.9	<0.5 U	<0.5 U	<0.5 U	<0.5 U	0.684 J	<0.5 U	19.8	20.1	1.31
1,2-DICHLOROPROPANE	ug/L	5	<0.4 U	<0.4 U	<0.4 U	<0.4 U	<4 U	<0.4 U	<0.4 U	<0.4 U	<0.4 U	<0.4 U	<0.4 U	<0.4 U	<0.4 U	<0.4 U
1,3,5-TRIMETHYLBENZENE	ug/L	5100	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
1,3-DICHLOROBENZENE	ug/L	3100	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
1,3-DICHLOROPROPANE	ug/L	29	<0.4 U	<0.4 U	<0.4 U	<0.4 U	<4 U	<0.4 U	<0.4 U	<0.4 U	<0.4 U	<0.4 U	<0.4 U	<0.4 U	<0.4 U	<0.4 U
1,4-DICHLOROBENZENE	ug/L	75	<0.25 U	<0.25 U	<0.25 U	<0.25 U	<2.5 U	<0.25 U	<0.25 U	<0.25 U	<0.25 U	<0.25 U	<0.25 U	<0.25 U	<0.25 U	<0.25 U
2,2-DICHLOROPROPANE	ug/L	42	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
2-BUTANONE	ug/L	61000	<5 U	<5 U	<5 U	<5 U	<50 U	<5 U	<5 U	<5 U	<5 U	<5 U	<5 U	<5 U	<5 U	<5 U
2-CHLOROTOLUENE	ug/L	2000	<0.25 U	<0.25 U	<0.25 U	<0.25 U	<2.5 U	<0.25 U	<0.25 U	<0.25 U	<0.25 U	<0.25 U	<0.25 U	<0.25 U	<0.25 U	<0.25 U
2-HEXANONE	ug/L	6100	<5 U	<5 U	<5 U	<5 U	<50 U	<5 U	<5 U	<5 U	<5 U	<5 U	<5 U	<5 U	<5 U	<5 U
4-CHLOROTOLUENE	ug/L	2000	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
4-METHYL-2-PENTANONE	ug/L	8200	<5 U	<5 U	<5 U	<5 U	<50 U	<5 U	<5 U	<5 U	<5 U	<5 U	<5 U	<5 U	<5 U	<5 U
ACETONE	ug/L	92000	<5 U	<5 U	<5 U	<5 U	<50 U	<5 U	<5 U	<5 U	<5 U	<5 U	<5 U	<5 U	<5 U	<5 U
BENZENE	ug/L	5	<0.25 U	<0.25 U	<0.25 U	<0.25 U	<2.5 U	<0.25 U	<0.25 U	<0.25 U	<0.25 U	<0.25 U	<0.25 U	<0.25 U	<0.25 U	<0.25 U
BROMOBENZENE	ug/L	2000	<0.25 U	<0.25 U	<0.25 U	<0.25 U	<2.5 U	<0.25 U	<0.25 U	<0.25 U	<0.25 U	<0.25 U	<0.25 U	<0.25 U	<0.25 U	<0.25 U
BROMOCHLOROMETHANE	ug/L	4100	<0.4 U	<0.4 U	<0.4 U	<0.4 U	<4 U	<0.4 U	<0.4 U	<0.4 U	<0.4 U	<0.4 U	<0.4 U	<0.4 U	<0.4 U	<0.4 U
BROMODICHLOROMETHANE	ug/L	4.6	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
BROMOFORM	ug/L	36	<1 U	<1 U	<1 U	<1 U	<10 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U
BROMOMETHANE	ug/L	140	<1 U	<1 U	<1 U	<1 U	<10 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U
CARBON DISULFIDE	ug/L	10000	<1 U	<1 U	<1 U	<1 U	<10 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U
CARBON TETRACHLORIDE	ug/L	5	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
CHLOROBENZENE	ug/L	100	<0.25 U	<0.25 U	<0.25 U	<0.25 U	<2.5 U	<0.25 U	<0.25 U	<0.25 U	<0.25 U	<0.25 U	<0.25 U	<0.25 U	<0.25 U	<0.25 U
CHLOROETHANE	ug/L	41000	<1 U	<1 U	<1 U	<1 U	<10 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U
CHLOROFORM	ug/L	1000	<0.25 U	<0.25 U	<0.25 U	<0.25 U	5.13 J	<0.25 U	<0.25 U	<0.25 U	<0.25 U	<0.25 U	<0.25 U	0.57 J	0.55 J	<0.25 U
CHLOROMETHANE	ug/L	220	<1 U	<1 U	<1 U	<1 U	<10 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U
CIS-1,2-DICHLOROETHENE	ug/L	70	1.02	<0.5 U	<0.5 U	<0.5 U	<5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	1.19	1.15	<0.5 U
CIS-1,3-DICHLOROPROPENE	ug/L	5.3	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
DIBROMOCHLOROMETHANE	ug/L	34	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
DIBROMOMETHANE	ug/L	380	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
DICHLORODIFLUOROMETHANE	ug/L	20000	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
ETHYLBENZENE	ug/L	700	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
HEXACHLOROBUTADIENE	ug/L	20	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
ISOPROPYLBENZENE	ug/L	1000	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
M,P-XYLENE	ug/L	10000	<1 U	<1 U	<1 U	<1 U	<10 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U
METHYLENE CHLORIDE	ug/L	5	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U

LHAAP-67 Quarterly MNA Sampling
July 2014

Location ID: **Sample Date:**	**Units**	**MCL/ MSC**	**67WW01-072514 7/25/2014**	**67WW02-072414 7/24/2014**	**67WW05-072414 7/24/2014**	**67WW07-072514 7/25/2014**	**67WW08-072414 7/24/2014**	**67WW09-072514 7/25/2014**	**67WW09A-072414 7/24/2014**	**67WW09AFD-072414 7/24/2014**	**67WW10-072414 7/24/2014**	**67WW11-072414 7/24/2014**	**67WW12-072514 7/25/2014**	**67WW13-072514 7/25/2014**	**67WW13FD-072514 7/25/2014**	**67WW14-072514 7/25/2014**
			Site 67 - SW, within site boundary. Sampled quarterly.	Site 67 - NW, within site boundary. Sampled quarterly.	Site 67 - WNW, outside site boundary. Sampled quarterly.	Site 67 - E, outside site boundary. Sampled quarterly.	Site 67 - SSE, within the site boundary. Sampled quarterly.	Site 67 - WSW, within the site boundary. Sampled quarterly.	Site 67 - S, outside site boundary. Sampled quarterly.	Site 67 - S, outside site boundary. Sampled quarterly.	Site 67 - SE, outside site boundary. Sampled quarterly.	Site 67 - S, within the site boundary, outer region. Sampled quarterly.	Site 67 - NNE, outside site boundary. Sampled quarterly.	Site 67 - WSW, within site boundary. Sampled quarterly.	Site 67 - WSW, within site boundary. Sampled quarterly.	Site 67 - SW, outside the site boundary beside Ignatius Avenue. Sampled quarterly.
NAPHTHALENE	ug/L	2000	<0.4 U	<0.4 U	<0.4 U	<0.4 U	<4 U	<0.4 U	<0.4 U	<0.4 U	<0.4 U	<0.4 U	<0.4 U	<0.4 U	<0.4 U	<0.4 U
N-BUTYLBENZENE	ug/L	4100	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
N-PROPYLBENZENE	ug/L	4100	<0.25 U	<0.25 U	<0.25 U	<0.25 U	<2.5 U	<0.25 U	<0.25 U	<0.25 U	<0.25 U	<0.25 U	<0.25 U	<0.25 U	<0.25 U	<0.25 U
O-XYLENE	ug/L	10000	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
P-ISOPROPYLTOLUENE	ug/L	10000	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
SEC-BUTYLBENZENE	ug/L	4100	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
STYRENE	ug/L	100	<0.25 U	<0.25 U	<0.25 U	<0.25 U	<2.5 U	<0.25 U	<0.25 U	<0.25 U	<0.25 U	<0.25 U	<0.25 U	<0.25 U	<0.25 U	<0.25 U
TERT-BUTYLBENZENE	ug/L	4100	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
TETRACHLOROETHENE	ug/L	5	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
TOLUENE	ug/L	1000	0.473 J	<0.5 U	<0.5 U	<0.5 U	<5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
TRANS-1,2-DICHLOROETHENE	ug/L	100	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
TRANS-1,3-DICHLOROPROPENE	ug/L	29	<1 U	<1 U	<1 U	<1 U	<10 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U	<1 U
TRICHLOROETHENE	ug/L	5	2.3	<0.5 U	<0.5 U	<0.5 U	3.14 J	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	1.72	1.71	<0.5 U
TRICHLOROFLUOROMETHANE	ug/L	31000	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U
VINYL CHLORIDE	ug/L	2	1.16	<0.5 U	<0.5 U	<0.5 U	<5 U	<0.5 U	<0.5 U	<0.5 U	<0.5 U	0.271 J	<0.5 U	0.707 J	0.728 J	<0.5 U
Inorganic Anions (9056)																
CHLORIDE	mg/L		NA	NA	NA	NA	1340	NA	NA	NA	NA	1290	NA	NA	NA	NA
NITRATE	mg/L	10	NA	NA	NA	NA	<1 U	NA	NA	NA	NA	<1 U	NA	NA	NA	NA
NITRITE	mg/L	1	NA	NA	NA	NA	<1 U	NA	NA	NA	NA	<1 U	NA	NA	NA	NA
SULFATE	mg/L		NA	NA	NA	NA	317	NA	NA	NA	NA	414	NA	NA	NA	NA
Sulfide (SM4500-S)																
SULFIDE	mg/L		NA	NA	NA	NA	<1.00 U	NA	NA	NA	NA	<1.00 U	NA	NA	NA	NA
Dissolved Gases (RSK-175)																
ETHANE	ug/L		NA	NA	NA	NA	<2 U	NA	NA	NA	NA	<2 U	NA	NA	NA	NA
ETHENE	ug/L		NA	NA	NA	NA	<2 U	NA	NA	NA	NA	<2 U	NA	NA	NA	NA
METHANE	ug/L		NA	NA	NA	NA	6.47	NA	NA	NA	NA	<2 U	NA	NA	NA	NA
Ferrous Iron (SM3500FE)																
FERROUS IRON	mg/L		NA	NA	NA	NA	0.227	NA	NA	NA	NA	<0.04 U	NA	NA	NA	NA

Blue Highlighting Indicates concentrations above the MCL/MSC

J - Estimated: The analyte was positively identified, the quantitation is an estimation due to discrepancies in meeting certain analyte-specific quality control criteria.

MCL/MSC - Maximum Contaminant Limit/Medium-Specific Concentrations

mg/L - milligrams per liter

N/A - not analyzed

U - Undetected: The analyte was analyzed for, but not detected.

ug/L - micrograms per liter

THE ADMINISTRATOR OF THE ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

OCT 3 1 2014

CERTIFIED MAIL

The Honorable John McHugh
Secretary of the Army
105 Army Pentagon
Washington, D.C. 20310-0105

Mr. Bryan W. Shaw
Chairman
Texas Commission on Environmental Quality
P.O. Box 13087
Austin, Texas 78711-3087

Dear Mr. Secretary and Mr. Shaw:

I am conveying my final decision resolving a dispute between the U.S. Environmental Protection Agency and the Army regarding cleanup of the Longhorn Army Ammunition Plant in Karnack, Texas. The dispute involves issues of fundamental importance to the federal government's cleanup program, including the restoration of potential sources of drinking water to beneficial use, land-use controls to ensure the long-term effectiveness of the remedy and the EPA's authority to assess stipulated penalties, as well as federal agencies' obligation to comply with the law in the same manner and to the same extent as private parties to protect human health and the environment.

I am resolving this dispute pursuant to the dispute-resolution process found in the Longhorn Federal Facility Agreement (FFA), which the EPA, Texas and the Army signed in 1991 under provisions of the Comprehensive Environmental Response, Compensation, and Liability Act to govern the cleanup.[1]

This formal dispute began on October 27, 2011, following an October 13, 2011, notification from EPA Region 6 to the Army that three draft final records of decision[2] (RODs) at Longhorn did not comply with CERCLA, the National Contingency Plan (NCP) and/or EPA guidance and that this noncompliance gave rise to stipulated penalties pursuant to the FFA. The region's written statement of dispute, which

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[1] Elevation to the EPA Administrator constitutes the final step in a formal dispute process that begins at the staff level of the Army, the EPA and Texas and proceeds through the mid-level managers to senior managers with the EPA regional administrator resolving the dispute, unless one of the other parties to the FFA formally elevates the dispute to the EPA Administrator. The purpose behind the tiered dispute-resolution process is to resolve disputes quickly and at the lowest possible levels to facilitate cleanup. In accordance with the site FFA, the EPA Administrator is responsible for the final resolution of all disputes, and Texas and the Army have agreed, by the FFA's provisions, to abide by the Administrator's decision.

[2] A Record of Decision is the document used in Superfund cleanups that memorializes the cleanup decision or selected remedy.

followed informal dispute discussion, included the following issues: the appropriate groundwater cleanup standards and levels for perchlorate, nickel and manganese (Issue 1); land-use controls (LUCs) and their duration, enforceability and integrity over time (Issues 2, 3, 6 and 7); the necessity for EPA concurrence on any changes to the selected remedy, including the LUCs (Issue 4); landfill performance requirements (Issue 5); and the proper description of investigations for munitions (Issue 8). All issues were ultimately elevated to the regional administrator for consideration and decision. The EPA regional administrator issued an April 5, 2013, decision, pursuant to Section XV.F. of the FFA. The Army agreed to comply with that decision with respect to Issues 4, 5, 6 and 8.

In an April 19, 2013, letter from Hershell E. Wolfe, deputy assistant secretary of the Army for Environment, Safety, and Occupational Health, the Army elevated Issues 1, 2, 3, 7, and the penalty assessment for a final decision. On March 25, 2014, Army Assistant Secretary Katherine Hammack and Army staff met with me and my staff along with representatives of the Texas Commission on Environmental Quality to present the Army position on the items in dispute. The elevated issues primarily concern groundwater-cleanup standards, LUCs and their duration and stipulated penalties.

In reaching a decision on this dispute, the EPA has carefully read and fully considered a number of relevant documents, including the Army's April 19, 2013, letter; the Army's March 18, 2014, letter and position paper; the April 5, 2013, letter signed by Region 6 Administrator Ron Curry setting out the agency's position on the formal dispute (the regional administrator's decision); and information provided in the March 25, 2014, meeting. This decision concludes this dispute and concerns only those five issues elevated to me pursuant to the FFA. I have not considered and do not address other aspects of cleanup at this site.

GROUNDWATER CLEANUP LEVELS (ISSUE1)

The Army elevated Issue 1 of this dispute, which involves the appropriate groundwater cleanup levels for perchlorate, nickel and manganese. Where the EPA decides that CERCLA action is needed to clean up groundwater, the law requires the EPA to select a level that protects public health and the environment. Whenever groundwater is designated as a potential source of drinking water, the EPA applies standards and other guidance designed to ensure that the water, after cleanup, is safe to drink. The state of Texas designated the groundwater at this site as a potential drinking-water source. *See* 30 TAC § 335.563(h)(1) and 30 TAC § 350.52. Therefore, consistent with CERCLA, the NCP and existing EPA Superfund guidance – for example, *Summary of Key Existing EPA CERCLA Policies for Groundwater Restoration*, OSWER Directive 9283.1-33 (June 2009) – the remedial action at this site should restore the groundwater to its beneficial use. In light of the groundwater's designation as a potential drinking-water source, cleanup levels reflecting residential use need to be used. As such, the draft records of decision prepared by the Army that are subject to this dispute must be modified accordingly.

I affirm that the EPA regional administrator's April 5, 2013, decision that the Texas Risk Reduction Program protective concentration level (PCL) regulation for residential groundwater cleanup level for perchlorate (i.e., 17 ug/L) shall be used as the cleanup level for LHAAP operable units 16 and 17 and as the monitoring level for operable units LHAAP-001-R-01 and LHAAP-003-R-01and the PCLs for nickel and manganese (i.e., 490 ug/L and 1,100 ug/L, respectively) shall be used as the cleanup levels for LHAAP operable unit 16.[3] All relevant draft final RODs subject to this dispute resolution proceeding

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[3] Concurrently with this dispute, the EPA is developing a maximum contaminant level for perchlorate that may necessitate a revision to the RODs in the future, if necessary to protect public health and the environment.

shall be revised in accordance with the language quoted in the regional administrator's decision with respect to Issue 1.

LAND-USE CONTROLS (ISSUES 2, 3 and 7)

The Army elevated Issues 2 and 3 of this dispute, which involve LUCs and their duration.[1] Depending upon current and future land use, LUCs are a frequent and essential component of a remedy to ensure protectiveness over time whenever cleanups do *not* remove contamination at a site sufficiently to achieve unlimited use/unlimited exposure (UU/UE). LUCs are often necessary to prevent residual contamination from posing a risk to human health or the environment for both current and subsequent property owners and users and for as long as the contamination and its accompanying risk remain. The costs to maintain such controls are minimal.

LUCs at this site are an essential part of the remedy to help ensure protectiveness of human health and the environment, and they will need to be maintained over time. While the draft final RODs originally submitted by the Army did not include a LUC to protect the integrity of the groundwater monitoring/remedial system, the Army has agreed to protect the integrity and long-term reliability of that system by agreeing to repair any damage to the system. While agreeing to repair the system is prudent and standard practice, to ensure protectiveness of human health and the environment at this site the LHAAP RODs must include a LUC objective and a control designed to avoid damaging the system in the first place.

With regard to the munition operable units, which pose an explosive hazard, the selected remedies must include a LUC objective and a control designed to ensure protectiveness of human health and the environment. The duration of the LUCs specified in the RODs for these purposes must be for as long as there remains an explosive threat and, as such, would not allow for unrestricted use and unlimited exposure.

Therefore, I also affirm the regional administrator's April 5, 2013, decision requiring the Army to include in its RODs a LUC objective and control to preserve groundwater remedial and monitoring systems as an essential part of the remedy. Moreover, as now agreed to by the Army in its April 19, 2013, letter, the duration for this LUC and all other LUCs included in the three RODs at issue shall be until hazardous substances in soil and groundwater are at levels that allow for unrestricted use/unlimited exposure. With regard to the ROD involving munitions and explosives of concern (MEC), the duration of the LUC for explosive hazard shall be until there is no longer a threat of explosion, which clarifies what UU/UE means where there is an explosive risk. The MEC ROD shall also include the two LUC objectives to prohibit unacceptable human exposures based on current and future land use, and to prohibit intrusive activities, unless the EPA and the Army approve them and trained explosive experts

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[1] Regarding Issue 7, the Army stated in its April 19, 2013, letter elevating the dispute that Issue 7 is resolved unless the EPA seeks to include the following sentence: "[t]he long-term groundwater and surface water monitoring and monitored natural attenuation (MNA) performance monitoring plan will also be presented in the remedial design (RD)." The Army provides no substantive basis for its objection and claims that this is a new sentence that was not specified in the dispute elevation or discussed with the Army. However, this statement is in the Army's September 28, 2012, ROD submission for operable unit (OU)-16 (page 1-4) for which the Army sought the EPA's approval. It has further been traced to the Army's November 2011, ROD submission for OU-16. A slightly different rendering of the statement was included in the Army's September 28, 2012, ROD for OU-17 (page 1-4). Accordingly, the Army is mistaken that the above statement was a new statement added by the EPA, and it should be retained in the RODs for OU-16 and OU-17. However, due to there being no MNA in the munitions and explosives of concern (MEC) ROD, the EPA does not require the Army to add the quoted above statement to the MEC ROD.

perform the work. All relevant draft final RODs subject to this dispute resolution proceeding shall be revised in accordance with this decision.

STIPULATED PENALTIES

Stipulated penalties are a standard provision of EPA enforcement agreements for Superfund cleanups. By signing the required FFA, the EPA and federal agencies agreed or "stipulated" that there would be certain monetary penalties for particular failures under the FFA. These penalties are imposed for failures, helping to ensure compliance with the FFA's terms and conditions and serve as a strong incentive for effective, efficient and protective cleanup.

While the Army agrees in this dispute that stipulated penalties are available for missed deadlines, it disagrees that it can be fined for providing insufficient documents. This issue revolves around the EPA's authority to assess stipulated penalties under the FFA for submission of primary documents that are substantively deficient, not only those that are untimely.

The FFA expressly provides for the assessment of stipulated penalties for both missed deadlines and failures to comply with a term or condition of the agreement. The FFA requires that the cleanup comply with CERCLA, the NCP and EPA guidance. In this case, the three draft-final RODs did not comply with one or more of these requirements. The EPA provided comments to the Army to correct their insufficiency; however, the Army did not agree to modify the RODs to bring them into compliance.

While $1,185,000 is a significant penalty, the Army's substantively deficient submittals directly affect a potential source of drinking water and fail to adequately protect against threats at the four operable units. The Army's continued position that the groundwater be cleaned only to industrial levels was inconsistent with CERCLA and the NCP. The LUC objectives and duration, challenged by the Army, are necessary to help ensure the remedies are protective over the long term. Despite the express language in CERCLA and the NCP that the EPA and the affected federal agency select a remedy jointly or, in the event of dispute, the EPA selects the remedy, the Army insisted that its draft final RODs allow the Army to independently change a remedy. The EPA informed the Army about these issues at the beginning of this dispute in 2011, and the Army had the ability to make the necessary changes to stop the accrual of penalties.

I find that under the FFA stipulated penalty provision, the EPA may assess a stipulated penalty for primary documents, such as the three draft-final RODs at issue here, that fail to comply with substantive requirements in an FFA, including those in Section IV (Purpose) and XIX (Selection, Design and Implementation of the Remedial Actions) in the Longhorn FFA, in addition to its authority to assess penalties for late primary documents. I also find that because the penalties here were for substantive deficiencies in the draft-final RODs, which relate to the remedial action to be taken, the EPA had the authority to assess stipulated penalties on that second basis provided for in Section XXIV.A (Stipulated Penalties) of the Longhorn FFA.

To implement the terms of the LHAAP FFA and ensure a protective cleanup consistent with CERCLA and the NCP, I affirm the regional administrator's April 5, 2013, decision that concluded penalties were warranted for the substantive failures in the three draft-final RODs as described in Issues 1-4, 6 and 7, which assessed a total penalty of $1,185,000 and hereby incorporate those sections of the regional administrator's decision by reference. The Army shall pay the $1,185,000 penalty to the Hazardous Substances Response Trust Fund as provided in the LHAAP FFA.

DECISION

Based on the information provided to me, I affirm the enclosed regional administrator's decision on April 5, 2013, and find that it is consistent with CERCLA, the NCP, the EPA's Superfund program policies and guidance and the CERCLA section 120 Federal Facilities Agreement governing environmental remediation at this site. In accordance with Section XV.J of the FFA, the Army is directed to revise the affected RODs consistent with this decision and the regional administrator's April 5, 2013, decision within twenty-one (21) days of this resolution of the dispute.

I also enclose as part of my decision a more thorough response to the significant issues raised by the Army, including those found in its March 18, 2014, submission and presented during our March 25, 2014, meeting. Again, my decision concerns only those five issues elevated to me pursuant to the FFA. The EPA's lack of response to other issues identified by the Army in its March 18, 2014, submission does not constitute any agreement with them.

Finally, this dispute has far exceeded the time frames for resolving disputes established in the LHAAP FFA. Such extended delays in dispute resolution impede a quick and efficient cleanup. The EPA and the Army, as well as other federal agencies in future disputes, should adhere more closely to the prescribed process and its deadlines to resolve disagreements in a more timely manner and at the lowest levels possible.

I appreciate your interest in these important issues and thank you for your efforts in identifying and discussing your concerns. The EPA looks forward to working closely with the Army and with the state of Texas as we move forward to implement this decision and the cleanup at LHAAP.

Sincerely,

Gina McCarthy

Enclosures

cc: The Honorable Avi Garbow
EPA General Counsel

The Honorable Mathy Stanislaus
Assistant Administrator for Solid Waste and Emergency Response

The Honorable Cynthia Giles
Assistant Administrator for Enforcement and Compliance Assurance

The Honorable Katherine Hammack
Assistant Secretary of the Army

Mr. Ron Curry
Region 6 Administrator

Ms. Lisa Feldt
Associate Deputy Administrator

DETAILED ANALYSIS OF LONGHORN ARMY AMMUNITION PLANT (LHAAP) ISSUES ELEVATED FOR RESOLUTION

The Environmental Protection Agency (EPA) has carefully considered the Army's March 18, 2014, Position Paper. It is appropriate to address a number of issues raised in that paper and at the meeting between EPA and the Army on March 25, 2014.

1. Remedies, CERCLA and the National Contingency Plan (NCP)

Consistent with CERCLA section 121, remedial actions such as the ones being carried out and selected at LHAAP must be "protective of human health and the environment" and EPA has the final determination in that selection. The statute includes other requirements for remedy selection (including consistency with the NCP), and, in section 120(e)(4)(A), makes it clear that for sites on the National Priorities List like LHAAP, the Administrator has the ultimate authority to select remedial actions if there is a dispute between EPA and (in this case) the Army. The Administrator's ultimate remedy selection authority is reiterated in section XV.G of the LHAAP FFA.

The NCP contains a number of provisions that are relevant to this dispute, including 40 CFR §300.430(a)(1)(iii), which in part states that "EPA expects to return usable ground waters to their beneficial uses wherever practicable, within a timeframe that is reasonable given the particular circumstances at the site," and "EPA expects to use institutional controls such as water use and deed restrictions to supplement engineering controls as appropriate for short-and long-term exposure to hazardous substances, pollutants, or contaminants." These provisions, and related EPA Superfund program guidance, were relied upon and cited by the Regional Administrator (RA) in reaching his April 5, 2013, decision.

The Army's March 18, 2014, Position Paper refers to what it regards as last-minute comments by EPA on the draft final RODs regarding groundwater cleanup levels for perchlorate, manganese and nickel and on land use controls. The Army also notes that EPA's position on the appropriate groundwater cleanup levels for those substances changed during the course of this dispute. While in the past the Texas industrial standard for perchlorate has been used, the decision documents must be based on our current understanding of the science, regulations and policy and reflect actual site conditions. EPA's statutory responsibility is to select remedies that protect human health and the environment, consistent with law and EPA guidance and policy. This decision is based upon the entire record in this dispute, including comments provided by the Army in its March 18 Position Paper, and does not depend on when a particular comment was made or position was developed.

The Army includes a new table in its March 18, 2014, materials which shows that EPA was late providing its comments on the RODs. EPA disagrees with the Army's implication that the timing of EPA's comments contributed to the Army's submission of inadequate RODs. As stated in EPA's letter to the Army on October 13, 2011, the "Army has a history of failing to submit adequate documents by the Site schedule deadlines at LHAAP." On September 23, 2009, EPA issued the Army a notice of violation concerning twelve sites at LHAAP for failure to comply with 2009 deadlines. The four sites subject to this dispute and stipulated penalty assessment were also subject to the September 23, 2009, notice of violation. In this case, EPA granted multiple extensions for two of the three RODs included in this dispute. Despite the many extensions, the Army submitted RODs that were substantively deficient, necessitating that EPA provide numerous comments. Because the Army failed to modify the RODs as necessary to select protective remedies, this dispute and enforcement action ensued.

2. Groundwater Cleanup Standard

The decision documents issued at this National Priorities List site must be based on our current understanding of the science, regulations, guidance and policy necessary to ensure protectiveness, even though the Texas industrial groundwater standard for perchlorate has been used in the past.[1] Although we understand the Army's concerns regarding the long history of cleanup at this site, it is important to recognize that regulatory standards, guidance, and the science that supports them change over time as we gather more knowledge about the risks to human health and the environment posed by various hazardous substances (including perchlorate, for example). Remedy selection decisions are made at the decision document phase (e.g., the ROD). In order to ensure protection of human health and the environment, they need to be based on the best and latest scientific and regulatory information. This approach is reflected in CERCLA, the NCP and existing EPA guidance. Even after the decision document is signed, remedy selection decisions may be changed, for example, to account for evolving science, newly promulgated standards that are potential applicable or relevant and appropriate requirements (ARARs) or site-specific factors that ensure protection of human health and the environment. This ongoing obligation to consider new science is clearly reflected in CERCLA section 121(c), which requires five year reviews of all CERCLA remedial actions such as the ones at Longhorn where hazardous substances are left in place over the long term.[2]

Second, since the state has designated the aquifer at Longhorn as a potential drinking water source, the remedy must restore the aquifer to this potential future use, consistent with the expectation in section 300.430(a)(1)(iii)(F) of the NCP. What is determinative is that the aquifer constitutes a potential future drinking water aquifer based on the "Guidelines for Ground-water Classification Under the EPA Ground-water Protective Strategy" (November 1986) and has been identified as a State of Texas designated potential drinking water source. *See* 30 TAC § 335.563(h)(1) and 30 TAC § 350.52. As stated in the March 8, 1990, preamble to the final NCP, "Ground water that is not currently used may be a drinking water supply in the future," (55 Fed. Reg. 8733) and, "[g]round water that is not currently a drinking water source but is potentially a drinking water source in the future would be protected to levels appropriate to its use as a drinking water source." (55 Fed. Reg. 8717). Consistent with the NCP and EPA guidance, a site's land use is not determinative of its underlying aquifer's groundwater use classification.[3]

Third, the Army Position Paper incorrectly states on page 3 that EPA has identified its interim drinking water Health Advisory for perchlorate as an ARAR. Since the Health Advisory is not a promulgated regulation (as correctly noted in the paper), it cannot represent an ARAR and was not identified as such by the Regional Administrator. However, since it does represent EPA's most current science-based position on safe levels of perchlorate in drinking water, the Health Advisory is significant when evaluating how a CERCLA remedial action ensures protectiveness of human health. It also may be relevant in evaluating the stringency of a potential state ARAR. Consistent with the NCP (e.g., 40 CFR §300.400(g)(3)), EPA's Safe Drinking Water Act health advisories, in appropriate circumstances, can be in the "to-be-considered" category (TBCs) for remedy selection purposes. (*See also* 55 Fed. Reg. 8765).

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[1] E.g., the Texas Risk Reduction Rule standard for perchlorate of 72 ppb.

[2] NCP at 40 C.F.R. § 300.430(f)(4)(ii).

[3] The Army, in its March 18, 2014, Position Paper mistakenly believes that EPA will similarly require the Army to clean up soils to residential cleanup levels. This is not correct. In accordance with Agency policy, soil cleanups take into account current and future land use.

While protectiveness of human health and ARARs often may overlap, they are not the same.[4] As acknowledged in a number of places by the Army Position Paper, CERCLA section 121 includes a number of clear, distinct statutory requirements; importantly, the statutory mandate to ensure that remedial actions are protective of human health and the environment is separate and independent from the statutory mandate to select remedial actions that attain (or, in certain limited circumstances, waive) ARARs.[5] This is reflected in the March 8, 1990, preamble to the final NCP, "EPA must decide the appropriate level of remediation necessary to protect human health and the environment and determine what requirements are ARARs based on the beneficial use of the ground water and specific conditions of the site." (55 Fed Reg. 8733). As also correctly noted in the Army Position Paper, an EPA-promulgated maximum contaminant level (MCL) in the future may impact the cleanup standard that needs to be attained.

Fourth, the Army Position Paper incorrectly interprets the NCP provisions in 40 CFR § 300.430(a). As stated on page 8732 of the March 8, 1990, preamble to the final NCP, "[t]he goal of EPA's Superfund approach is to return usable ground waters to their beneficial uses within a timeframe that is reasonable given the particular circumstances of the site." The NCP's expectation that groundwater will be restored to its beneficial use reflects the broad remedial purposes and goals found in various provisions in CERCLA, including section 104(c)(6) and section 121(d)(2)(A);[6] thus, for example, as stated on page 8702 of the March 8, 1990, preamble to the final NCP: "[t]hese expectations were developed based on both the preferences and mandates expressed in CERCLA section 121 as well as EPA's practical experience in trying to meet those preferences and mandates." The NCP preamble and existing EPA CERCLA policy documents (e.g., the June 2009 *Summary* referred to above) provide further support and guidance regarding this fundamental tenet of the Superfund program.

The NCP and its expectations, which reflect other important CERCLA provisions, like the preference for treatment to the maximum extent practicable, are the blueprint for CERCLA cleanups carried out by the Army or any other party subject to its provisions. Thus, based on the circumstances at this site, the CERCLA cleanup needs to restore the groundwater to its beneficial use, not merely control human exposure or prevent further migration of the contaminant plume. The draft RODs for OU-16 and OU-17 include a Remedial Action Objective (RAO) of returning the groundwater to beneficial use as drinking water, correctly reflecting the NCP's expectation that groundwater be restored to its beneficial use whenever practicable in a reasonable period of time (*see* 40 CFR §300.430(a)(1)(iii)(F)).

Fifth, the Army's claims that the cleanup will be extended for an additional 100 to 150 years to achieve residential standards for perchlorate is not supported by the facts. First, the draft ROD for OU-16 uses a target concentration of 23 ug/L when calculating time-dependent attenuation rates (*see* Table A-6 in the Feasibility Study). This concentration approximates the Texas residential drinking water levels that were in effect at the time the Feasibility Study was prepared (they were actually 26 ug/L and have since been

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[4] This point is specifically addressed in the 1990 preamble (e.g., "[c]ontaminant-specific ARARs have been promulgated for a small percentage of contaminants, and even if contaminant specific ARARs were available for some relevant substances, they generally do not define protective levels for contaminated soils nor do they always define protective levels for mixtures chemicals (typical Superfund site situations). Thus, EPA must evaluate additional information to determine what remedies would protect human health and the environment," 55 Fed. Reg. at p. 8727). It is also addressed in EPA's existing CERCLA guidance (see for example, "Clarification of the Role of Applicable, or Relevant and Appropriate Requirements in Establishing Preliminary Remediation Goals under CERCLA," OSWER Directive No. 9200.4-23 (August 22, 1997)).

[5] This is reflected in the March 8, 1990, preamble to the final NCP, "EPA must decide the appropriate level of remediation necessary to protect human health and the environment and determine what requirements are ARARs based on the beneficial use of the ground water and specific conditions of the site." (55 Fed Reg. 8733).

[6] The Army Position Paper on page 8 seems to suggest that the NCP's ground water restoration expectation is tied to CERCLA's natural resource damages provisions, which is not correct.

changed to 17 ug/L) and is only slightly higher than the Texas residential groundwater cleanup level affirmed by this decision. In addition, for operable units 16 and 17, the estimated cleanup time for trichloroethylene (TCE) contamination in groundwater, as described in the associated Feasibility Studies, appears to exceed the estimated cleanup time for perchlorate even if one uses the Texas Risk Reduction Program (TRPP) protective concentration limits (PCLs) regulations for residential groundwater cleanup levels or the EPA interim drinking water Health Advisory. Since TCE is driving the need and time required for cleanup, the choice between the state's industrial versus residential perchlorate cleanup level is not determinative of the ultimate cleanup costs at these operable units or length of time for monitoring/sampling. Similarly, it appears that the level of perchlorate contamination for operable units LHAAP-001-R-01 and LHAAP-003-R-01is at levels below EPA's interim drinking water Health Advisory of 15 ppb. Thus, no cleanup level for perchlorate at these operable units appears to be needed at this time, and, consequently, no additional cleanup costs would be incurred. Thus, EPA's decision that the residential groundwater cleanup level for perchlorate is the appropriate one at this site will not, as a practical matter, necessarily lead to additional cleanup costs.

Finally, the Army Position Paper states on page 7 that "[i]t is the Army's position that the Region 6 Administrator's choice of the TRRP residential standards as the ARARs for perchlorate, manganese, and nickel in groundwater *is contrary to law because CERCLA requires* that the Texas Risk Reduction Rule (TRRR) apply to response action at the Longhorn facility" (emphasis added). However, the Army provided no persuasive support for this characterization of CERCLA. As discussed herein, even if the TRRR were to be considered an ARAR, the Agency finds that CERCLA and the NCP require consideration of more than simply ARARs in determining the appropriate remedy at a site.

3. Land Use Controls (LUCs) and Their Duration

EPA appreciates and fully supports the Army's maintenance and repair of the LHAAP groundwater monitoring system, but an effective remedy requires a LUC, established and sustained, to protect the system from damage in the first place. The Army incorrectly relies on Operation and Maintenance as sufficient to protect the groundwater monitoring/remedial system. As the Army notes in its March 18, 2014, Position Paper, wellheads could be damaged by human action such as hunting and vehicular traffic. In EPA's experience at military facilities, we have seen instances of heavy machinery rupturing pipelines, knocking the water system out of service and damaging wellheads. A LUC to maintain the integrity of the groundwater monitoring system will reduce the potential for such damage. The Army appears to be focusing on the word "maintain." As EPA has explained in writing to the Army in February 2012, "institutional controls would be developed to protect the infrastructure of both the landfill and groundwater components of the remedy, including the Operation and Maintenance components, to ensure that the groundwater monitoring system is protected from damage and will operate as designed for the duration of the remedy." The RODs submitted by the Army omitted objectives designed to protect the integrity of the groundwater monitoring system which is an integral engineering component of the final remedy.

This is a commonplace LUC, used at many other sites, including other Army sites. Prior to this dispute, the Army has agreed to include this LUC in its RODs at other sites, such as the Picatinny (NJ) 2011 Groundwater ROD and a 2005 Seneca (NY) Army Depot ROD. Moreover, including this LUC is common in other federal facility groundwater RODs across the country. Finally, contrary to the Army's assertions, EPA includes similar controls in RODs at private party sites where EPA is the remedy selector. Even in the two RODs that the Army provided in its March 18, 2014, materials, LUCs to protect the components of the remedy are included. The North Cavalcade Street (TX) Superfund site ROD includes such an institutional control: "[r]estrictions should also be used to protect components of the ground water remedy (i.e., digging restrictions into the two stabilized source areas) including the permanent monitoring wells" (page 24). Similarly, the Army-provided Molycorp, Inc. (NM) ROD states on page 2-664: "[o]ther government controls contemplated for the Selected Remedy after remedial construction is complete include local ordinances, permits and/or zoning to protect source water control and water collection and *treatment remedy components*" (emphasis added). There are numerous other private site RODs that include a control to protect the groundwater remedy components, [7] which is what EPA seeks at LHAAP.

Including such a LUC to protect the engineered components of a remedy is a principle of EPA's LUC guidances.[8] The Army's observation in its March 18, 2014, position that "EPA's documents usually refer to the narrow term 'institutional controls,'" overlooks an important point. While EPA's guidances use the term institutional control quite often, in EPA's December 2012 PIME for example, there is a discussion and definition of the term "LUC" and it encompasses the term ICs *(see* page 2): "ICs are a subset of Land Use Controls (LUCs). LUCs include engineering and physical barriers, such as fences and security guards, as well as ICs. The federal facility program may use either term in its decision documents. For purposes of this guidance, the term ICs is used, but the concepts also apply to LUCs." Thus, EPA seeks a control to protect the remedy components at private party sites and at federal facility sites.

Also, this LUC to protect the groundwater monitoring/remedial system must remain in place until the property achieves unlimited use/unrestricted exposure (UU/UE). The Army stated in its March 18, 2014, Position Paper that it found EPA's requirement that all LUCs be in place until UU/UE "confusing" because the Army understood the Longhorn Draft Final RODs to already contain such language. However, because the Army did not have a LUC to protect the groundwater remedial system, this LUC, in consequence, lacked the appropriate duration of remaining in place until the property achieves UU/UE. EPA indicated several times in its comments on the draft and draft final RODs to the Army that the Army must include this duration standard for all of the LUCs, including the missing LUC to protect the integrity of the groundwater monitoring/remedial system.

With regard to the munition operable units, which pose an explosive hazard, the selected remedies must include a LUC that ensures protectiveness of human health and the environment. The LUC objective and a control must be designed to prohibit unacceptable human exposures based on current and future land use and to prohibit intrusive activities, unless EPA and the Army approve them and trained explosive experts perform the work. The duration for the LUCs specified in the munition and explosives of concern (MEC) ROD for these purposes must be for as long as there remains an explosive threat, which also means that the property does not allow for UU/UE. This position is consistent with Region 6's September 12, 2012, e-mail to the Army addressing appropriate LUC language for the Army's MEC ROD. While the Army's September 28, 2012, counterproposal was to transfer to the new owner (as we understand it, the Fish and Wildlife Service) the responsibility for ensuring safety from explosive hazards, we do not believe this approach will ensure protectiveness of human health and the environment in an appropriate manner. In light of the circumstances at this site and the Army's expertise

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[7] *See also*, CTX Printex Site (CA) (institutional controls to prevent "any interference with the remedial systems"); J.H. Baxter Site (CA) (Institutional controls shall be implemented to "protect the integrity of the remedy.") and Skinner Landfill (OH) ("the restrictions must prevent the use of this portion of the site for any activity which will interfere with the performance of the remedy."

[8] See EPA's 2012 "Institutional Controls [IC]: A Guide to Planning Implementing, Maintaining, and Enforcing Institutional Controls at Contaminated Sites (PIME)" Section 2 "Definition and Role of ICs," 1st sentence: "For purposes of this document, EPA defines ICs as non-engineered instruments, such as administrative and legal controls, that help to minimize the potential for exposure to contamination and/or protect the integrity of a response action."

in handling MEC safely, the LUC provides that intrusive activities are prohibited unless EPA and the Army agree that the intrusive activities can be performed safely and by qualified personnel.

Therefore, redevelopment can proceed, but intrusive activities, such as digging into this area, must be done safely. The Army claims that EPA's requirement of a control while there is an explosive risk would "essentially render these properties useless in perpetuity for any development that could allow the slightest intrusion below the surface." However, this is not supported by a plain reading of the ROD. EPA's controls would simply ensure that, if such intrusion is necessary (for redevelopment, for example), EPA and the Army would need to approve the intrusion and trained explosive experts would perform the work.

While an explosion in these circumstances might be rare, the consequences of death or damage from an explosion are great enough to warrant this simple, inexpensive control. In assessing the need for a control addressing explosive risk, the Army considers that the probability of an explosion is low and states that the "low level of risk is acceptable." EPA, in contrast, looks at the magnitude of the potential consequences if an unlikely, but reasonably possible, explosion occurs at this former bomb testing area. The risk to human health from such an event requires the LUC.

4. Stipulated Penalties

EPA has the authority, under the LHAAP FFA, to assess stipulated penalties for substantive failures in primary documents as well as for their late submission, and the Agency may assess them at any time to promote consistency with CERCLA, the NCP and EPA guidance. In 1991, EPA, the Army, and the state of Texas signed the LHAAP FFA, agreeing to stipulated penalties in the event the Army failed to comply with a term or condition of the FFA. Three years earlier (in 1988), EPA and the Department of Defense (DOD) agreed to include a model stipulated penalties provision in all future cleanup agreements for military facilities, such as LHAAP, that are included on Superfund's National Priorities List. The LHAAP provision is what EPA and DOD agreed to include in all DOD FFAs. Specifically, the LHAAP FFA at Section XXIV.A provides that:

> In the event that the Army fails to submit a primary document (i.e., RI/FS Work Plan, Risk Assessment, RI Report, Initial Screening of Alternatives, FS Report, Proposed Plan, Record of Decision, Remedial Design, Remedial Action Work Plan) to EPA and TWC [Texas Commission on Environmental Quality] pursuant to the appropriate timetable or deadline in accordance with the requirements of this Agreement, or fails to comply with a term or condition of this Agreement which relates to an operable unit or final remedial action, EPA may assess a stipulated penalty against the Army.

The Army's March 18, 2014, Position Paper asserted that the stipulated penalties assessed here were an improper attempt by EPA to coerce the Army into accepting EPA's position on the issues in dispute. EPA disagrees. EPA assesses stipulated penalties to encourage compliance with the FFA and to provide an incentive to the party performing the cleanup to do so in accordance with CERCLA, the NCP and EPA guidance. Section XXIV.A (Stipulated Penalties) in the Longhorn FFA allows EPA to assess stipulated penalties for primary documents that are inconsistent with CERCLA, the NCP and EPA guidance.

The FFA provides two bases under which EPA may assess stipulated penalties – "fail[ure] to submit a primary document...pursuant to the appropriate timetable or deadline in accordance with the requirements of this Agreement" or "fail[ure] to comply with a term or condition of this Agreement which relates to an operable unit or final remedial action." Here, EPA's stipulated penalty assessment was proper under either basis.

Under the first basis, EPA may assess a penalty if a primary document is late or if it is not in accordance with the requirements of the agreement.[9] EPA may assess stipulated penalties even if the documents are submitted on time, if they do not comply with CERCLA, the NCP or EPA guidance. This interpretation of the FFA gives full effect to the phrase "in accordance with the requirements of this Agreement," which under the FFA includes those in the "Purpose" and "Selection, Design, and Implementation of the Remedial Actions" sections of the FFA, as well as timeliness. The FFA's stipulated penalty section is also consistent with CERCLA section 120(a)(2), which provides that CERCLA, the NCP and guidelines and criteria applicable to remedial actions at privately-owned sites shall apply to federally-owned sites, and prohibits the Army from using any guidelines or criteria that are inconsistent with the EPA's.

Furthermore, the stipulated penalty was appropriate under the second basis for stipulated penalties in the FFA, "fail[ure] to comply with a term or condition of this Agreement which relates to an operable unit or final remedial action." Each of the eight substantive issues that originally were the basis for the stipulated penalties relates to an operable unit and final remedial actions to be selected in the RODs. These eight issues include the appropriate groundwater cleanup standards for perchlorate, nickel and manganese; land use controls and their duration, enforceability and integrity over time; and the necessity for EPA concurrence on any changes to the selected remedy, including LUCs, landfill performance requirements and the proper description of investigations for munitions. The words "relates to" are interpreted broadly, and encompass the Army's substantive failures that describe the nature and extent of the remedial actions in the three draft final RODs. *See* the enclosed Regional Administrator's April 5, 2013, decision for more details. The assessment of penalties under this second basis also hinges on an analysis of whether the Army's Draft Final RODs complied with CERCLA, the NCP and EPA guidance.

Contrary to the Army's statements in its March 18 Position Paper, EPA's decision here, that the FFA allows EPA to assess stipulated penalties for substantive failures in primary documents, is not a new interpretation by EPA. The same issue arose in 1991 in a dispute with the Department of Energy (DOE) regarding its facility in Fernald (OH), that was settled by EPA and DOE after it was elevated to the Administrator. DOE and EPA agreed that the stipulated penalty provision applied to deficient documents, as well as those that were late. In addition, on at least two other occasions, EPA has assessed FFA stipulated penalties because of deficient documents. In the May 19, 1993, resolution of the FFA dispute at Loring (ME) Air Force Base regarding late and deficient documents, the Air Force Office of General Counsel agreed that EPA may assess stipulated penalties if a document prepared under the FFA did not comply with CERCLA, the NCP, or applicable EPA guidance. More recently, the Navy similarly challenged EPA's authority to assess stipulated penalties for a deficient feasibility study at the Jackson Park (WA) Housing Complex. In that matter, the EPA Region 10 Acting Administrator affirmed EPA's authority under the FFA to assess stipulated penalties for substantive failures in primary documents.

The Army has not provided a compelling argument to change the longstanding interpretation of EPA's stipulated penalty authority. The April 5, 2013, decision issued by the Regional Administrator regarding EPA's ability to assess a stipulated penalty for the substantive failures in the primary documents is consistent with the FFA stipulated penalty assessments in these previous actions. Furthermore, the Regional Administrator's April 5, 2013, decision pursuant to Section XXIV.B (Stipulated Penalties) of

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[9] Sections XIX (Selection, Design, and Implementation of the Remedial Actions) and IV (Purpose) of the LHAAP FFA require that the Army's primary documents comply with CERCLA, the NCP and EPA guidance.

the FFA, which was based on whether the failures "did in fact occur," is consistent with the EPA Administrator's June 12, 2008, Final Decision in the FFA dispute with the Navy at Brunswick (ME) Naval Air Station.

Section XXIV.B. of the FFA recognizes that a stipulated penalty may be assessed before there is a formal dispute on the substantive issue and gives the Army 15 days to invoke dispute resolution (if the failure is not already subject to dispute resolution) on “whether the failure did in fact occur.” If the ultimate decision resolving a dispute finds that a failure did not in fact occur, penalties would not be due and owing. The EPA Administrator’s decision in the 2008 Brunswick dispute explained that equitable issues are not part of the decision in a formal FFA dispute on stipulated penalties, because the sole issue is whether the failure did in fact occur. The decision also explained that equitable issues should be addressed by the parties during the time period between when the Army received the penalty assessment notice and when it invoked formal dispute resolution. Accordingly, EPA’s assessment of stipulated penalties at LHAAP on October 13, 2011; the Army’s invocation of a formal dispute on the penalties on October 27, 2011; and EPA’s invocation of a formal dispute on the substantive issues in the three draft final RODs, also on October 27, 2011, were consistent with the agreed-upon process established in the FFA. Furthermore, EPA’s assessment of penalties was substantively consistent with the FFA.

While EPA’s original penalty assessment accrued on a weekly basis for violations at each of the *four operable units*, the Regional Administrator’s Decision instead assessed penalties only for the three primary documents at issue, the *three RODs*. Under the FFA, EPA has discretion to assess penalties based upon operable units, primary documents or for specific violations. Here, the assessment based upon the three RODs lead to a significantly lower total penalty than an assessment based upon operable units or for each violation. EPA also used its enforcement discretion to stop the accrual of penalties between November 30, 2011, and February 23, 2012, and after September 28, 2012.

Finally, the Army stated in its March 30, 2012, letter to the EPA Region 6 Administrator that the stipulated penalties were precluded by the OMB/CEQ Memorandum on Environmental Conflict Resolution (Nov. 28, 2005). The Army’s March 18, 2014, Position Paper made the same comment regarding the 2012 revised version of the OMB/CEQ memorandum, which superseded the 2005 memorandum, and cited other statutes, executive orders, rules, and agency policies that encourage the use of alternative dispute resolution. The 2012 OMB/CEQ memorandum and other provisions cited in the Army’s March 18, 2014, Position Paper do not apply to the assessment of stipulated penalties under the FFA and do not supplant the mutually agreed-upon procedures in the Dispute Resolution section of the FFA (which are a form of alternative dispute resolution) to resolve stipulated penalty assessments. The Army, EPA and Texas have agreed to use the Longhorn FFA’s dispute resolution process and to treat its results as final and binding on all parties. *See* LHAAP FFA at Section XV.K. EPA and DOD have successfully resolved many disputes using this process. The Longhorn FFA’s dispute resolution process originates from the 1988 Model FFA language negotiated and agreed to by DOD and EPA, and there is no basis to deviate from applying model language in this dispute.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 6
1445 ROSS AVENUE, SUITE 1200
DALLAS, TEXAS 75202 – 2733

April 5, 2013

Office of the Regional Administrator

Mr. Hershell Wolfe
Department of the Army
Deputy Assistant Secretary of the Army for
Environment, Safety, and Occupational Health
600 Army Pentagon
Washington, D.C. 20310-0600

Mr. Zak Covar
Executive Director
Texas Commission on Environmental Quality
Post Office Box 13087
Austin, Texas 78711-3087

RE: In the Matter of the United States Department of Army, Longhorn
Army Ammunition Plant, Federal Facility Agreement Under CERCLA Section 120

Dear Mr. Wolfe and Mr. Covar:

This letter sets forth my decision constituting the United States Environmental Protection Agency's position for the three disputed draft final Records of Decision concerning four operable units at LHAAP. More specifically, this decision addresses the dispute concerning the draft final RODs for the Longhorn Army Ammunition Plant-16 (Old Landfill) operable unit, the LHAAP-17 (No. 2 Flashing Area Burning Ground) operable unit, and two Munitions Response Sites operable units (i.e., LHAAP-001-R-01-MMRP - South Test Area/Bomb Test Area, and LHAAP-003-R-01 MMRP - Ground Signal Test Area). The EPA Position provides language to be included in the RODs; a determination regarding protective groundwater cleanup and monitoring standards for contaminated groundwater; a determination regarding land use controls and the duration of such controls; and a determination concerning the assessment of stipulated penalties under the Longhorn Federal Facility Agreement.

BACKGROUND

On October 13, 2011, the EPA issued a Notice of Violation and Stipulated Penalty Assessment concerning the issuance of draft final RODs for the four operable units at issue here (i.e., LHAAP-16, LHAAP-17, LHAAP-001-R-01-MMRP and LHAAP-003-R-01 MMRP), pursuant to Section XXIV (Stipulated Penalties) of the Longhorn FFA under CERCLA Section 120 for the LHAAP Site. The Army submitted its Response to EPA's Notice of Violation and Stipulated Penalty Assessment on October 27, 2011, and invoked dispute resolution regarding the assessment of stipulated penalties. Per Section XXIV.B (Stipulated Penalties) of the FFA, no assessment of a stipulated penalty shall be final until the conclusion of the dispute resolution process.

Despite August and September 2011 efforts to resolve issues presented in the Army's draft RODs, several issues remained unresolved. As a result, on October 27, 2011, the EPA invoked formal dispute resolution concerning a total of eight issues. The Army submitted its Response to the EPA's October 27, 2011, Written Statement of Dispute which also included revised draft final RODs. As part of the Dispute Resolution Committee's effort to resolve the dispute, the DRC representatives for the Army, the Texas Quality and the Commission on Environmental EPA met on November 30, 2011. At the meeting, the parties discussed the eight disputed issues raised by the EPA and the assessment of stipulated penalties issue raised by the Army.

On December 23, 2011, the EPA submitted a letter to the Army, which enclosed a revised draft final LHAAP-16 ROD, included language designed to address the eight disputed issues. The Army provided an email response on January 13, 2012, which demonstrated there was no agreement at the DRC level. On February 15, 2012, the EPA sent a letter with eight separate written agreements signed by the EPA DRC representative, to the DRC representatives for the Army and the TCEQ. On February 23, 2012, the TCEQ signed seven of the eight written agreements. Although the TCEQ did not sign the written agreement that addressed the groundwater cleanup and monitoring standards for groundwater contaminated with perchlorate and other contaminants, it stated that the TCEQ would agree to cleanup levels more stringent than the TCEQ's standards if the Army and the EPA agreed to such standards. On March 12, 2012, the EPA sent the Army a letter denying the Army's November 4, 2011, and February 16, 2012, requests for the withdrawal of the assessment of stipulated penalties. Because the DRC did not reach a resolution, the Army elevated the stipulated penalties assessment dispute to the Senior Executive Committee on March 30, 2012. The EPA elevated the dispute concerning the eight disputed issues to the SEC on April 5, 2012.

The SEC representatives for the Army, the TCEQ and the EPA conducted a conference on May 17, 2012. The SEC also directed its staffs to attempt to resolve disputed issues which led to April 26, 2012, and May 11, 2012, conferences. The parties also agreed to set May 31, 2012, as the time-frame to either have an agreement, or have Region 6 commence the written position process identified in the LHAAP FFA. Exchanges among the parties include the Army's submission of revised final draft RODs on June 29, 2012, and the EPA's July 20, 2012, submission of revisions to the Army's revised final draft RODs, which incorporated revisions from the TCEQ. The Army, the TCEQ and the EPA next participated in a July 27, 2012, conference call to discuss the EPA's and TCEQ's revisions, and set an August 10, 2012, deadline to either reach an agreement or commence the Region 6 written position process under the LHAAP FFA. The Army submitted revised copy final draft RODs on August 3, 2012. Upon the EPA's request, the Army also submitted revised, color-coded final draft RODs highlighting the Army's revisions on August 7, 2012. The EPA reviewed the Army's revisions and sent the Army final draft RODs on August 8, 2012, with color-coded revisions, requesting the Army incorporate the EPA revisions by August 10, 2012. Thereafter, the parties held a conference call on September 5, 2012, in an attempt to resolve issues that remained in dispute.

SEC ORAL AGREEMENTS

The SEC and assigned staff members attempted to resolve seven of the disputed issues. These efforts led to the Army's submission of the September 28, 2012, final draft RODs. These Army RODs seemingly resolved dispute issues 4, 5, 6, 7, and 8. While the SEC was unable to memorialize that agreement, by this decision, I provide the language the EPA believes the parties agreed to include in (or delete from) the RODs resolving the five issues in chronological order. If the Army or the TCEQ disagree with the language as provided herein by the EPA, they each have the opportunity to elevate to the Administrator that language and any other disputed issues for resolution in accordance with the Longhorn FFA.

EPA's UNDERSTANDING OF THE ORAL AGREEMENTS

Issue four dealt with modifying finalized remedies and impacted all four operable units. The EPA believes the SEC orally agreed that the following language would be deleted from the final RODs signed by the parties:

> ~~"The U.S. Army will be responsible for implementation, maintenance, periodic inspection, reporting on and enforcement of the LUCs in accordance with the RD. Although the U.S. Army may transfer these responsibilities to another party through property transfer agreement or other means, the U.S. Army will remain ultimately responsible for: (1) CERCLA §121(c) five-year reviews; (2) notification of the appropriate regulators of any known LUCs deficiencies or violations; (3) access to the property to conduct any necessary response; (4) reservation of the authority to change, modify, or terminate the LUCs and any related transfer or lease provisions; and (5) ensuring the protectiveness of the selected remedy."~~
>
> ~~"The U.S. Army shall consult with TCEQ and obtain USEPA concurrence prior to termination or significant modification of a LUC, or in the highly unlikely event of a land use change inconsistent with the industrial/recreational use assumptions of the remedy. (There is no reasonably anticipated use of the property for other than wildlife refuge purposes). In the event that TCEQ and/or EPA and the Army agree with respect to any significant modification of the selected remedy, including the LUCs component of the selected remedy, the remedy will be changed consistent with the FFA and 40 C.F.R. §300.435(c)(2)."~~

Dispute issue five dealt with applicable or relevant and appropriate standards in only one LHAAP operable unit (LHAAP Site 16). The SEC orally agreed that the following ARARs language would be added to the final ROD signed by the parties:

"Post-closure Care: Closure and post-closure ARARs were identified for LHAAP-16 in the IRA ROD and included 30 TAC 335.112, 335.118, 335.119 and 335.174 and 40 C.F.R. §§ 264.228 and 264.310 addressing landfills and surface impoundments storing hazardous waste. Closure requirements were met during implementation of the (cap) presumptive remedy of the IRA. Post-closure requirements are relevant and appropriate, and include 40 C.F.R. §§ 264.228(b)(1), (3) and (4); 264.310(b)(1), (4), (5), and (6); and 30 TAC 335.174. Although there is no permanent benchmark inside the LHAAP-16 area, one is located adjacent to the Site. Therefore, 40 C.F.R. § 264.310(b)(6) is relevant and appropriate for a benchmark located near a landfill. In addition, the substantive requirements of 40 C.F.R. §§ 264.117 through 120 related to post-closure for the remedy in place are relevant and appropriate."

Issue six concerns the land use controls that will fulfill the various LUC objectives before and after transfer of Army property at Longhorn. This issue arose at all four units. The SEC orally agreed that the following LUC language would be added to the final RODs signed by the parties:

"The Army will implement, maintain, monitor, report on and enforce land use controls at Army-owned property. The Army shall perform those actions related to land use control activities described in this ROD and in the Remedial Design for the ROD. For portions of the Site subject to land use controls that are not owned by the Army, the Army will monitor and report on the implementation, maintenance, and enforcement of land use controls, and coordinate with federal, state, and local governments and owners and occupants of properties subject to land use controls. The Army will provide notice of the groundwater and soil (surface and subsurface) contamination and any land use restrictions referenced in the ROD. The Army will send these notices to the federal, state and local governments involved at this site and the owners and occupants of the properties subject to those use restrictions and land use controls. The Army shall provide the initial notice within 90 days of ROD signature. The frequency of subsequent notifications will be described in the Remedial Design for the ROD. The Army remains responsible for ensuring that the remedy remains protective of human health and the environment. The Army will fulfill its responsibility and obligations under CERCLA and the NCP as it implements, maintains, and reviews the selected remedy."

Upon transfer of Army-owned property, the Army will provide written notice of the land use controls to the transferee of the groundwater and soil (surface and subsurface) contamination and any land use restrictions referenced in the ROD. Within 15 days of transfer, the Army shall provide the EPA and the TCEQ with written notice of the division of implementation, maintenance, and enforcement responsibilities unless such information has already been provided in the LUC RD. The LUC RD will address the procedures to be used by the Army and the transferee to document compliance with the LUCs described in this ROD. In the event property is transferred out of Federal control, the land use controls relating to property and groundwater restrictions shall be recorded in the deed and shall be enforceable by the United States and the state of Texas."

Dispute issue seven applied to all four operable units and addressed whether an enforceable document would be appropriate for the implementation of LUCs. The SEC orally agreed that the following LUCs language would be added to the final RODs signed by the parties:

"A LUC Remedial Design (RD) will be finalized as the land use component of the Remedial Design. Within 21 days of the issuance of the ROD, the Army will propose deadlines for completion of the RD Work Plan, RD, and Remedial Action Work Plan. The documents will be prepared and submitted to EPA and TCEQ pursuant to the FFA. The LUC RD will contain implementation and maintenance actions, including periodic inspections. The long-term groundwater and surface water monitoring and MNA performance monitoring plan will also be presented in the RD."

With respect to dispute issue eight and whether there were principal threat wastes at two munitions response sites located on two LHAAP operable units (LHAAP-001-R-01-MMRP and LHAAP-003-R-01 MMRP), the SEC orally agreed that the following language would be added to the final ROD signed by the parties:

"There are currently no known principal threat wastes at these two MRS sites (LHAAP-001-R-01 MMRP and LHAAP-003-R-01 MMRP)."

In light of the EPA's understanding of the above SEC Agreements, the Army shall make the modifications to the RODs for issues 4, 5, 6, 7, and 8 as described above. These changes will be implemented in accordance with the LHAAP FFA. Language inconsistent with the above language as memorialized herein shall not be incorporated in the final RODs subject to this dispute. Pursuant to Section XV.F (Dispute Resolution) of the LHAAP FFA, this written decision constitutes the EPA's position regarding this dispute. This decision will serve as the final dispute resolution decision unless the TCEQ or the Army elevates the dispute to the EPA Administrator within 14 days of its issuance under Section XV.F of the FFA. Materials and documents cited herein were reviewed and considered before making a decision regarding the issues in dispute. A list/index of those materials and documents is enclosed with this decision. CERCLA, the NCP, and the LHAAP FFA were also reviewed and considered before this decision was rendered.

UNRESOLVED ISSUES

After many months of discussions, the SEC appeared to reach oral agreement on only five out of the eight issues, excluding stipulated penalties, before the committee. Four issues remain that I resolve herein through this decision. The remaining issues involve: 1) the cleanup and monitoring standards for contaminated groundwater, (2) LUC objectives, (3) the duration of LUCs, and (4) the assessment of stipulated penalties.

GROUNDWATER CLEANUP STANDARDS

The first issue involves the role of state standards and federal guidance where there currently is no federal primary Maximum Contaminant Level for specific contaminants (i.e., perchlorate, manganese, and nickel) that are found in contaminated groundwater at this site. More specifically, the issue concerns how to consider the Texas standards (for groundwater residential or groundwater industrial/non-residential use) in the remedy selection process, consistent with CERCLA and the National Contingency Plan.

Based on the specific circumstances at this site, Region 6 believes that applying cleanup levels based on the Texas standards, (when evaluated in light of the EPA Health Advisory Information, and the TCEQ risk model data and information), ensure selection of a CERCLA remedial action at this site (where groundwater is a potential drinking water aquifer) that will be protective of human health and consistent with the CERCLA, NCP and agency guidance.

The LHAAP FFA requires the Army's investigation and cleanup to comply with CERCLA, the NCP, and the EPA's CERCLA Policies. Sections IV (Purpose) and XIX (Selection, Design and Implementation of Remedial Actions) of the LHAAP FFA require the Army to perform tasks, obligations and responsibilities (i.e., remedial action selection, design and implementation tasks) in accordance with CERCLA, 42 U.S.C. §§ 9601 et seq., NCP, 40 C.F.R. Part 300 et seq., and the EPA CERCLA guidance and policy. As discussed below, the EPA finds that the Army failed to comply with LHAAP FFA standards cited above. Because the contaminated groundwater at the LHAAP Site has a potential drinking water source designated use, the Safe Drinking Water Act, MCLs at 40 C.F.R. Part 141 et seq., generally are ARARs consistent with 40 C.F.R. § 300.430(e)(2)(i)(B & C).

In general, where the federal government has not promulgated a primary MCL under the Safe Drinking Water Act, or where a state has promulgated a standard more stringent then the federal MCL for specific contaminants (i.e., perchlorate, manganese, and nickel in this case), it may be appropriate to consider state standards in determining the cleanup level for a CERCLA response action. Texas has two regulatory standards the EPA has considered at this site: 1) the medium-specific concentration for groundwater as authorized under 30 TAC § 335.559; and 2) protective concentration limits developed under the Texas Risk Reduction Program found at 30 TAC 350 et seq.; the state recently updated the PCL groundwater cleanup numbers on June 29, 2012 (e.g., perchlorate PCL of 17 ug/L for residential, and 51 ug/L for nonresidential/industrial use). *See* 30 TAC 350, Subchapter D, Tier 1 PCL Tables (June 29, 2012).

Pursuant to CERCLA Section 121(d) and the NCP, on-site remedial actions must attain (or waive) the substantive requirements of federal and more stringent state ARARs. In addition, pursuant to CERCLA section 121, the remedy selected at this site must ensure protectiveness of human health. The EPA Health Advisories can provide useful information when evaluating protection of human health, and in selecting response actions that ensure restoration of contaminated groundwater to its potential beneficial uses, consistent with the NCP *(See* 40 C.F.R. § 300.430(a)(1)(iii)).

Region 6 believes the PCLs may be sufficiently stringent (when evaluated in light of the EPA Health Advisory Information and the TCEQ risk model data and information) to ensure protection of human health, and may be sufficient to ensure restoration of contaminated groundwater to its potential beneficial uses, consistent with the NCP *(See* 40 C.F.R. § 300.430(a)(1)(iii)). As such, the region has selected the PCLs as groundwater cleanup levels at this site. The EPA notes that this decision may need to be re-evaluated once the agency has finished its rulemaking process for establishing a federal MCL for perchlorate under the Safe Drinking Water Act.

As noted herein, the groundwater at the LHAAP Site is designated as a potential drinking water source by the state of Texas. *See* 30 TAC § 335.563(h)(1), and 30 TAC § 350.52. The groundwater is classified as a potential future drinking water aquifer in accordance with the EPA Guidelines for Groundwater Classification, (Final Draft December 1986). As such, the CERCLA remedy at this site should achieve restoration of the contaminated aquifer consistent with CERCLA 121(b), 40 C.F.R. § 300.430(e)(2)(i)(B & C), the NCP's 40 C.F.R. § 300.430(a)(1) expectations, and existing EPA guidance on groundwater remedial actions (i.e., Summary of Key Existing EPA CERCLA Policies for Groundwater Restoration, OSWER 9283.1-33, June 26, 2009).

I have determined that it is appropriate to consider the Texas MSC and TRRP PCL groundwater residential cleanup and monitoring standards for perchlorate when selecting a CERCLA remedy, consistent with CERCLA and the NCP. However, at this time, Region 6 has determined that the TRRP PCL cleanup level of 17 ug/L, when evaluated in light of the EPA's Drinking Water Health Advisory Information and the TCEQ model data and information (see attachment 26), will ensure protection of human health. As such, the EPA believes that the TRRP PCL groundwater residential cleanup standards for nickel and manganese are sufficiently protective of human health and the environment at LHAAP-16.

I have considered the EPA health advisory information, TRRP PCL residential groundwater cleanup levels and the September 29, 2011, draft final RODs (i.e., LHAAP-16 and LHAAP-17 operable units) submitted by the Army, which include the remedial action objective to return, wherever practicable, the groundwater to its potential beneficial uses as drinking water. After reviewing this information, I have determined that the TRRP PCL regulations for residential groundwater cleanup include levels for perchlorate, nickel, and manganese that shall be used as cleanup levels at LAHAAP 16 and 17 to ensure protection of human health and the environment. The EPA also finds that the perchlorate concentration level from the TRRP PCL residential groundwater standard shall be attained as the appropriate monitoring/cleanup level in the draft final ROD for the two (2) MMRP operable units (i.e., LHAAP-001-R-01 MMRP, and LHAAP-003-R-01 MMRP), which includes the remedial action objective to confirm that perchlorate levels in the groundwater designated as a potential drinking water source are at levels that are protective of human health. As such, all relevant draft final RODs subject to this dispute resolution proceeding (i.e., LHAAP-16 and LHAAP-17, and two (2) LHAAP MMRP operable units for monitoring only) shall include revisions in accordance with the language quoted below:

<u>For LHAAP-16 and LHAAP-17</u>:

"Per the ROD's RAOs, and consistent with the NCP, groundwater will be returned to its beneficial uses as drinking water. The groundwater cleanup level for perchlorate at the Site is the TRRP PCL residential groundwater cleanup level, 17 ug/L, and is protective of human health and the environment."

For LHAAP-16:

"The TRRP PCL groundwater residential levels are protective of human and the environment for purposes of selecting a protective remedial action for LHAAP-16. Therefore, the groundwater residential cleanup levels are 490 ug/L for nickel and 1,100 ug/L for manganese at LHAAP-16, and such cleanup levels are protective of human health and the environment at LHAAP-16."

For LHAAP-001-R-01 and LHAAP-003-R-01:

"Per the selected remedial action and consistent with the NCP, the groundwater will be monitored to ensure that it can be utilized for its beneficial uses as a drinking water source. The groundwater monitoring level for perchlorate at the Sites is the TRRP PCL residential groundwater cleanup level, 17 ug/L, and is protective of human health and the environment."

LAND USE CONTROLS OBJECTIVES AND DURATION

Consistent with the Section XIX (Selection, Design and Implementation of Remedial Actions) of the FFA, the Army is required to perform tasks, obligations and responsibilities (i.e., remedial action selection, design and implementation tasks) in accordance with the CERCLA, the NCP, 40 C.F.R. Part 300 et seq., and the EPA CERCLA guidance and policy. With respect to remedial action selections, including LUCs, it is clear that consistent with CERCLA Sections 121(a) and (b), and 40 C.F.R. § 300.430(f), there should be written documentation explaining the application of the 40 C.F.R. § 300.430(e)(9)(iii) nine criteria evaluation to such remedial action selections. In addition, the NCP Preamble (at pp. 55 FR 8701 - 8702) makes clear that the nine criteria evaluation under 40 C.F.R. § 300.430(e)(9)(iii), reflects CERCLA 121(b)(1). Consistent with the NCP (e.g., 40 C.F.R. § 300.430(f)(5)), there should be documentation of the remediation objectives and cleanup levels and whether or not hazardous substances, pollutants or contaminants remain at the site.

In light of the above, a discussion concerning remedial action selections and documentation is warranted (for further detail, please refer to the EPA's 1999 ROD guidance). Consistent with CERCLA and the NCP (e.g., 40 CFR 300.430(e)(9)(iii)), the administrative record and decision documents should explain how the remedy selection will meet the threshold criteria (i.e., ensuring the overall protection of human health and the environment, and compliance with ARARs). Generally, overall protection of human health and the environment addresses whether a remedy ensures protectiveness of human health and the environment. As stated in 40 C.F.R. § 300.430(a)(1)(iii)(D), "EPA expects to use institutional controls such as water use and deed restrictions to supplement engineering controls as appropriate for short- and long-term management to prevent or limit exposure to hazardous substances, pollutants, or contaminants." Thus, ICs may be appropriate in combination with the use of treatment and engineered controls to ensure the protection of human health and the environment. The second threshold criterion, compliance with ARARs, generally addresses whether a remedy will meet the applicable or relevant and appropriate requirements. If a selected remedy cannot satisfy this criterion, the administrative record and decision documents must contain data and information demonstrating how a waiver of the ARAR is justified under CERCLA section 121(d) (*See* also, e.g., 40 C.F.R. § 300.430(f)(5)(ii)(C)).

The administrative record and decision documents also should contain data and information showing how the primary balancing criteria (which include long-term effectiveness and permanence; reduction of toxicity, mobility or volume through treatment; short-term effectiveness; implementability; and costs) have been evaluated consistent with the NCP (e.g., 40 CFR 300.430(e)((iii)(9)). In evaluating long-term effectiveness and permanence, factors to consider generally may include expected residual risk, and the ability of a remedy to maintain reliable protection of human health and the environment over time. Evaluating reduction of toxicity, mobility or volume through treatment reflects the statutory preference for selecting, to the maximum extent practicable, remedial actions that utilize permanent solutions, and alternative treatment technologies that permanently and significantly reduce toxicity, mobility or volume of hazardous substances, pollutants or contaminants. This statutory preference for treatment can be satisfied when treatment is used to reduce the principal threats at the site through destruction of toxic contaminants, reduction of the total mass of toxic contaminants, irreversible reduction in contaminant mobility or reduction of total volume of contaminated media. When the preference for treatment to the maximum extent practicable is not met, the reasons need to be explained in the administrative record and decision documents.

Generally, short-term effectiveness evaluates potential risks and impacts to workers, the community and the environment during construction and implementation of the remedy until cleanup levels are achieved. In general, implementability addresses factors such as the technical and administrative feasibility of a remedy from design through construction, including the availability of services and materials needed to implement a particular option, and coordination with other governmental entities. Generally, cost includes estimated capital costs, annual operation and maintenance costs (assuming a 30-year time period), and net present value of capital and operation and maintenance costs, including long-term monitoring.

The administrative record and decision documents also should explain the evaluation of the modifying criteria, which include state and community acceptance. State acceptance generally includes consideration of the state's position (e.g., does supporting agency concur with the selected remedy for the site). Community acceptance generally evaluates the public's views (e.g., community support or opposition) to the remedial alternatives and the preferred alternative presented in the Proposed Plan. consistent with the NCP, the ROD includes a responsiveness summary that summarizes the public comments and the EPA's response to those comments.

In this case, the Army refused to properly select, specify and document LUC objectives and the duration of LUCs in the September 29, 2011, draft final RODs for the four operable units in question. The September 29, 2011, draft final RODs for two operable units (LHAAP-16 and LHAAP-17), failed to identify LUCs objectives needed to protect and preserve the integrity of the groundwater monitoring and remedial systems at these two operable units (LHAAP-16 and LHAAP-17). The Army also failed to include a duration requirement for the missing LUCs objectives in the September 29, 2011, draft final RODs for operable units LHAAP-16 and LHAAP-17. aThe September 29, 2011, draft final ROD for the two military munitions response program operable units (LHAAP-001-R-01 and LHAAP-003-R-01) did not adequately address LUCs objectives, and LUCs duration requirements necessary to guard against construction, development, uses such as schools and day-care, digging and other intrusive activities that could present public/human safety risks due to potential explosive hazards that exists at the two (2) MMRP operable units. The description of the selected remedy section of the September 29, 2011, ROD for the two MMRP operable units did not adequately specify restricted uses and limitations needed to ensure the protection of human health and the environment over time; and it also failed to specify the duration of the LUCs.

Adequately addressing the LUCs objectives and duration is needed to help ensure the long-term effectiveness of a remedial action. As discussed in the NCP preamble (*See* e.g., 55 FR 8720) an analysis of long-term effectiveness includes "consideration of the degree of threat posed by the hazardous substances remaining at the site and the adequacy and reliability of any controls (e.g., engineering or institutional controls) used to manage the hazardous substances remaining at the site. The criterion is founded on CERCLA's mandate to select remedies that are protective of human health and the environment that maintain protection over time." In this case, it is imperative that the groundwater monitoring and remedial systems designed to ensure protectiveness of human health in light of the risks posed by contaminated ground water for operable units LHAAP-16 and LHAAP-17 include controls and restrictions designed to preserve the integrity of such systems that will be relied upon to reduce the contamination and track the movement (i.e., whether the movement shows a decrease or an increase in size of the plumes; to track the vertical and horizontal movements of the plumes) of contaminated groundwater. Such systems are also needed to ensure that protection of human health and the environment is both attained and maintained over time. The groundwater contamination may present risks to at least five known active drinking water wells located near the LHAAP facility; several livestock and domestic wells located near the LHAAP facility; three water supply wells located at the LHAAP facility; and Caddo Lake, a major source of drinking water which bounds the northeastern portion of the LHAAP facility. There are also risks to human health and the environment due to the LHAAP facility's groundwater contamination location within or near the 100-year floodplain of Harrison Bayou, which drains into Caddo Lake. Without groundwater monitoring and remedial systems that can be relied upon for 117 and 280 years respectively (i.e., the estimated time-frame for the contaminated groundwater to attain drinking water standards for the LHAAP-17 and LHAAP-16 plume), the selected remedies may not ensure protection of human health and the environment in the short- or long-term.

The adequacy and reliability of the LUCs at the two MMRP operable units also are needed to ensure the protection of human health and the environment over the long-term. As provided in the Army's September 29, 2011, draft final ROD addressing operable units LHAAP-001-R-01 and LHAAP-003-R-01, it is clear between August and November 2008, the Army collectively located and destroyed over 100 munitions and explosives of concern and materials presenting a potential explosive hazard at these two MMRP operable units. Despite the above non-time critical removal work performed, the Army acknowledged public/human safety risks remained at the two MMRP operable units in light of potential explosive hazards at LHAAP-001-R-01 and LHAAP-003-R-01. Although the risk of public/human exposure or direct contact with MEC and/or MPPEH was reduced, there is the potential that some MEC remains at the operable units.

Consistent with the Army's 2007 engineering evaluation and cost analysis (EE/CA), the Army recognized that LUCs were necessary to ensure protection of human health posed by the potential explosive hazards that exist at the two (2) MMRP operable units. In light of the public/human safety threat identified, it is imperative that the LUCs objectives adequately and specifically identify restricted uses and use limitations, and specify the LUCs duration requirements in the final ROD. Due to the lack of clearly documented and specified LUC objectives and LUC duration requirements addressing use restrictions and limitations such as construction, development, uses such as schools and day-care, digging and other intrusive activities, the selected remedies for LHAAP-001-R-01 and LHAAP-003-R-01 do not ensure protection of human health and the environment over time.

Consistent with the EPA Administrator's July 8, 2010, decision in the FFA dispute with the Army Corps of Engineers concerning the former Naval Ammunition Depot, Hastings, Nebraska (referred to as the Hastings Decision), it is an important part of the site manager's responsibility to ensure that land use controls are implemented, maintained and enforced. EPA Guidance provides that the site manager's responsibilities for institutional controls do not end once the institutional controls are selected. Site managers also should ensure that the ICs are actually implemented, are reliable, are enforced, and remain effective. *See* A Site Manager's Guide to Identifying, Evaluating and Selecting Institutional Controls at Superfund and RCRA Corrective Action Cleanups (the Site Manager's Guide), (OSWER

9355.0-74FS-P, September 2000). It is important to note that the LHAAP operable units in question require special attention and precautions in light of the waste under the landfill cap at LHAAP-16, soil (surface and/or subsurface restricted to nonresidential use) and groundwater contamination that will remain at the operable units for years (i.e., 117 and 280 years of groundwater contamination); public/human safety risks due to potential explosive hazards (i.e., LHAAP-001-R-01 and LHAAP-003-R-01); the proximity to surface waters, including Caddo Lake, a major drinking water source; the location within the 100 year flood-plain; and the location near drinking water wells, livestock and domestic wells, and water supply well located at the LHAAP facility. In addition, all four operable units will leave hazardous substances, pollutants, and contaminants at or above levels that do not support unlimited use and unrestricted exposure, and will require five-year reviews under 40 C.F.R. § 300.430(f)(4).

As such, all relevant draft final RODs subject to this dispute resolution proceeding (i.e., LHAAP-16, LHAAP-17, LHAAP-001-R-01 and LHAAP-003-R-01) shall include LUCs objectives and duration language in accordance with the quoted provisions provided below:

For LHAAP-16:

LUCs. The LUC's objectives include maintaining the integrity of any current or future remedial or monitoring systems and preventing the use of groundwater contaminated above cleanup levels as a potable water source. The groundwater treatment and MNA remedial components include a groundwater monitoring system that will be used to characterize the condition of the groundwater during the period the groundwater remedy is in place until the groundwater remediation goals are achieved, and to demonstrate achievement of the groundwater remediation goals when the groundwater remedy is complete. As a part of this groundwater remedy, the Army will maintain the remedial and monitoring systems associated with the groundwater remedies until these components of the remedy are no longer needed to achieve cleanup levels, and when these levels have been achieved. During the period of operation of the groundwater remedy, if any of the elements of the remedial and groundwater monitoring systems are damaged, destroyed or become ineffective, they will be repaired or replaced with suitable components to ensure that the remedial and groundwater monitoring systems are able to provide data of the quality necessary to determine the progress of and eventual completion of this component of the remedy. The actions to be taken to implement these LUC objectives and requirements will be provided through modifying the "Comprehensive LUC Management Plan, Former Longhorn Army Ammunition Plant, Karnack, Texas" and detailed in the LUC RD.

The LUCs' performance objectives are to prohibit access to the contaminated groundwater except for environmental monitoring and testing only, to preserve the integrity of the landfill cap, to restrict intrusive activities (e.g., digging) that would degrade or alter the cap, to restrict land use to nonresidential, to maintain the integrity of any current or future remedial or monitoring systems and to prevent the use of groundwater contaminated above cleanup levels as a potable water source. The landfill LUCs will remain in place as long as the landfill waste remains at the site or until the levels of Contaminants of Concern (i.e., including all hazardous substances, pollutants, and contaminants found at the Site at cleanup levels as listed in Table 2-7) allow for unlimited use and unrestricted exposure. The LUCs restricting the use of groundwater to environmental monitoring and testing only and the LUC restricting land use to nonresidential will remain in place until the levels of COCs (i.e., including all hazardous substances, pollutants, and contaminants found at the Site at cleanup levels as listed in Table 2-7) in surface and subsurface soil and groundwater allow for unlimited use and unrestricted exposure. The LUC to maintain the integrity of any current or future remedial or monitoring systems will remain in place until groundwater cleanup levels of COCs (i.e., including all hazardous substances, pollutants and contaminants found at the Site at cleanup levels as listed in Table 2-7) are met. The LUC prohibiting groundwater use (except for environmental monitoring and testing) as a potable source will remain in place until the levels of COCs (i.e., all hazardous substances, pollutants, and contaminants found at the Site at cleanup levels as listed in Table 2-7) in soil and groundwater allow for unlimited use and unrestricted exposure."

For LHAAP-17:

LUCs. The LUC objectives include maintaining the integrity of any current or future remedial or monitoring systems and preventing the use of groundwater contaminated above cleanup levels as a potable water source. The groundwater treatment and MNA remedial components include a groundwater monitoring system that will be used to characterize the condition of the groundwater during the period the groundwater remedy is in place until the groundwater remediation goals are achieved, and to demonstrate achievement of the groundwater remediation goals when the groundwater remedy is complete. As a part of this groundwater remedy, the Army will maintain the remedial and monitoring systems associated with the groundwater remedies until these components of the remedy are no longer needed to achieve cleanup levels, and cleanup levels have been achieved. During the period of operation of the groundwater remedy, if any of the elements of the remedial and groundwater monitoring systems are damaged, destroyed or become ineffective, they will be repaired or replaced with suitable components to assure that the remedial and groundwater monitoring systems are able to provide data of the quality necessary to determine the progress of and eventual completion of this component of the remedy. The actions to be taken to implement these LUC objectives and requirements will be provided through modifying the "Comprehensive Land Use Control (LUC) Management Plan, Former Longhorn Army Ammunition Plant, Karnack, Texas" and detailed in the LUC RD.

The LUC for prohibition of groundwater use (except for monitoring and testing) shall be implemented and shall remain in place at the Site until the COCs (i.e., including all hazardous substances, pollutants, and contaminants found at the Site at cleanup levels as listed in ~~Tables~~ 2-10) in soil and groundwater remaining at the site are reduced below levels that would support unlimited use and unrestricted exposure. A LUC RD will be finalized as the land use component of the Remedial Design. Within 21 days of the issuance of the ROD, the Army will propose deadlines for completion of the RD Work Plan, RD and Remedial Action Work Plan. The documents will be prepared and submitted to the EPA and the TCEQ pursuant to the FFA. The LUC RD will contain implementation and maintenance actions, including periodic inspections. The recordation notification for the Site, which will be filed with Harrison County, will include a description of the LUCs. The preliminary boundary for the groundwater LUC is shown on **Figure 2-5**.

The LUC restricting land use to nonresidential shall be implemented until it is demonstrated that surface and subsurface soil and groundwater COCs (i.e., including all hazardous substances, pollutants, and contaminants found at the Site at cleanup levels as listed in ~~Tables~~ 2-10) are at levels that allow for unlimited use and unrestricted exposure.

The LUC to maintain the integrity of any current or future remedial or monitoring systems will remain in place until the levels of COCs (i.e., including all hazardous substances, pollutants, and contaminants found at the Site at cleanup levels as listed in ~~Tables~~ 2-10) in groundwater are met. The LUC to prohibit groundwater use (except for environmental monitoring and testing) as a potable source will remain in place until the levels of COCs (i.e., all hazardous substances, pollutants, and contaminants found at the Site at cleanup levels as listed in Table 2-10) in soil and groundwater allow for unlimited use and unrestricted exposure."

For LHAAP-001-R-01 and LHAAP-003-R-01:

LUCs. LUCs were designed and constructed to promote ongoing protection of human safety against potential explosive hazards that may remain at the MMRP sites. The LUCs' performance objectives are to prohibit the development and use of the property for residential housing, elementary and secondary schools, and child care facilities and playgrounds, and to prohibit intrusive activities such as digging or any other activity which could result in explosive safety risks. The recordation notification for the sites which will be filed with Harrison County will include a description of the LUCs. The boundary of the LUCs encloses the site boundaries shown on **Figures 2-7** and **2-8**. The locations of the signs are also shown on **Figures 2-7** and **2-8**. The details for the LUCs will be included in the RD. The LUC to prohibit residential land use will remain in place until it is demonstrated that the MEC no longer presents a threat to public/human safety. The LUC restricting land use to nonresidential will remain in place until it is demonstrated that the MEC no longer presents a threat to public/human safety. A LUC to prohibit intrusive subsurface activities, including digging, will remain in place until it is demonstrated that the MEC no longer present an explosive hazard. However, intrusive subsurface activities may occur provided that the Army and the EPA approve such intrusive subsurface activities before they are commenced and provided that they are undertaken by qualified personnel who are trained in explosives safety measures."

STIPULATED PENALTIES

This stipulated penalties determination is based upon relevant provisions found in the LHAAP FFA, factual determinations, and precedents cited. The EPA assessed stipulated penalties against the Army by letter dated October 13, 2011. The assessment was made because the Army's September 2011 three draft final RODs failed to comply with CERCLA, the NCP, and the EPA Guidance. The three draft final RODs addressed the four operable units at issue here (i.e., LHAAP-16, LHAAP-17, LHAAP-001-R-01 MMRP, and LHAAP-003-R-01 MMRP). Sections XIX (Selection, Design, and Implementation of Remedial Actions), and IV (Purpose) of the LHAAP FFA require the Army to comply with CERCLA, the NCP, and EPA CERCLA guidance documents when drafting primary documents such as the three draft final RODs for the four operable units. The three draft final RODs submitted by the Army failed to satisfy the LHAAP FFA provisions cited above. EPA assessed stipulated penalties in accordance with Section XXIV.A (Stipulated Penalties) of the FFA because the Army failed to submit the draft final RODs (primary documents) "pursuant to the appropriate timetable or deadline in accordance with the requirements of this Agreement" and the Army failed "to comply with a term or condition of this Agreement which relates to an operable unit or final remedial action."

The EPA's October 13, 2011, notice of violation and penalty assessment letter assessed penalties of $5,000 for the first week, which in this case started the first week following September 30, 2011, for each of the four operable units in question, and $10,000 per operable unit for each additional week (or part thereof) until all the failures for the operable units in question are resolved, consistent with the FFA. As evidenced by the EPA letter dated February 15, 2012, the EPA stayed the running of stipulated penalties from November 30, 2011, through February 23, 2012.

In the October 13, 2011, notice of violation and penalty assessment letter, the EPA assessed stipulated penalties on an operable unit basis for each of the four operable units affected by the Army's three draft final RODs. The Army submitted three draft final RODs: one each for LHAAP-16 and LHAAP-17, on September 29, 2011, and a single one for LHAAP-001-R-01 MMRP and LHAAP-003-R-01 MMRP, on September 27, 2011. The EPA could have assessed the penalties on a per violation basis, which may have led to a higher penalty, or on a per ROD basis, which could have led to a lower penalty. The LHAAP FFA does not limit the EPA's discretion regarding assessing the penalty on a per violation, per ROD or per operable unit basis. There are two important consequences of assessing the penalties on a per operable unit or per ROD basis. First, a penalty for an operable unit or ROD is sustainable so long as at least one failure alleged by the EPA for that operable unit or ROD is found to have occurred. This means it is not necessary to find that all failures alleged by the EPA occurred for an operable unit or ROD to sustain the total penalty amount. Second, the penalty for an operable unit or ROD will continue to accrue until the Army corrects all failures for that operable unit or ROD.

Section XXIV.B of the LHAAP FFA gives the Army an opportunity to show that the failure did not occur and that it would not be responsible for paying the stipulated penalties. The Army has not demonstrated during this dispute that all failures alleged by the EPA did not occur. Rather, the Army argued in its November 4, 2011, letter to the EPA that there was no basis for the assessment of stipulated penalties because it submitted the required primary documents in a timely fashion and therefore, stipulated penalties may not be assessed. However, as provided in the FFA, stipulated penalties are not limited merely to late submissions. Each of the eight issues specified in the EPA's October 27, 2011, letter to the Army alleged a failure by the Army to comply with CERCLA, the NCP, or the EPA guidance for the selection, design and implementation of remedial actions as required by Sections IV (Purpose) and Section XIX (Selection, Design, and Implementation of Remedial Actions) of the LHAAP FFA. CERCLA Section 120(a)(2) also provides that the Army shall comply with CERCLA, the NCP and guidelines and criteria applicable to remedial actions, and prohibits the Army from using any guidelines or criteria that are inconsistent with the EPA's. Pursuant to Section XXIV.B (Stipulated Penalties) of the FFA, and the EPA Administrator's June 12, 2008, Final Decision in the FFA dispute with the Navy at Brunswick Naval Air Station, the sole issue here is whether the failures "did in fact occur."

Under the first basis for a stipulated penalty, the Army's failure to submit the draft final RODs "pursuant to the appropriate timetable or deadline in accordance with the requirements of this Agreement," the EPA may assess a penalty if the primary document is late or if it fails to comply with CERCLA, the NCP or applicable the EPA guidance. The ability to obtain a stipulated penalty for the failure of a primary document to comply with CERCLA, the NCP or the EPA guidance was confirmed in the EPA Position issued by the EPA Region 10 Regional Administrator in the FFA dispute with the Navy at the Jackson Park Housing Complex (Jackson Park), on October 7, 2009. Because the Navy did not elevate that EPA Position to the EPA Administrator, the EPA Position became the final resolution of that dispute. The rationale in the Jackson Park EPA Position applies to the penalties assessed here because the October 13, 2011, penalty assessment letter cited both bases for a penalty (draft final primary document that fails to comply with the requirements of the FFA, and a failure related to an operable unit or remedial action) to support the stipulated penalty, including the first basis that was at issue in the Jackson Park dispute. It also is consistent with the EPA and Department of Energy (DOE) 1991 resolution of the same issue in the Fernald FFA dispute, where, after the dispute was elevated to the EPA Administrator, the parties agreed that the failure of a draft final primary document to comply with CERCLA, the NCP or the EPA guidance was subject to a stipulated penalty. The FFA at issue at Fernald had substantially the same FFA stipulated penalties provision as in the Longhorn FFA, both of which are based upon model language agreed to by the EPA, the Department of Defense and the DOE. It would be inappropriate to interpret the language one way for the DOE and another for the Army.

The second basis for the stipulated penalty, the Army's failure "to comply with a term or condition of this Agreement which relates to an operable unit or final remedial action," also hinges on whether the Army's three draft final RODs for the four operable units complied with CERCLA, the NCP and the

EPA guidance. Each of the eight issues relates to an operable unit and a draft final ROD. Consequently, the analysis for each of the eight underlying violations will be the same for both bases for the penalty: whether the Army's draft final RODs failed to comply with CERCLA, the NCP or the EPA guidance. The Army's October 27, 2011, letter did not address the second basis for the penalty assessment.

The Army, in a March 30, 2012, letter on the Longhorn stipulated penalties wrote, "This attempted use of stipulated penalties for disagreement on text is not provided in Section XXIV of the FFA, and is fundamentally inconsistent with Federal policy favoring good faith cooperative dispute resolution. *See* OMB/CEQ Memorandum on Environmental Conflict Resolution, dated Nov. 28, 2005, (currently in the process of reissuance)." CERCLA 120(e)(4)(A) gives the EPA joint remedy selection authority, with sole remedy selection authority in case of a disagreement. Consequently, the EPA views this dispute as far more than a "disagreement on text" because the language memorialized in the RODs ultimately affects whether the remedy will be protective. As for the OMB/CEQ Memorandum, it encourages the use of Environmental Conflict Resolution (Alternative Dispute Resolution using a third-party neutral) by federal agencies to resolve "environmental, public lands, or natural resource issues or conflicts" for disputes with outside parties and interagency disputes. It does not mandate the use of Environmental Conflict Resolution. Here, the parties have mutually agreed on how disputes will be resolved in section XV of the FFA, including the agreement in section XV.K that the resolution of a dispute under these procedures will be final and all parties will abide by it. The use of the voluntary Environmental Conflict Resolution process is inconsistent with the FFA dispute resolution process and is not a prerequisite to the assessment of stipulated penalties under the FFA.

Having explained why the EPA may assess stipulated penalties for the failure of the three draft final RODs to comply with CERCLA, the NCP or the EPA guidance, I now analyze whether there was such a failure for each Dispute Issue.

Dispute Issue One: Groundwater Cleanup Standards at LHAAP-16 and LHAAP-17; Groundwater Monitoring Standards at LHAAP-001-R-01 MMRP and LHAAP-003-R-01 MMRP

The Army's draft final RODs did not conform to CERCLA, the NCP and the EPA guidance because they inappropriately relied on the Texas industrial/non-residential use drinking water standards to select groundwater cleanup and monitoring levels. As explained above in "Groundwater Cleanup Standards," the Army's use of the Texas MSC industrial/non-residential drinking water standard is inconsistent with the protectiveness standards for remedies in CERCLA, the NCP and the EPA guidance because the groundwater at Longhorn AAP is a potential drinking water source, and land use restrictions and limitations should not be a basis to establish cleanup standards for potential drinking water sources. *See* Summary of Key Existing EPA CERCLA Policies for Groundwater Restoration, OSWER Directive 9283.1-33 (June 2009) at page 7. In addition, restoration of contaminated groundwater to drinking water quality is consistent with CERCLA 121(b) and the NCP at sections 300.430(a)(1) and 300.430(e)(2)(i)(B) and (C). This penalty is sustained based upon the inappropriate industrial/non-residential groundwater standards used by the Army in its three draft final RODs. The June 2012 revisions to the Texas PCLs do not change the outcome for the penalty for the Army's use of the inappropriate industrial/non-residential groundwater standards because the failure that justifies the penalty was complete when the Army submitted the draft final RODs, and the revised industrial/non-residential PCLs would not be appropriate for groundwater at the Site, which is a potential source of drinking water.

The Army's failure to comply with the above CERCLA and NCP requirements and to conform to the EPA guidance in the three draft final RODs support the entire stipulated penalty assessed for the four operable units.

Dispute Issues Two and Three: Land Use Control Objectives and Their Duration

The EPA assessed stipulated penalties in part because the September 29, 2011, draft final ROD for LHAAP-16 did not have LUC objectives to protect and maintain the integrity of the groundwater monitoring system and remedial system, and lacking those objectives, it also did not have the duration for the LUC objectives. The Army did include a LUC objective for maintaining the integrity of the landfill cap in the September 29, 2011, draft final ROD for LHAAP-16. The Army also did not include a LUC objective to protect and maintain groundwater monitoring systems and remedial systems in the September 29, 2011, draft final ROD for LHAAP-17. As such, the Army's draft final RODs did not have a duration for the missing LUCs objectives. In addition, the September 29, 2011, draft final RODs for the two MMRP operable units (LHAAP-001-R-01 MMRP and LHAAP-003-R-01 MMRP) did not adequately address LUC objectives or duration of LUCs necessary to protect against construction, development, digging and other intrusive activities that could present public/human safety risks due to explosive hazards at the Sites.

The Army's failure to include and adequately address the LUC objectives and LUCs duration in its three draft final RODs for all four operable units, support the assessment of a stipulated penalty for the reasons explained above in "Land Use Controls and Duration."

Dispute Issue Four: Remedial Action Selection Authority and LUCs Modification

The EPA assessed a stipulated penalty because language in the Army's three draft final RODs for the four operable units provided that the Army could change, modify or terminate a LUC without recognizing the EPA's and the TCEQ's role under the LHAAP FFA, CERCLA and the NCP. These provisions in the draft final RODs were inconsistent with Section 120(e)(4)(A) of CERCLA, which provides that the EPA and the other federal agency (i.e., the Army) jointly select a remedy at federal facility sites on the National Priorities List, and that the EPA alone selects the remedy if the parties cannot reach agreement. The NCP at 40 C.F.R. § 300.430(f)(4)(iii)(B), also reflects the EPA's ultimate remedy selection authority where there is a dispute ("if mutual agreement on the remedy is not reached, selection is of the remedy is made by EPA"). CERCLA Section 120(g) prohibits the transfer of any authority granted to the Administrator under Section 120 to any person outside of the EPA. The EPA's remedy selection authority at federal facility NPL sites would be eviscerated if other agencies could modify the selected remedy (including changing, modifying or terminating a LUC that is part of the selected remedy) without the EPA's approval.

The LUC modification provisions in the three draft final RODs also were inconsistent with the Longhorn FFA. The CERCLA Section 120(e)(4)(A) statutory requirement for remedy selection is incorporated into Section XIX of the FFA (Selection, Design and Implementation of Remedial Actions). This section of LHAAP FFA in part provides, "the ROD will be finalized jointly by the Army and EPA, or if they are unable to reach an agreement about the selection of the remedial action, by the EPA Administrator." Furthermore, Section VIII (Subsequent Modification of Final Reports) of the FFA governs the process the parties (i.e., the Army, the EPA and the TCEQ) have agreed to with respect to modification of a final primary report, and RODs are final primary reports. If the parties do not agree on the modification to a ROD, which would include a change, modification or termination of a LUC, the issue will be subject to dispute under Section XV (Dispute Resolution) of the FFA, which imparts the ultimate decision-making authority to the EPA Administrator.

The Army's LUC modification provisions in the draft final RODs were inconsistent with CERCLA, the NCP and the LHAAP FFA, and thus failed to comply with the LHAAP FFA. Consequently, the stipulated penalty is sustained on this basis.

Dispute Issue Five: Leak Detection and Leachate Collection as ARARs for the LHAAP-16 Landfill

Issue five involved the identification of ARARs for the landfill at the LHAAP-16 operable unit, including whether the RCRA post-closure requirements for leak detection systems and leachate collection systems (40 C.F.R. §§ 264.228(b)(2) and (3); 264.310(b)(2) and (3)) were ARARs. During the course of DRC and SEC deliberations, the EPA believes the parties reached unanimous agreement that these provisions were not ARARs for the LHAAP-16 ROD.

Because the EPA assessed penalties on a per operable unit basis rather than a per violation basis, and there are failures identified in other issues that support a stipulated penalty for LHAAP-16, it is not necessary to determine whether Dispute Issue five was a failure that independently would support a stipulated penalty.

Dispute Issue Six: LUCs Administrative Mechanism and Site Property Transfer

Issue six involved the failure of the Army's three draft final RODs for the four LHAAP operable units to identify the mechanisms that would be used to implement the RODs' LUC objectives. The draft final RODs did not identify how the Army would implement the LUC objectives while it owned the property, what actions the Army would take to ensure that transferees knew the LUC objectives and who was responsible for continued compliance with the LUCs following transfer.

The LUCs are an essential part of the remedy. They contribute to its overall protectiveness and long-term effectiveness. In addition, the NCP at 40 C.F.R. § 300.430(f)(5)(ii)(A), requires the ROD to document how the selected remedy is "protective of human health and the environment, explaining how the remedy eliminates, reduces, or controls exposures to human and environmental receptors." The ROD must document that these exposures will be controlled over time. The Army's draft final RODs failed to include how the LUCs would be implemented, both before and after transfer of the Site property. Specifically, the three draft final RODs failed to document that the Army would notify the state and local government, and an expected new owner of part of LHAAP of the contamination at the Army property and the associated LUCs. In addition, the expected new owner will likely have responsibilities for maintaining, or at a minimum not interfering with, the integrity of the LUCs over time. The Army did not address what would happen to the LUCs post-transfer. In order for the RODs to control exposures over time, they must document who is responsible for ensuring the controls' viability over time. Finally, as stated in the October 2003 "Principles and Procedures for Specifying, Monitoring, and Enforcement of Land Use Controls and Other Post-ROD Actions," referred to herein as the "Navy Principles" (which the Army also agreed to), the ROD at transferring properties will need to be crafted based on the responsibilities of the new owner, and the ROD should identify the entities responsible for implementing, monitoring and reporting on and enforcing the LUCs.

The draft final RODs also omitted the identification of the enforceable document designed to foster execution of the LUC objectives. Such omission is also inconsistent with the EPA guidance, including the March 17, 2008, OSWER Directive No. *9208.2* "'Enforcement First' to Ensure Effective Institutional Controls at Superfund Sites" and "Institutional Controls, A Guide to Planning, Implementing, Maintaining, and Enforcing Institutional Controls at Contaminated Sites" (Interim Final, November 2010). The "Enforcement First" guidance stressed the importance of ensuring the implementation and maintenance of ICs through the consent decree, making the ICs enforceable by the EPA. The omission of how the Army would implement and enforce the LUC objectives also was inconsistent with CERCLA Guidance (Institutional Controls: A Site Manager's Guide to Identifying, Evaluating and Selecting Institutional Controls at Superfund and RCRA Corrective Action Cleanups, OSWER 9355.0-74fs-p (September 2000) at pp. 5-6), which stresses the importance of identifying the mechanism that will be used to implement a LUC objective, and who will be responsible for LUCs implementation as described under CERCLA's nine-part selected remedial action analysis. It also directs the site manager to "discuss the enforcement mechanisms that are anticipated to ensure the long-term reliability of the ICs." *See* "Checklist of Implementing ICs" which is attached to the end of the Site Manager's Guide. The omission is also inconsistent with the Navy Principles: "Likewise a LUC Remedial Design (RD) or Remedial Action Work Plan (RAWP) describes those actions that are needed to ensure viability of both long-term engineered and institutional control remedies." The Navy Principles state that the LUC implementation actions will be included in either the RD or the RAWP which are enforceable documents in standard FFAs. The Army's proposal was that these actions would be included in a document that was not enforceable under the terms of the FFA. The Army's failure to comply with the NCP, and the EPA Guidance noted herein violate the LHHAP FFA's requirements at Sections IV (Purpose) and Section XIX (Selection, Design, and Implementation of Remedial Actions), mandating compliance with the NCP and the EPA guidance with respect to the selection, design and implementation of remedial actions. The Army's failure to include in its three draft final RODs for the four LHAAP operable units a description of the mechanisms to implement the LUC objectives and related LUC notice and responsibility provisions before and after transfer, support the assessment of a stipulated penalty for Dispute Issue six.

Dispute Issue Seven: Enforceable Plan for LUC Objectives for Munitions and Explosives of Concern

Issue seven involved the Army's failure to include an enforceable plan to implement LUC objectives related to munitions and explosives of concern in the draft final ROD for the two military munitions related operable units, LHAAP-001-R-01-MMRP and LHAAP-003-R-01 MMRP. The draft final ROD included a reference to a removal action workplan for LUC implementation, and the referenced workplan is not identified as an enforceable primary report document subject to dispute resolution under the LHAAP FFA. The LUCs are an essential part of the selected remedy, and selected remedial actions must be developed and designed from implementation through construction consistent with the remedial design provisions found at 40 C.F.R. § 300.435(a) and (b). The LUCs contribute to the selected remedial actions overall protectiveness and long-term effectiveness. The Army's failure to identify and include an enforceable LUCs remedial design plan to implement the MEC-related LUCs failed to comply with the FFA and supports the penalty for Dispute Issue seven for the reasons explained above for Dispute Issue six.

The draft final ROD also failed to document how the Army would implement in accordance with 40 C.F.R. § 300.430(f)(5) and enforce the LUCs component of the selected remedial action, and coordinate with other agencies under 40 C.F.R. § 300.430(f)(5). The removal action LUC's workplan specified in the Army's final draft ROD is not identified as a viable plan for use under the LHAAP FFA, and is inconsistent with the remedial design requirements at 40 C.F.R. § 300.435(a). As stated above, the omission of how the Army would implement the LUC objectives also was inconsistent with CERCLA Guidance (Institutional Controls: A Site Manager's Guide to Identifying, Evaluating and Selecting Institutional Controls at Superfund and RCRA Corrective Action Cleanups, OSWER 9355.0-74fs-p (September 2000) at pp. 5-6), which stresses the importance of identifying the mechanism that will be used to implement a LUC objective, and who will be responsible for LUCs implementation as described under CERCLA's nine-part selected remedial action analysis. The Army's failure to include in its draft final ROD for LHAAP-001-R-01-MMRP and LHAAP-003-R-01-MMRP, a description of an enforceable plan to implement the MEC-related LUC objectives, and how it would be implemented and coordinated with other agencies, violates the LHHAP FFA's requirements at Sections IV (Purpose) and Section XIX (Selection, Design, and Implementation of Remedial Actions), mandating compliance with CERCLA, the NCP, and the CERCLA guidance with respect to the selection, design and implementation of remedial actions. This failure supports the assessment of a stipulated penalty for Dispute Issue seven.

Dispute Issue Eight: Identification of Principal Threat Wastes for Munitions and Explosives of Concern

Issue eight involved the failure to adequately address MEC principal threat wastes in the Army's draft final ROD for the two military munitions related operable units, LHAAP-001-R-01-MMRP and LHAAP-003-R-01 MMRP. In general, a principal threat waste is one that may pose risks to human health or the environment due, among other things, to its toxicity or mobility. Consistent with 40 C.F.R. § 300.430(a)(1)(iii)(A), there should have been an analysis of treatment options for the principal threat wastes at a site, reflecting CERCLA Section 121(b)'s preference for treatment. CERCLA guidance (A Guide to Principal Threat and Low Level Threat Wastes, OSWER 9380.3-06FS (November 1991), provides information concerning the identification and documentation of principal threat wastes.

The Army's draft final ROD for the two MMRP operable units provided, in part, "[t]here are no known principal threat wastes at these two MRS sites." The EPA was concerned about the statement's potential to mistakenly create the impression that there were no principal threat wastes at the operable units, when there were no data or information in the administrative record to show or support a comprehensive investigation or evaluation specifically developed, designed and conducted to support such a position. During the SEC deliberations, the parties agreed to replace the Army's statement with, "[t]here are currently no known principal threat wastes at these two MRS sites (LHAAP-001-R-01 MMRP and LHAAP-003-R-01 MMRP)."

Because the EPA assessed penalties on a per operable unit basis rather than a per violation basis, and there are failures identified in other issues that support a stipulated penalty for the draft final ROD for the two MMRP operable units, it is not necessary to determine whether Dispute Issue eight was a failure that independently would support a stipulated penalty.

STIPULATED PENALTIES CONCLUSION

Stipulated penalties are sustained for Dispute Issues one (Groundwater Cleanup and Monitoring Standards), two and three (Land Use Control Objectives and Their Duration), four (Remedial Action Selection Authority and LUCs Modification), six (LUCs Administrative Mechanism and Site Property Transfer), and seven (Enforceable Plan for LUC Objectives for Munitions and Explosives of Concern). As noted above, the EPA assessed penalties on a per operable unit basis for the four OUs, and a penalty will be sustained so long as at least one failure is sustained for an OU. In addition, penalties will continue to accrue at $10,000 per week per OU, or $40,000 per week, until all failures for the OUs are corrected. The Army has not corrected the failures for any of the issues, so penalties have continued to accrue, except for the 11 week period when EPA temporarily stayed the accrual of penalties. Thus, the penalties due as of December 10, 2012, were $2,020,000, and could continue to accrue at $40,000 per week until the failures were corrected.

Former EPA Administrator Johnson, in his 2008 decision in the FFA dispute on stipulated penalties at the Brunswick, Maine, Naval Air Station, explained that because the sole issue in a formal FFA dispute over stipulated penalties is whether the alleged failure occurred, the EPA will not bargain with the other agency over the amount of the penalty during the formal FFA dispute resolution process. However, under the EPA guidance, the EPA always has the authority to unilaterally reduce a stipulated penalty it has assessed. *See, e.g., Guidance on the Use of Stipulated Penalties in Hazardous Waste Consent Decrees,* Thomas L. Adams, Assistant Administrator, Office of Enforcement and Compliance Monitoring (Sept. 21, 1987) at five. This authority was the basis for the earlier 11 week stay of the accrual of penalties.

As a matter of unilateral EPA enforcement discretion, I have determined that stopping the accrual of penalties as of September 28, 2012, the date of the last written communication among the SEC, is warranted for this particular dispute. At that point, the issuance of this EPA Position was solely under the control of the EPA, and the resolution of the many complex issues in this dispute has caused the EPA to take much longer than usual to issue the EPA Position. In addition, although the EPA had the discretion to assess the penalties on a per OU basis, I find that it is appropriate to sustain the penalties on a per ROD basis because the dispute involved failures by the Army to comply with the FFA in each of the three draft final RODs. Therefore, the total penalty will be $1,185,000, calculated as follows:

	Start Date	**End Date**	**$/ROD/week**	**RODs**	**Weeks**	**Total as of End Date**
Assessed	Sept. 30, 2011	Oct. 7, 2011	$5,000	3	1	$15,000
Rate >	Oct. 7, 2011	Nov. 30, 2011	$10,000	3	8	$255,000
Stayed	Nov. 30, 2011	Feb. 23, 2012	$0	3	11	$255,000
Restarted	Feb. 23, 2012	Sept. 28, 2012	$10,000	3	31	$1,185,000

DECISION

The above determinations represent the EPA Position concerning the disputed matters addressed herein, including the assessment of stipulated penalties. The determinations were made upon careful review and consideration of all the materials listed/indexed with this decision, as well as CERCLA, the NCP, and standards provided in the LHAAP FFA. In light of the SEC oral agreements and this EPA Position, all RODs subject to this dispute will include the required language modifications as specified herein for issues 1, 2, 3, 4, 5, 6, 7, and 8, in accordance with the LHAAP FFA. Language inconsistent with the SEC oral agreements and the EPA Position shall not be incorporated in the final RODs subject to this dispute. This decision also requires payment of the stipulated penalty amount assessed herein unless the issue is elevated to the next level. The EPA Position will constitute the final decision of the EPA, unless the disputed matters, including stipulated penalties, are elevated to the EPA Administrator within 14 days of its issuance. Should this EPA Position become the final decision of the EPA, it shall be implemented and complied with in accordance with the terms of the LHAAP FFA.

So rendered on: 04/5/2013
By:
Ron Curry
Regional Administrator

Enclosure

TABLE OF LISTED/INDEXED MATERIALS CONSIDERED

1. Longhorn FFA (1991)
2. Army's September 30, 2011, Draft Final RODs
3. EPA's October 13, 2011, Notice of Violation and Stipulated Penalty Assessment
4. Army's October 27, 2011, Response to EPA's Notice of Violation and Stipulated Penalty Assessment
5. EPA's October 27, 2011, Written Statement of Dispute
6. November 17, 2011, Army Response to the EPA's October 27, 2011, Written Statement of Dispute and Submission of Revised Draft Final RODs
7. 2009 Summary of Key Existing EPA CERCLA Policies for Groundwater Restoration
8. Revised Assessment Guidance for Perchlorate
9. Clarification of the Role of Applicable, or Relevant and Appropriate Requirements in Establishing Preliminary Remediation Goals under CERCLA
10. January 2004 Drinking Water Health Advisory for Manganese
11. April 2012 Edition of Drinking Water Standards and Health Advisories
12. EPA Administrator's July 8, 2010, Final Decision, former Naval Ammunition Depot, Hastings, Nebraska
13. Institutional Controls: A Site Manager's Guide to Identifying, Evaluating and Selecting Institutional Controls at Superfund and RCRA Corrective Action Cleanups
14. Army's November 4, 2011, letter to EPA Requesting Penalty Withdrawal
15. EPA Administrator's June 12, 2008, Final Decision, Brunswick Naval Air Station
16. EPA Region 10 Regional Administrator October 7, 2009, Written Position, Navy Jackson Park Housing Complex
17. EPA's February 15, 2012, letter from EPA to the DRC concerning Penalties and Written Agreements
18. Army's February 16, 2012, email to EPA Requesting Penalty Withdrawal
19. EPA's March 12, 2012, letter to Army concerning Penalties
20. Army's March 30, 2012, letter Requesting Referral of the Penalty Dispute to the SEC and Penalty Withdrawal
21. EPA's April 5, 2012, letter Requesting Referral of the Dispute to the SEC and Penalty Justification
22. September 28, 2012, Revised Draft Final RODs for LHAAP Operable Units (Site 16, Site 17, LHAAP-001-R-01 MMRP and LHAAP-003-R-01 MMRP)
23. March 17, 2008 OSWER Directive No. *9208.2*, Enforcement First to Ensure Effective Institutional Controls at Superfund Sites
24. Institutional Controls, A Guide to Planning, Implementing, Maintaining, and Enforcing Institutional Controls at Contaminated Sites (Interim Final, November 2010)
25. October 2, 2003 U.S. Navy Principles and Procedures for Specifying, Monitoring, and Enforcement of Land Use Controls and Other Post-ROD Actions
26. Figure: 30 TAC §350.74(a): Risk-Based Exposure Limit Equations and Default Exposure Factors for Residents

Subject:	**Final Minutes, Monthly Managers' Meeting,** **Longhorn Army Ammunition Plant (LHAAP)**
Location of Meeting:	**LHAAP Army Trailer and Teleconference – 866-203-6896, passcode 1759304791**
Date of Meeting:	**November 20, 2014 – 10:00 AM**

Attendees:

Army BRAC:	Rose Zeiler
EPA:	Rich Mayer, Steve Tzhone, Kent Becher (USGS Liaison)
TCEQ:	April Palmie, Dale Vodak (by phone)
USACE:	Aaron Williams, Rick Smith
AECOM:	Dave Wacker, Gretchen McDonnell, Josh Miller (by phone)
AEC:	Robin Paul
USFWS:	Paul Bruckwicki

Welcome **AECOM**

Action Items

AECOM

- Review as-builts of the LHAAP-29 area available from USFWS attempt to find conduit to explain locations of contamination identified. **Pending.**
- Examine the level of effort required to develop a comprehensive geospatial database of all information for LHAAP (lab data, boring logs, well construction reports, etc.) that will make review easier. **Pending.**
- Develop revised 1,4-dioxane sampling memo and sampling plan for next event. **Pending.**
- Provide results from groundwater split sampling event with EPA sampling, to include 1,4-dioxane results. **Pending.**
- Provide the current 2007 GWTP sampling plan, including any modifications, to the participants. **Pending.**
- Develop with Army the path forward for submitting proposed changes to GWTP sampling requirements. **Pending.** Contingent on evaluation of the current 2007 GWTP sampling plan and subsequent modifications identified.
- Provide new master groundwater sampling plan. **Complete.**

Army

EPA

- Identify the path forward required for review/signature of Action Memorandums to provide appropriate agency concurrence for implementation of groundwater remedies in the absence of signed RODs, such as LHAAP-16 and LHAAP-47. Mr. Tzhone stated that there will be no concurrence from EPA on actions conducted in absence of a signed ROD because the EPA Administrator's decision on the dispute has now been rendered.
- Develop/coordinate with Army on a schedule for surface water drainage sampling. **Remove per Mr. Mayer.** Action may be reinstated depending upon the results of Army surface water sampling.
- Provide results from 1,4-dioxane sampling. **Pending.**
- Review GWTP Nutrient Analysis Memorandum. **Complete.**

TCEQ

- Identify the path forward required for review/signature of Action Memorandums to provide appropriate agency concurrence for implementation of groundwater remedies in the absence of signed RODs, such as LHAAP-16 and LHAAP-47. **Remove.** Mr. Tzhone stated earlier in the meeting that there will be no concurrence from EPA on such actions because the EPA Administrator's decision on the dispute has now been rendered; therefore, there is no need for TCEQ to identify a path to concurrence.
- Submit request to AEC for injection volumes for each individual point from LHAAP-37 Bioplug Study. **Complete.**
- Review GWTP Nutrient Analysis Memorandum. **Complete.**

AEC

USFWS

Defense Environmental Restoration Program (DERP) PBR Update **AECOM**

- Upcoming document submissions to regulators (see Document and Issue Tracking table)

Item 1 (GWTP Quarterly Report) – 2nd Quarter 2014 report is planned for submittal to agencies by the end of the month.

Item 2 (LHAAP-18/24 Revised FS) – Schedule extension to January 31, 2015 will be formally requested by Army. EPA (Mr. Tzhone and Mr. Mayer) concurred with this extension, acknowledging that the goal is for the FS to be done right.

Preface/Notes Relating to RACR/LUC/RAO Documents: Dr. Zeiler prefaced discussion on the RACR, LUC and RAO documents by saying that is has become clear to Army that the way we have been proceeding on the RACRs has been very confusing; very difficult to track comments given that the LUC concurrence process is also generating comments for incorporation in the RACRs. Mr. Wacker commented that the problem is largely caused by the fact that we decided nine months ago to hold back the RACR documents until final delineation information was added, but moved ahead with RAO.

Ms. Palmie asked if there was a way to coordinate timing of document submittals so that the RACRs and 1st annual RAO reports were received for review at the same time, to facilitate review. Dr. Zeiler and Ms. Paul responded that the FFA parties would have to agree to such adjustments to the schedule. Although the RACRs and RAO reports are not primary documents, Dr. Zeiler stated that it would be wise to evaluate such schedule changes in the context of the FFA. Ms. Palmie stated that she has observed that responses to comments on RACRs or LUC document submittals cite data that would be part of the RAO, but the agencies do not yet have the RAO to reference. Dr. Zeiler asked if the need is just for the data, even if the RAO is not yet complete. Mr. Wacker replied that the data is already being supplied (prior to inclusion in a report) via monthly data validation reports.

The group agreed that future documents submitted for review should provide references to where the relevant data can be found (i.e., which monthly data validation package(s) contained the relevant data). Mr. Wacker advised that only covers data, not items like well screen intervals. Dr. Zeiler stated that the remedial designs typically have well construction information and Army will point out the documents where this information can be found when submitting future documents for review.

Item 3 (LHAAP-37 RACR) – The Draft RACR was submitted for agency comment on 11/18/14. Comment response due from agencies 12/18/14. The proposed LUC boundary shown in this document will be revised to avoid overlap with the known extent of the LHAAP-47 plume.

Item 4 (LHAAP-37 LUC) – Proposed LUC boundaries have been transmitted for agency concurrence; however, the southeast corner of the proposed footprint will be revised to avoid overlap with the known extent of the LHAAP-47 plume.

Item 5 (LHAAP-46 RACR) – The Draft RACR was submitted for agency comment on 11/18/14. Comment response due from agencies 12/18/14.

Item 6 (LHAAP-46 LUC) – Army has signed the recordation documents, which will be filed with Harrison County.

Item 7 (LHAAP-50 RACR) – Agencies will likely see this near the end of January. An additional appendix is being added to provide more robust information on the surface water sampling rationale for GPW-1 and GPW-1A, which is designed to monitor the effectiveness of the excavation remedy for perchlorate-impacted surface soils.

Item 8 (LHAAP-50 LUC) - Proposed LUC boundaries have been transmitted for agency concurrence. TCEQ has requested additional supporting documentation (additional well data and screened intervals of the wells).

Item 9 (LHAAP-58 RACR) – Plume configuration is being adjusted in response to agency comments. RTCs and redline draft document will be provided upon finalization of those figure adjustments.

Item 10 (LHAAP-58 LUC) – Plume configuration is being adjusted in response to agency comments. Revised figures will be provided for agency concurrence.

Item 11 (LHAAP-67 RACR) – Both agencies have commented on the draft RACR. TCEQ comments have been resolved. EPA comments were responded to, with failure to achieve concurrence on some comments. In particular, EPA has commented that another plume well should be installed and monitored for MNA in the western portion of the plume. Three source area wells currently are in place at LHAAP-67 but a well in the western portion of the plume is not being monitored for MNA. Dr. Zeiler stated there are no differences (analyte suites, lithology, aquifer characteristics) between the location where EPA has asked for an additional MNA monitoring well and the areas currently monitored for MNA.

Ms. Palmie asked if this was an issue of a LUC boundary not being monitored. Mr. Wacker replied that the plume is encircled with well and all LUC boundaries are monitored, but that EPA is looking for an additional MNA monitoring well within ~70 feet from one of three other existing monitoring wells in the heart of the plume monitoring wells. Ms. Palmie stated that the presence or absence of MNA must be demonstrated at MNA sites. Mr. Wacker responded, stating there is 20 years of monitoring data supporting a downward trend in contaminant concentrations at the site, leaving us with a current situation were there is very little TCE even left in the plume; it has largely been degraded to daughter products.

Dr. Zeiler noted that the location where EPA wants additional MNA monitoring is no different hydrologically, lithologically or with respect to the suite/concentrations of contaminants than that being monitored by three other plume monitoring wells that satisfy the requirement for a minimum number of plume monitoring wells. She further stated that Army would be willing to sample groundwater in this area at “Remediation Complete” if needed to confirm that area of the plume has been remediated, but not at this time (in the middle of the RAO), and not for MNA monitoring. Mr. Mayer stated that confirming remediation of that part of the plume was the reason for this comment that an additional well was needed in the western portion of the plume. Mr. Wacker said that a additional discussion was appropriate as to whether additional groundwater monitoring would be required to confirm in the western portion of the plume, as the plume is so small that it likely does not warrant additional monitoring to establish complete remediation.

Dr. Zeiler summarized that we have the plume delineated, we have wells in place to establish the LUC boundary and monitor the site through the remedial action; therefore, the expenditure for an additional well is not a responsible use of taxpayer funds at this time. Mr. Mayer asked if Army was saying that the western portion of the plume would respond similarly to MNA as the areas of the plume that are being monitored. Dr. Zeiler stated that we can say with confidence, knowing the contaminant suite and the hydrogeology of the western plume area are similar to the heart of the plume, then the western area will behave in a similar manner to the heart of the plume, which is monitored for MNA by three wells that already have trends demonstrating MNA. Mr. Tzhone asked, if Army was willing to monitor groundwater at that location in the future, why the well could not just be installed now instead of later. Dr. Zeiler responded that Army agrees at some point perhaps 30 years from now response complete will have to be demonstrated in that portion of the plume, but there is cost to install and monitor an additional well and for what real purpose? If the new well would be in similar lithology and with a similar contaminant suite as an existing well, it is repetitive and there is no point to abandoning the well currently in place in favor of installing another in the western portion of the plume.

Mr. Mayer stated that he would review the comments and documentation again, and consult with others at EPA to determine whether EPA will sustain or withdraw these remaining comments. Mr. Wacker advised the group that the first annual RAO report will be submitted to agencies, which will provide data to make better decisions for potential additional work. Mr. Wacker further stated that waiting to review the RAO reports before making decisions for additional work follows the CERCLA process that provides for a five-year review to evaluate the site for additional needs. Mr. Williams added that the site is already in RAO (RA construction is complete), so to add an additional well now is not optimal.

Item 12 (LHAAP-67 LUC) – Army has signed the recordation documents, which will be filed with Harrison County.

Preface to RAO Report Items: RAO reports will be submitted for agency review approximately 135 days after the last date of sampling in that reporting period. This includes 60 days to receive and validate lab data, 30 days for AECOM to generate the report, 45 days for Army to review, and AECOM to resolve comments and produce draft document for agency review.

Item 13 (LHAAP-46 RAO Report) – Projected for submittal to agencies in early February.

Item 14 (LHAAP-67 RAO Report) – Projected for submittal to agencies in early February.

Item 15 (LHAAP-50 RAO Report) – Projected for submittal to agencies in mid-February.

Item 16 (LHAAP-58 RAO Report) – Projected for submittal to agencies in mid-February.

Item 17 (Monthly Managers' Meeting) – Next MMM scheduled for 10AM, Thursday, December 11th by teleconference. Dr. Zeiler asked how updates to the website are scheduled. Mr. Wacker stated that, whenever an update request is made by Army or updates come out of quarterly RAB meetings, he instructs Mr. Miller to make the update to the website. Updates for the admin record. Mr. Wacker stated AECOM will set a trigger to perform an update of the website after each RAB meeting, so it is updated at least quarterly.

Item 18 (LHAAP-29 Amended RI/FS) – Bio-Traps will be installed on November 21st. They will incubate for 60 days, then another 6 weeks is required for laboratory data to be received. Based on these time frames, the date for agency submittal of the amended FS will likely slip until mid-March.

Item 19 (LHAAP-17 PDI WP, LHAAP-16 RD WP, LHAAP-03 RD/RAWP, LHAAP-04 RD, LHAAP-47 RD) – Placeholder for sites on hold due to dispute.

Item 20 (RAB/Website) – Next RAB tentatively scheduled for Thursday, February 19th at 6PM, but will be confirmed with the RAB tonight. RAO fact sheets for LHAAP-46 and LHAAP-67 were reviewed by the group and approved for distribution during the RAB. Updated handouts for perimeter well and surface water sampling, and GWTP treatment statistics were reviewed and approved for distribution during the RAB.

Item 21 (GWTP O&M) – Ray Wagner resigned from his GWTP technician position at the end of October. Other AECOM staff have been backfilling as support for Scott Beesinger as necessary, and a replacement person is tentatively staring December 1st. Marwan Salameh, AECOM's GWTP task lead will be on-site to perform initial training and orientation for the new staff.

Nutrient Analysis - Mr. Wacker summarized that the GWTP nutrient analysis indicated that when FBR feeding was reduced, and effluent nutrient levels dropped, FBR treatment efficiency is observed to become unsatisfactory. Based on this analysis, and the fact that the current feeding levels are in accordance with manufacturer's guidance to maintain treatment performance, further plans for attempting to reduce FBR feed rates have been tabled. However, additional field data is being collected using HACH test kits to monitor nutrient levels. Mr. Becher stated ortho-phosphate concentrations is still a bit higher than desirable for Caddo Lake, but he understands why the values need to be where they are for FBR health. Mr. Wacker stated that there has been no discharge to Harrison Bayou in the last six months; all treated water has been returned to the site through the sprinkler system. More aggressive strategy for rotating the active sprinkler heads is being discussed to ensure standing water is avoided.

Mr. Becher asked if use of the INF Pond to hold treated water was contemplated. Dr. Zeiler stated it is likely it would be used at some point. Mr. Wacker stated that option needed to be kept available. Mr. Becher stated he felt an algal bloom would quickly occur if water was added given the current sunlight levels.

Mr. Mayer asked whether recent cold weather had negatively impacted the FBR effectiveness. Mr. Wacker replied that the FBR had continued to operate well during the recent cold spell. The group discussed that this historical FBR treatment issues were tied to off-specification/mislabeled feed stock (acetic acid) in combination with a long cold spell, within which power failure was experienced, leading to lack of circulation in the FBR. Mr. Wacker stated that AECOM switched feed stock vendors after the mislabeled material issue occurred. Mr. Wacker further stated that there is are winterization protocols that are followed: heat traces and additional insulation on certain components.

Item 22 (Admin Record Update) – AR Update for the 3rd quarter is being prepared and is scheduled for submittal to Army by the end of the month. Frequency of website update for the AR has not yet been established.

Item 23 (CRP/CIP) – RAO fact sheets for LHAAP-46 and LHAAP-67 were reviewed by the group and approved for distribution during the RAB.

Item 24 (LHAAP-12 RAO Report 2013) – The Draft Final report will become Final on 11/27/14.

Item 25 (1,4-Dioxane Sampling) – Discussed earlier in meeting under AECOM Action Items.

Defense Environmental Restoration Program (DERP) PBR Update (continued) AECOM

- RACR Procedure Discussion
  - Army has been initiating RAO (with agency construction complete concurrence) but without an approved RACR in order to get the data collection moving forward.
  - For sites where RAO began before the RACR was approved, and there have been subsequent decision to require additional wells…how will the RAO documents/data be evaluated for compliance by the agencies?
    - Will agencies honor the year of monitoring where some wells eventually listed in the RACR plan are not included for some quarters, because they were installed after initial construction complete? If agencies will not honor an RAO report because it contains less than four quarters of data for some wells, Army will need to delay further RAO until RACRs have been approved.
    - Ms. Palmie stated acceptability of RAO reports for lacking four quarters of data for all wells would likely depend upon what the data is saying. Dr. Zeiler stated that one possibility could be to extend the quarterly monitoring period for wells installed after the start of RAO if data indicates eight quarters of data is needed to evaluate conditions at those wells. Army will discuss this subject more internally.
    - Ms. Palmie stated, and Mr. Tzhone agreed, that simply because you have less data for some wells than others during an annual evaluation period does not invalidate the entire year of data.
    - Ms. McDonnell pointed out that most of the situations where wells have been installed after initiation of RAO are those where additional plume delineation was required. At these wells, there is not a need to have 100% data coverage for MNA trend analysis, so the impacts of fewer data points should be minimal, if any.
    - For optimization, Army feels that no optimization should occur until one year of data is collected (RACR approved and 1st year RAO submitted).
    - RAO reports should have a section addressing late-added wells and impacts on data iterations.

- LHAAP-67 RACR Discussion of EPA Comments on Army RTCs – discussed earlier in meeting. See Item 11 of the Document and Issue Tracker discussion.

- Upcoming field work – MNA site groundwater sampling. LHAAP-46 being done currently. LHAAP-67 will be completed next week. LHAAP-29 bio-traps will be installed in wells 29WW43 and 29WW44 on November 21st.
- Monthly data – no validation report this month due to limited validated data
- Groundwater Treatment Plant – discussed earlier in meeting.

MMRP Update **Army**

- Update – no update

Other Environmental Restoration **Army**

- Site 37 Bioplug Update – While the bioplug remediation method has been successful at some other pilot sites, Ms. Paul advised that the results here at LHAAP-37 were not significant enough to warrant continuation of the demonstration beyond the initial planned two-year period. The contractor has been instructed that the demonstration is being terminated and has collected a final set of groundwater samples. A final report containing results of the final sampling event and documentation of decommissioning activities will be provided by the contractor.
    - Army is asking AECOM to monitor the aquifer's return to pre-demonstration conditions. The agencies will receive a technical memorandum detailing the proposed groundwater monitoring to track recovery of the aquifer to pre-demonstration conditions. Anticipate recovery of pre-demonstration conditions between August-October 2015, at which time MNA monitoring will begin.
    - Demobilization initiation date is yet to be determined.
    - Water line feeding the bioplug system will be terminated and capped. Electrical will be terminated where service was provided to the equipment trailer.
    - EPA and TCEQ will be asked to provide formal written concurrence with removal of the Bioplug system.
- Quarterly Reporting and Requirements
    - GWTP Evaluation with air monitoring data - air monitoring report has been submitted. TCEQ has responded that they have no concerns with sampling less frequently. EPA does not plan on making a statement, as this is delegated to the State of Texas.
    - Surface Water/Perimeter Well Quarterly Update – handouts have been updated for the RAB and there are no changes based from historical values.
    - Administrative Record Update – addressed earlier in the meeting.
- Annual Reporting
    - LUC Management Plan Update (due September 2014) – Update will be completed with addition of LUC boundaries for LHAAP-46 and LHAAP-67 when available. The other MNA site LUCs will be captured in the next update.
    - CRP/CIP Revision (Biennial) and questionnaire October 2015

Programmatic Issues **RMZ/RM/AP**

- Status of Dispute – Mr. Tzhone asked whether Dr. Zeiler had anything to communicate on Army's response (due tomorrow) to the EPA Administrator's decision. Dr. Zeiler stated that Army is reviewing the EPA Administrator's decision. EPA has been directed to share with the RAB the link to decision on the EPA website as their response to questions on the dispute resolution.
- Interim Path Forward – Mr. Tzhone stated there will be no concurrence from EPA on moving forward in an interim manner on sites without RODs (e.g., LHAAP-16 and

LHAAP-47) because the EPA Administrator's decision has been rendered, requiring submittal of revised RODs.

- Contractor (AECOM) Contract Duration – Ms. Palmie asked when AECOM's contract for LHAAP expires. Mr. Williams stated that AECOM's contract runs through September 2017. Mr. Mayer inquired whether that contract could be extended for a year or two after that. Mr. Smith stated that a six-month contract extension was possible, but that it was most likely that the work after AECOM's contract would be awarded through another competitive bid process.

USFWS Update **RMZ/PB**

- Environmental Restoration Issues with Transfer Schedule Impact – USFWS realty department has hired new staff and, additionally, directed another individual to move forward with the LHAAP documents. No information on where the LHAAP documents fall for priority within the queue for processing.
- USFWS Comments on Documents – no issues

Schedule Next Managers' Meeting – 10AM, Thursday, December 11th by teleconference.

New Action Items

AECOM

- Add the number (first, second, third) of quarterly round to the master GW sampling schedule and resubmit to MMM group.
- Add to document and issue tracker a note that website will be updated at least quarterly, after each RAB meeting.
- Provide LHAAP-58 update on EISB.
- Send RAB surface water/perimeter well results handouts to Dale Vodak.
- Check for methylene chloride in the August split sample for well 134.
- Check LHAAP Army website hits.

Army

- Forward "data dump" to AECOM for evaluation for potential update/merge with current data. **Complete.**

EPA

- Provide decision on continued disagree comments for LHAAP-67 RACR.

AEC

- Review proposals for comprehensive geospatial database of all information for LHAAP (lab data, boring logs, well construction reports, etc.) that will make review easier.

Adjourn

ACRONYM LIST

AEC	United States Army Environmental Command
AECOM	AECOM Technology Services, Inc.
AP	April Palmie
AR	Administrative Record
BRAC	Base Realignment and Closure
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CRP/CIP	Community Relations Plan/Community Involvement Plan
DERP	Defense Environmental Restoration Program
EISB	Enhanced In-Situ Bioremediation
EPA	United States Environmental Protection Agency
FBR	Fluidized Bed Reactor
FS	Feasibility Study
GWTP	Ground Water Treatment Plant
INF	Intermediate-Range Nuclear Forces
LHAAP	Longhorn Army Ammunition Plant
LUC	Land Use Control
MMM	Monthly Managers' Meeting
MMRP	Military Munitions Response Program
MNA	Monitored Natural Attenuation
O&M	Operation and Maintenance
PB	Paul Bruckwicki
PBR	Performance-Based Remediation
PDI	Pre-Design Investigation
RAB	Restoration Advisory Board
RACR	Remedial Action Completion Report
RAO	Remedial Action Operation
RAWP	Remedial Action Work Plan
RD	Remedial Design
RM	Rich Mayer
RMZ	Rose M. Zeiler
ROD	Record of Decision
RTC	Response to Comments
TCE	Trichloroethene
TCEQ	Texas Commission on Environmental Quality
USACE	United States Army Corps of Engineers
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Service
WP	Work Plan

DEPARTMENT OF DEFENSE
UNITED STATES OF AMERICA

SECRETARY OF THE ARMY
WASHINGTON

NOV 25 2014

The Honorable Gina McCarthy
The Administrator of the Environmental Protection Agency
Washington, DC 20460

Dear Madam Administrator:

Thank you for your October 31, 2014 letter regarding the dispute resolution surrounding cleanup of the Longhorn Army Ammunition Plant in Karnack, Texas.

I have asked the Assistant Secretary of the Army for Installations, Energy and Environment, who has responsibility in this area, to review your letter and provide you a thorough response on my behalf.

Thank you for bringing this matter to my attention.

Sincerely,

John M. McHugh

John M. McHugh

DEPARTMENT OF THE ARMY
ASSISTANT SECRETARY OF THE ARMY
INSTALLATIONS, ENERGY AND ENVIRONMENT
110 ARMY PENTAGON
WASHINGTON DC 20310-0110

NOV 25 2014

The Honorable Gina McCarthy
Administrator
United States Environmental Protection Agency
Office of the Administrator 1101A
1200 Pennsylvania Avenue, N.W.
Washington, DC 20460

Dear Ms. McCarthy:

I have been asked to respond on behalf of Secretary of the Army John M. McHugh to your October 31, 2014 decision letter concerning resolution of a dispute between the Department of the Army and the Environmental Protection Agency regarding the cleanup of the Longhorn Army Ammunition Plant in Karnack, Texas.

The Army does not agree with this decision and continues to assert that it contains numerous inaccurate statements of fact, is contrary to the law, and is contrary to well established Federal policy. Due to the significant fiscal and policy concerns involved and consistent with Section XXVII of the Federal Facility Agreement, the Army intends to elevate these issues to the Office of Management and Budget (OMB) pursuant to Executive Order 12580. Until the fundamental issues raised by the Administrator's decision are addressed at OMB, the Army is moving forward with those aspects of the response action that are not in dispute and will continue to maintain the response actions that are currently in place in order to ensure protection of human health and the environment.

The Army will draft a submission to OMB, and intends to continue working with you to facilitate resolution of these significant issues.

Sincerely,

Katherine Hammack

FINAL
2013 REMEDIAL ACTION OPERATION REPORT
LANDFILL 12 (LHAAP-12)
LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS

Prepared For:

ON THE LINE

U.S. Army Corps of Engineers

Prepared By:

AECOM

AECOM Technical Services, Inc.

November 2014

Responses to Comments on Draft 2013 Remedial Action Operation Report LHAAP-12 Longhorn Army Ammunition Plant, Karnack, Texas

09 September 2014

Reviewer: Rich Mayer, USEPA
Respondent: Dave Wacker, AECOM

1. Respondent Concurs (C), Does Not Concur (D), Takes Exception (E), or Delete (X).
2. Commentor Agrees (A) with response, or Does not Agree (D) with response.

Comment #	Section/ Paragraph	Comment	C, D, E or X[1]	Response	A or D[2]
1	General Comment	The EPA does not believe it is coincidental that the majority of the higher TCE concentrations in 12WW24 were recorded in samples collected during the winter months (December – February). Cis-1,2-DCE also appears to exhibit similar although less pronounced behavior. These data strongly suggest seasonal variation that is not adequately captured during annual sampling. Similar comments were made by the EPA and TCEQ during review of the 2012 RAO Report. The 2013 Five Year Review identifies potential seasonal effects on VOC concentrations at LHAAP-12 as an issue requiring evaluation. The Army should examine the available dataset to determine what effects, if any, seasonal variation may have on the MNA evaluation and make recommendations for correcting deficiencies. The EPA recommends that quarterly sampling of 12MW24 (and potential new wells in the plume) be re-established for a period of at least two years to obtain a more complete and representative dataset. This evaluation should not be being pushed to the next Five Year Review	E D D	The current annual sampling is planned during the December-February timeframe to reflect EPA's concerns that higher levels of COCs may be present due to seasonal effects. The collection of annual data during this timeframe will identify if higher levels of COCs are present compared to historical results. Army recommends that EPA review the administrative record for information pertaining to seasonal variation, in particular the RAO Summary Report Years One and Two for LHAAP-12, July 2012. Army also recommends that EPA review the approved sampling plan for LHAAP-12 for requirements associated with seasonal variation of COCs. Note: Subsequent to these comments, USEPA, TCEQ and Army concurred on a planned approach to gauge water levels at LHAAP-12 monthly for a year to determine the best time to sample to avoid dry wells. Additionally, a Direct Push Technology boring was completed in September 2014 in an attempt to identify another location within the plume to install a well. This location (~50 feet from 12WW24) did not contain COCs over the MCL confirming the plume size above the MCL is small and not migrating at LHAAP-12	

Responses to Comments on
Draft 2013 Remedial Action Operation Report LHAAP-12
Longhorn Army Ammunition Plant, Karnack, Texas

09 September 2014

Reviewer: Rich Mayer, USEPA
Respondent: Dave Wacker, AECOM

1. Respondent Concurs (C), Does Not Concur (D), Takes Exception (E), or Delete (X).
2. Commentor Agrees (A) with response, or Does not Agree (D) with response.

Comment #	Section/ Paragraph	Comment	C, D, E or X[1]	Response	A or D[2]
2	General Comment	The conclusions state "*VOC concentrations in 12WW24 have shown a decreasing trend in concentrations over the past several years excluding this most recent year, where all three COCs increased*." This statement is misleading. All lower concentration samples collected from April 2009 through June 2011 were collected during the spring and summer months and do not account for probable seasonal variations as described in the previous comment. The EPA expects that concentrations spikes likely would have been observed if samples were also collected during the winter.	E	The conclusions section of the RAO Report will be revised to indicate that some seasonal variation is likely present in the levels of COCs because the data were collected in variable seasons, but the long-term trend is a declining one. Four samples have been collected at 12WW24 since 2006 within the December to February timeframe when USEPA has concerns higher COC levels may be observed (December, 2006, December, 2007, February 2009, and December 2013). These data points support a declining COC trend. The plume at LHAAP-12 is small, is not migrating, and existing data supports declining COC trend in only the first few years of MNA. The Record of Decision for LHAAP-12 groundwater (Shaw, 2006) identified that MNA will require between 23-261 years to naturally attenuate TCE to below the MCL. Given the data trend in the first few years since MNA was initiated, no further data collection or analysis is warranted as part of annual RAO/LTM.	
3	General Comment	As recommended in EPA comments on the 2012 RAO Report, Army should be performing more robust statistical analyses of these data to support MNA evaluation, including a discussion of the potential effects of seasonal variation. A concentration-time plot by itself, such as presented in Figure 2-2, has little value. EPA recommends using the following Guidance: *An Approach for Evaluating the Progress of Natural Attenuation in Groundwater*, EPA 600-R11/204, December 2011/www.epa.gov/ada	D	Evaluation of the data is being conducted in accordance with the approved plan, which specifically requires the time trend plot. There has been no increase in the concentration of COCs above historic levels and no migration to down gradient wells has occurred. Therefore, statistical analysis will not be performed. It is noted that the referenced document states that the statistical evaluation method recommended was specifically intended to support the CERCLA Five Year Review process or for sites where a clean-up goal or timeframe to achieve the clean-up is not known (Page 1, introduction, paragraph 3, last sentence, EPA, 2011). The ROD for LHAAP-12 identifies the MCL as the clean-up objective and the timeframe to reach the MCL through MNA as between 23-261 years. The appropriate location for assessment of progress toward achieving the timeframe for clean-up is the Five Year Review where multiple additional data sets are available for review and analysis, not within the annual RAO/LTM monitoring report.	

Responses to Comments on
Draft 2013 Remedial Action Operation Report LHAAP-12
Longhorn Army Ammunition Plant, Karnack, Texas

09 September 2014

Reviewer: Rich Mayer, USEPA
Respondent: Dave Wacker, AECOM

1. Respondent Concurs (C), Does Not Concur (D), Takes Exception (E), or Delete (X).
2. Commentor Agrees (A) with response, or Does not Agree (D) with response.

Comment #	Section/ Paragraph	Comment	C, D, E or X[1]	Response	A or D[2]
4	General Comment	Water levels should be gauged in all existing (and new) monitoring wells at LHAPP-12 – not just the five currently included in the monitoring program. Accordingly 12WW01, -02, -05 and any new wells installed should be added to the gauging program	C	Monthly water level gauging for a year is planned to address this comment.	
5	Page 2-1, Section 2.1, 1st Paragraph	The last half of this paragraph needs to be revised due to the timing aspects of certain requirements discussed, which have already occurred	C	The referenced text has been edited based upon this comment and a similar one from TCEQ to reflect potential additional work as needed planned for 2015.	
6	Page 2-2, 1st Paragraph, last sentence	Please revise this sentence, as parts of the sentence are not clear.	C	The referenced text has been modified to state "During the 2013 sampling event, all five wells were in good condition and no evidence of turbidity or silt accumulation was identified."	
7	Page 2-2, 2nd Paragraph	Since groundwater levels are only taken once a year, the apparent change in groundwater flow direction to the west may be to seasonal variation	C	See responses to comments 1 and 4.	
8	General Comment	As has been repeatedly expressed in EPA comments on other documents, the DO and ORP measurements presented in the Monitoring Well Sample Collection Forms (appendix C) are notable, and the EPA remains skeptical of proper equipment operation, maintenance and/or calibration. Consider: Is it realistic to have DO concentrations of 0 in shallow groundwater at any location, especially those located outside of the plume (where anaerobic reductive dechlorination is not supposed to be occurring)?	E	Bates stamp ID's 00115893-00115913 and 00114225-00114303 in the Administrative Record are the sampling forms for years 1 through 4 of LTM at LHAAP-12. Since 2008, with at least two different sampling personnel, two different contractors and several different brands and types of parameter monitoring equipment for ORP and DO in use, these wells have demonstrated similar ORP and DO readings to that observed and recorded in the 2013 report. USGS historically also collected split samples for USEPA as part of LHAAP-12 LTM where similar measurements were observed and recorded on the sampling forms. Additionally, note that ORP is not simply a function of dissolved oxygen concentration, but depends on concentrations of all redox	

Responses to Comments on
Draft 2013 Remedial Action Operation Report LHAAP-12
Longhorn Army Ammunition Plant, Karnack, Texas

09 September 2014

Reviewer: Rich Mayer, USEPA
Respondent: Dave Wacker, AECOM

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2. Commentor Agrees (A) with response, or Does not Agree (D) with response.

Comment #	Section/ Paragraph	Comment	C, D, E or X[1]	Response	A or D[2]
		Lower ORP values are generally anticipated in wells having very low DO concentrations. In the case of 12WW20, ORP values were 300+ while DO values were around 0.10. Please offer a geochemical explanation for this. While the EPA recognizes that low water levels necessitated sampling of 12WW24 by bailing, the DO and ORP values are clearly not representative of a plume where anaerobic reductive dechlorination is purported to be occurring. This undoubtedly is a function of the sampling method. These are key data to support the MNA evaluation and speak to the need for a replacement well at this location in the heart of the plume that will allow the collection of representative samples (e.g. with a pump and flow through cell)	E	pairs in the sample (including hydrogen ion concentration [pH]) so correlations between ORP and DO readings cannot always be assumed. These two pieces of information can be considered together to indicate that improper equipment operation, maintenance and/or calibration are unlikely causes of the observed field readings Subsequent to these comments, USEPA, TCEQ and Army concurred on a planned approach to gauge water levels at LHAAP-12 monthly for a year to determine the best time to sample to avoid dry wells. Additionally, a Direct Push Technology boring was completed in September 2014 in an attempt to identify another location within the plume to install a well. This location (~50 feet from 12WW24) did not contain COCs over the MCL confirming the plume size above the MCL is small and not migrating at LHAAP-12. Based upon 12WW24 being fully penetrating and the small size and stability of the plume, additional wells within the plume are not warranted.	

Responses to Comments on
Draft 2013 Remedial Action Operation Report LHAAP-12 AND Installation of New Plume Monitoring Well at LHAAP-12 Memo (18 August 2014)
Longhorn Army Ammunition Plant, Karnack, Texas

09 September 2014

Reviewer: April Palmie, TCEQ
Respondent: Dave Wacker, AECOM

1. Respondent Concurs (C), Does Not Concur (D), Takes Exception (E), or Delete (X).
2. Commentor Agrees (A) with response, or Does not Agree (D) with response.

Comment #	Section/ Paragraph	Comment	C, D, E or X[1]	Response	A or D[2]
1	1.1	Work was completed in October/November 2013 and December 2013/January 2014. Why did it take so long to submit this draft report?	C	The report was originally developed in February/March and then placed on-hold pending assessment of the need for an additional source area well which was agreed to as it was a recommendation of the Five Year Review.	
2	1.1	Please add ital. text to this sentence: This report summarizes the results of *December 2013/January 2014* groundwater sampling and the *October/November 2013* landfill integrity inspections and repairs.	C	Italicized text has been added as suggested.	
3	2.1	Regarding this sentence: If seeding is not effective, erosion control matting will be installed in the spring of 2014. Spring 2014 has passed. Did you mean 2015?	C	Yes, "2014" has been changed to "2015" in the text.	
4	2.2, First paragraph	First paragraph – First sentence is overly long, confusing, and contains two ":". Please at least put the MW lists in "( )" instead.	C	The sentence has been edited as suggested, and separated into two sentences for clarity.	
5	2.2, Second paragraph	Second paragraph - This section is poorly written and unclear. First sentence - Groundwater flow direction *interpretation* has changed. The second and third sentences should be rewritten. 2012 groundwater elevation for 12WW22 was not within historic range; 2013 measurement is within range. There is not a "dramatic" increase.	C	The second paragraph has been re-written as follows: "Groundwater flow direction interpretation shows an easterly flow, changing from a northeasterly flow the previous year. The 2012 groundwater elevation for 12WW22 was not in the historic range. The 2013 groundwater elevation measurement is within historic range. Year 5 and 6 (i.e., 2012 and 2013) elevation data are plotted on Figure 2-3."	

Responses to Comments on
Draft 2013 Remedial Action Operation Report LHAAP-12 AND Installation of New Plume Monitoring Well at LHAAP-12 Memo (18 August 2014)
Longhorn Army Ammunition Plant, Karnack, Texas

09 September 2014

Reviewer: April Palmie, TCEQ
Respondent: Dave Wacker, AECOM

1. Respondent Concurs (C), Does Not Concur (D), Takes Exception (E), or Delete (X).
2. Commentor Agrees (A) with response, or Does not Agree (D) with response.

Comment #	Section/ Paragraph	Comment	C, D, E or X[1]	Response	A or D[2]
6	2.2, Third paragraph	Why was 12WW24 sampled at a different date than rest of site wells?	C	12WW24 was dry during the 2012 sampling event, when it was gauged in December 2013 and contained water, it was sampled. 12WW24 was dry again in January 2014 when the annual event was planned, so data from December 2013 was used for this report. Text has been edited to reflect this, and monthly gauging is planned to determine the best time to collect samples to avoid dry wells.	
7	2.2, Fourth paragraph	States: Water samples were collected using the low-flow method Standard Operating Procedure (AECOM, 2013). According to the field notes, 12WW24 was bailed dry and sampled after recovery. This should be in the narrative.	C	Text was edited as suggested.	
8	Tables	There should be a table of historic/cumulative groundwater COCs.	C	Table 2-3 has been added with suggested data.	
9	Table 2-1	Should include: day, month, year of measurement; total depth of wells; and screen interval.	C	The Table has been edited as suggested.	
10	Table 2-2	This table mixes results with different dilution factors. As far as I can tell, all results are from the dilution factor 1 run except TCE in 12WW24 which is dilution factor 5 (310 J on DF 1 or 259 on DF 5). A note would help clarify	C	A footnote was added to Table 2-2 for trichloroethene. Trichloroethene was diluted 5X.	
11	3	First paragraph, last sentence – "," should be ";" or "."	C	Comma changed to a period.	

Responses to Comments on
Draft 2013 Remedial Action Operation Report LHAAP-12 AND Installation of New Plume Monitoring Well at LHAAP-12 Memo (18 August 2014)
Longhorn Army Ammunition Plant, Karnack, Texas

09 September 2014

Reviewer: April Palmie, TCEQ
Respondent: Dave Wacker, AECOM

1. Respondent Concurs (C), Does Not Concur (D), Takes Exception (E), or Delete (X).
2. Commentor Agrees (A) with response, or Does not Agree (D) with response.

Comment #	Section/ Paragraph	Comment	C, D, E or X[1]	Response	A or D[2]
12	3	Why does the conclusion section include a listing of every chemical detection, including common lab contaminants? This section should focus on conclusions relating to the site and site COCs or chemicals that can be attributed to the site.	C	The Conclusions section was revised to reflect the site COCs, trichloroethene, cis-1,2-dichloroethene, and vinyl chloride.	
13	Appendix D	QC Summary inaccurately says one data package is reviewed. These samples are from two data packages with different run dates and machines. Why are there no duplicates?	C C	The Quality Control Summary Report now reflects that two data packages were reviewed. This was an omission, no duplicate samples were collected. The collection of QC samples in accordance with the QAPP was reviewed with the field and office staff to ensure appropriate samples are collected for future events.	
14	New plume MW memo; Section 2	The memo lists two new wells – 1) 12WW25 to be downgradient of 12WW24 and 2) a deeper well coupled with 12WW24. I concur with these proposed locations.	C	A DPT boring was installed on September 8th, 2014 at the proposed LHAAP-12 new well 12WW25 location (50 feet down-gradient/east of plume well 12WW24) to guide well installation. The boring was drilled to a depth of 35 feet, with visibly wet soils encountered starting at 25 feet below ground surface (bgs) and an assemblage of sands from 15 – 30 feet bgs. A grab groundwater sample was collected from this boring to confirm its location within the plume. Analytical results identified low levels of COCs TCE (0.317 micrograms per liter [ug/L]) and cis-1,2-DCE (0.402 ug/L) below the MCL, along with similar levels of methylene chloride, benzene, chlorobenzene and 1,4-dichlorobenzene. The proposed 12WW25 location is not within the plume above the clean-up criteria observed at 12WW24, so a permanent monitoring well will not be installed. This approach was discussed between the Army, EPA, and TCEQ with EPA and	

Responses to Comments on
Draft 2013 Remedial Action Operation Report LHAAP-12 AND Installation of New Plume Monitoring Well at LHAAP-12 Memo (18 August 2014)
Longhorn Army Ammunition Plant, Karnack, Texas

09 September 2014

Reviewer: April Palmie, TCEQ
Respondent: Dave Wacker, AECOM

1. Respondent Concurs (C), Does Not Concur (D), Takes Exception (E), or Delete (X).
2. Commentor Agrees (A) with response, or Does not Agree (D) with response.

Comment #	Section/ Paragraph	Comment	C, D, E or X[1]	Response	A or D[2]
				TCEQ providing concurrence via email September 17, 2014 and September 18, 2014, respectively. As discussed, a plume this limited in size does not justify the installation of additional wells; however, monthly groundwater level monitoring will be completed for a year in order to assess optimum sampling dates to avoid dry wells. The DPT borings leading to concurrence from EPA and TCEQ that 12WW25 will not be installed will be discussed in the next (2014) RAO Report covering this period.	
15	New plume MW memo; Section 3	Narrative should be revised to include both wells.	E	See response to Comment 14.	
16	New plume MW memo; Section 4	When do you anticipate well install? Current text says August 2014.	C	See response to Comment 14.	

FINAL
2013 REMEDIAL ACTION OPERATION REPORT
LANDFILL 12 (LHAAP-12)
LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS

Prepared For:

U.S. Army Corp of Engineers

Tulsa District

Prepared By:

AECOM Technical Services, Inc.

Contract No. W912DY-09-D-0059

Task Order No. DS01

November 2014

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Acronyms and Abbreviations

µg/L	micrograms per liter
AECOM	AECOM Technical Services, Inc.
bgs	below ground surface
cis-1,2-DCE	cis-1,2-dichloroethene
COC	contaminant of concern
IRA	Interim Remedial Action
LHAAP	Longhorn Army Ammunition Plant
LHAAP-12	Landfill 12
LUC	Land Use Control
MCL	maximum contaminant level
MNA	Monitored Natural Attenuation
MSC	medium specific concentration
No.	Number
RA(O)	Remedial Action Operation
RD	Remedial Design
ROD	Record of Decision
TCE	trichloroethene
U.S.	United States
VC	vinyl chloride
VOC	volatile organic compound

1 INTRODUCTION

The United States (U.S.) Army Corps of Engineers, Tulsa District, contracted AECOM Technical Services, Inc. (AECOM), to perform remedial activities at multiple sites at the former Longhorn Army Ammunition Plant (LHAAP), Karnack, Texas, under the Huntsville District's Worldwide Environmental Restoration Services Contract Number (No.) W912DY-09-D-0059, Task Order No. DS01. As part of this contract, AECOM is performing operations and maintenance and monitoring activities at the closed Landfill 12 (LHAAP-12). A Final Record of Decision (ROD) was executed for LHAAP-12 in August, 2006 (Shaw, 2006). Groundwater monitoring and site inspection activities at LHAAP-12 are ongoing as described in the Final Remedial Design (RD) Addendum (Shaw, 2007). This report summarizes the results of December 2013/January 2014 groundwater sampling and the October/November 2013 landfill integrity inspections and repairs.

1.1 Remedial Action Operation Scope and Objective

Work completed as part of the Remedial Action Operation (RA[O]) at LHAAP-12 consisted of two components: physical inspections and repairs; and groundwater monitoring. Physical inspections are conducted at a minimum annually to confirm compliance with Land Use Control (LUC) objectives, which consist of ensuring the integrity of the existing landfill cover, and ensuring no consumption of trichloroethene (TCE)-contaminated groundwater. The objectives of groundwater monitoring at LHAAP-12 are to ensure that contaminated groundwater does not migrate into nearby surface water and to perform Monitored Natural Attenuation (MNA) so that maximum contaminant levels (MCLs) are achieved for groundwater contaminants of concern (COCs): TCE, cis-1,2-dichloroethene (cis-1,2-DCE), and vinyl chloride (VC). This report summarizes the results of groundwater sampling and the landfill integrity inspections and repairs.

1.2 Site Description

LHAAP-12 was established in 1963, covers approximately seven acres, and is 500 feet southeast of Central Creek, which eventually drains into Caddo Lake. LHAAP-12 was used for the disposal of industrial solid wastes, possibly containing small quantities of hazardous constituents generated at LHAAP. From 1978 until its closure in April 1994, the landfill was used continuously for the disposal of non-hazardous industrial solid waste, including cafeteria waste, chemical waste, petroleum-contaminated soil, and asbestos. The construction of a landfill cap over the site was completed in 1998 as part of an Interim Remedial Action (IRA). The IRA is consistent with U.S. Environmental Protection Agency presumptive remedy guidance. The final remedy for LHAAP-12 is protective of human health and the environment and consists of LUCs in conjunction with MNA. LUCs include those set in place by the ROD (Shaw, 2006) for landfill cap maintenance and restriction of groundwater use.

2 OPERATIONS AND MAINTENANCE ACTIVITIES AT LHAAP-12

Physical inspection activities at LHAAP-12 consist of:

- Maintenance of the integrity of the landfill cap and repairs to desiccation cracks, erosion, or gullying upon observance.
- Maintenance of the vegetative cover on the landfill cap, including periodic mowing.
- Maintenance of the signage around landfill cap.
- Prohibition of any activities that would affect the integrity of the cap.
- Prohibition of any activities that would cause exposure to contaminated groundwater.

The RD Addendum stipulated physical inspections to be conducted annually, although actual inspections are conducted more frequently with daily drive-by oversight to ensure compliance with the above requirements and annual groundwater sampling to monitor the effectiveness of MNA in reducing contaminant concentrations over time. The effectiveness of MNA was evaluated in the Years 1 and 2 report (Shaw, 2011). Groundwater was included as a component of the remedy for LHAAP-12 identified in the ROD (Shaw, 2006).

2.1 Physical Inspection Summary

Inspections conducted during 2013 indicated that minimal repairs were needed. The vegetative cover was observed to be in good condition and well-maintained through routine mowing, except for a few spots affected by subsidence and minor erosion. Subsidence, as deep as 1.5 feet, was observed to be present in several locations during the 2012 inspection. These spots were flagged for backfilling by AECOM and have subsequently been repaired with the addition of soil and vegetation in 2013. Inspections conducted during 2013 indicated that minimal repairs to the cap were needed. Cap subsidence and six separate locations of surface erosion were observed, and were addressed in November 2013 through re-seeding. If seeding is not effective, erosion control matting will be installed in the spring of 2015. As of the 2013 inspection, subsidence had continued at two newly identified locations, which have been scheduled for repair. Minor surface erosion and signs of burrowing animals were observed on the north eastern edge of the cap. No excessive cracking or desiccation was observed.

Signage remains in good condition and the fencing is intact (See Photo Log, Appendix A). Well-head locks continue to be in good condition. Monitoring well identification tag replacement as well as painting/re-labeling, as warranted for wells outside the current monitoring, network was completed in fall 2013 (See Photo Log, Appendix A). No damage to bollards, pads, or protective casings was observed, and no encroachment of weeds or brush on the well pads was observed. No change in land or groundwater use was observed at the site and the use of the site is consistent with that mandated by the ROD (SHAW, 2006). No significant issues were identified regarding the cap condition or maintenance, signs, or site use.

The official 2013 physical inspection of the LHAAP-12 cap was completed October 29, 2013. The LUC Inspection and Maintenance Log is included in **Appendix B**. One week after the inspection was completed a tree fell on the eastern fence line surrounding the landfill (See Photo Log, Appendix A). The tree was then removed, and the fence was repaired.

2.2 Groundwater Monitoring and Analytical Results

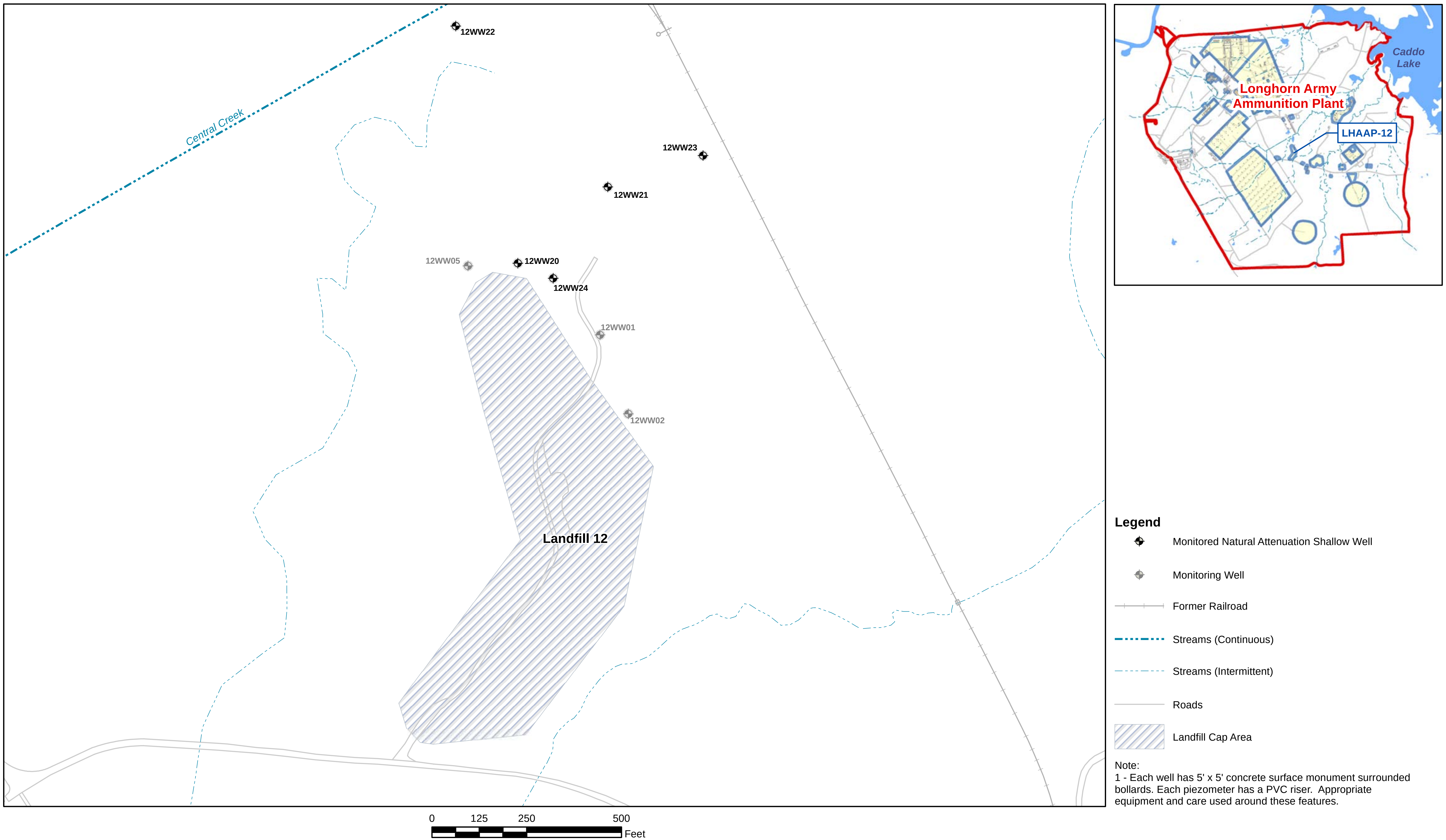
As described by the Groundwater Sampling Plan included in the RD Addendum (Shaw, 2007), groundwater sampling of monitoring wells (12WW20, 12WW21, and 12WW24) and compliance monitoring wells (12WW22 and 12WW23), has been conducted annually beginning in the third year of the RA(O). The Purpose of the sampling was to develop data to support the effectiveness of MNA in reducing contaminant concentrations over time, to evaluate plume migration, and to ensure that TCE-contaminated groundwater does not impact nearby surface water. The locations of these groundwater monitoring wells are shown in **Figure 2-1**. During the 2013 sampling event, all five wells were in good condition and no evidence of turbidity or silt accumulation was identified.

Groundwater flow direction interpretation shows an easterly flow, changing from a northeasterly flow the previous year. The 2012 groundwater elevation for 12WW22 was not in the historic range. The 2013 groundwater elevation measurements are within historic range. Year 5 and 6 (i.e., 2012 and 2013) elevation data are plotted on **Figure 2-3**.

Annual samples were collected December 11, 2013 from 12WW24, and January 8, 2014 from wells 12WW20, 12WW21, 12WW22, and 12WW23, and were analyzed for volatile organic compounds (VOCs). Sampling dates for these wells were not the same since 12WW24 was dry in 2012 additional periodic gauging was completed, and identified a small volume of water in December 2013 so the well was bailed dry and a sample collected upon recovery. 12WW24 was again dry during the annual January 2014 sampling event. Analytical results for the samples are shown in **Table 2-2**. Historic COC concentrations for LHAAP-12 wells are shown in **Table 2-3**.

Water samples were collected using the low-flow method Standard Operating Procedure (AECOM, 2013) for wells 12WW20, 12WW21, 12WW22, and 12WW23. The objective of using this method was to collect representative samples of the groundwater in the formation adjacent to the well screen, eliminating the mixing of stagnant water above and below the well screen. After water quality parameters stabilized and were within acceptable ranges, samples were collected at the same low flow rate. 12WW24 was bailed dry and sampled after recovery due to the small volume of water available. Groundwater monitoring well sampling forms were completed for each monitoring well sampled and are included in **Appendix C**. Laboratory analytical results are included in **Appendix D**.

The MNA evaluation completed as part of the Five-Year Review (AECOM, 2014), concluded that TCE degradation was occurring via anaerobic reductive dechlorination. Groundwater COC concentrations can be found on **Table 2-2** and seen on **Figure 2-4**.



Note:
1 - Each well has 5' x 5' concrete surface monument surrounded bollards. Each piezometer has a PVC riser. Appropriate equipment and care used around these features.

AECOM

Figure 2-1
Groundwater Monitoring Well Locations
LHAAP-12

Longhorn Army Ammunition Plant
Karnack, Texas

60256135

January 2014

Path: L:\Group\IT_GIS\GIS Projects\Longhorn\MXDs\LHAAP-12\2014-Jan-30\Figure 2-1 LHAAP-12 Groundwater MW Locations Rev-RJS.mxd

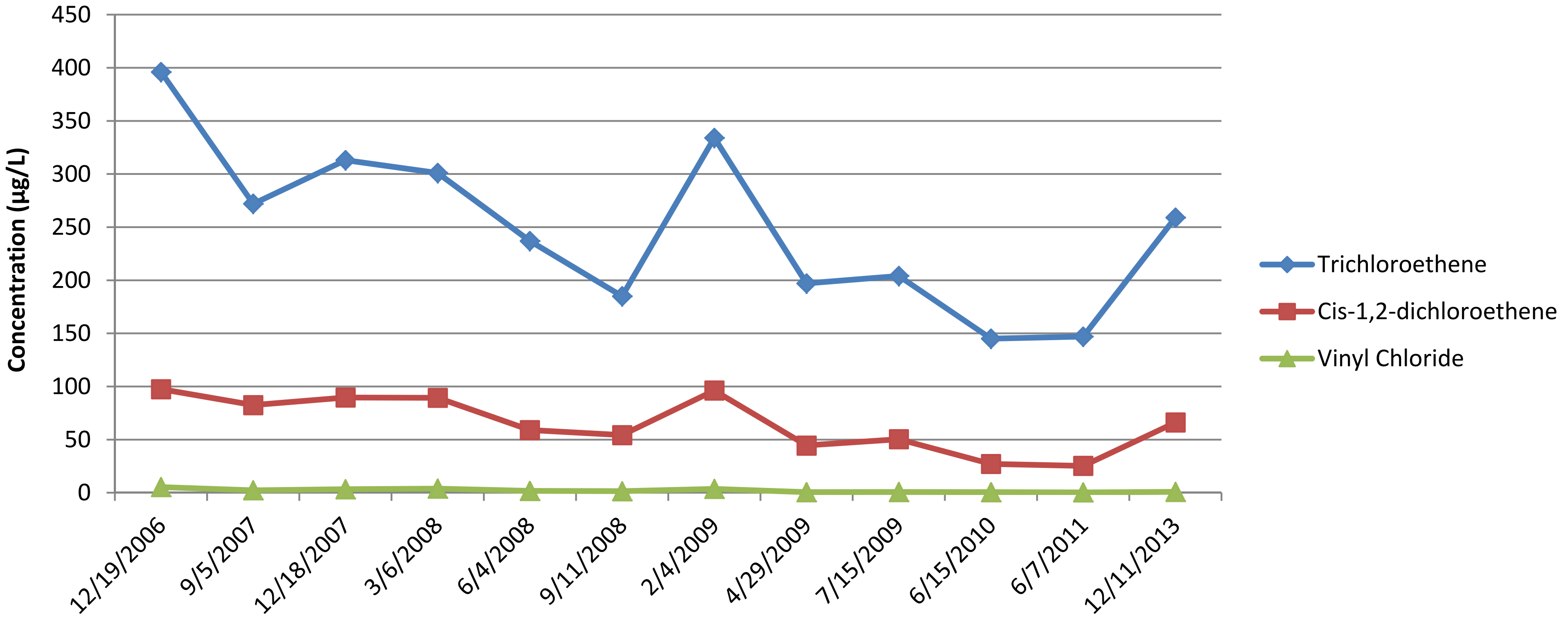
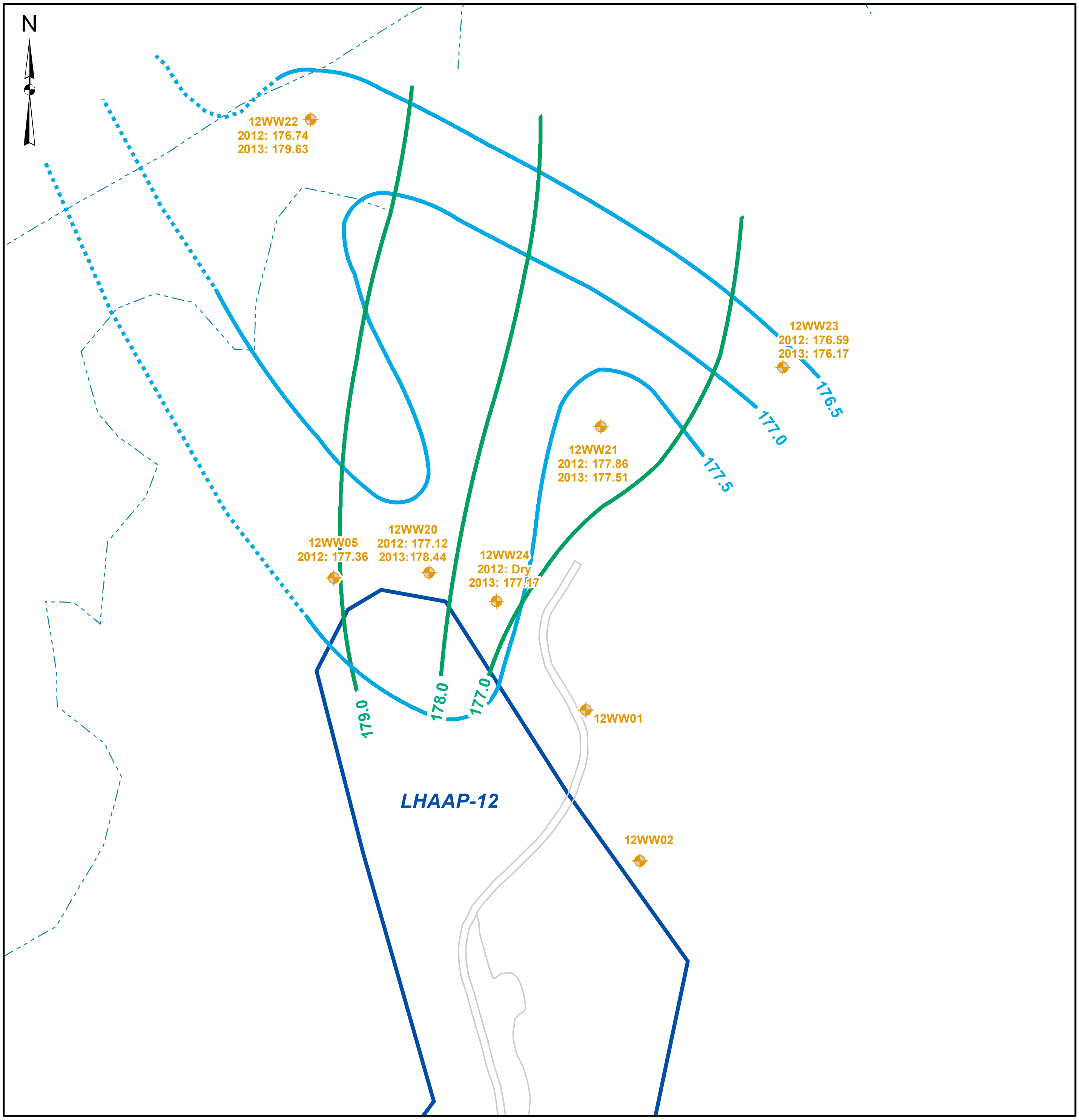


Figure 2-2
TCE, cis-1,2-DCE, and VC Concentrations in 12WW24
LHAAP-12



Legend

0 100 200 400 Feet

⊕	Shallow Monitoring Well
—	2012 Groundwater Gradient Contour (Dashed Where Inferred)
—	2013 Groundwater Gradient Contour (Dashed Where Inferred)
- · -	Streams
—	Roads
▨	Drainage Feature
☐	Site (Boundary of Landfill Cap)

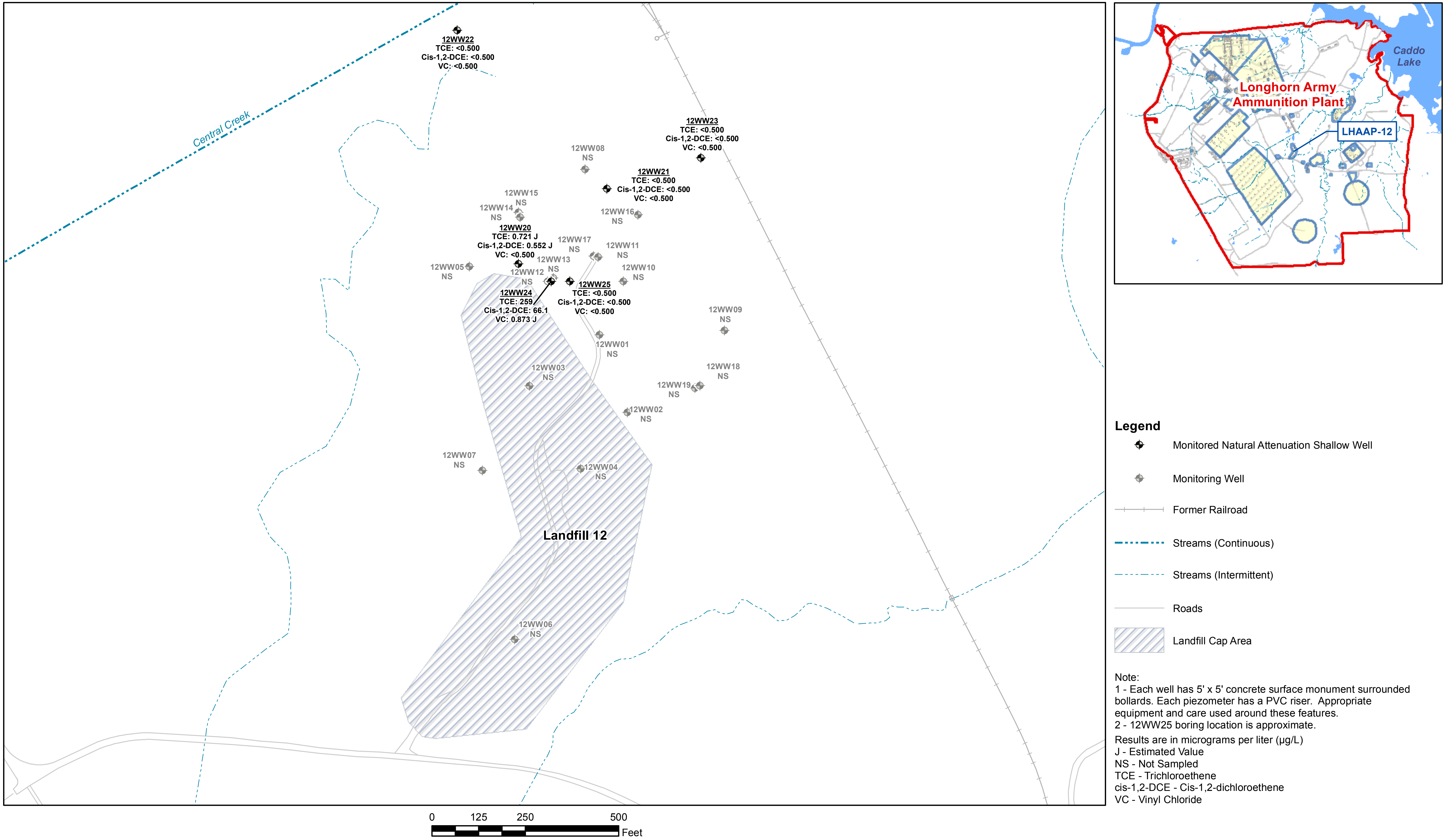
AECOM

Figure 2-3
Groundwater Gradient Map
2012 and 2013
LHAAP-12
Longhorn Army Ammunition Plant
Karnack, Texas

60256135

June 2014

Path: L:\Group\IT_GIS\GIS Projects\Longhorn\MXDs\LHAAP-12\2014-June-20\Figure 2-3 LHAAP-12 GW Gradient Map 2012_2013.mxd



Legend

- ⊕ Monitored Natural Attenuation Shallow Well
- ⊕ Monitoring Well
- Former Railroad
- Streams (Continuous)
- Streams (Intermittent)
- Roads
- ▨ Landfill Cap Area

Note:
1 - Each well has 5' x 5' concrete surface monument surrounded bollards. Each piezometer has a PVC riser. Appropriate equipment and care used around these features.
2 - 12WW25 boring location is approximate.

Results are in micrograms per liter (μg/L)
J - Estimated Value
NS - Not Sampled
TCE - Trichloroethene
cis-1,2-DCE - Cis-1,2-dichloroethene
VC - Vinyl Chloride

AECOM

Figure 2-4
Groundwater COC Concentrations Map 2013
LHAAP-12

Longhorn Army Ammunition Plant
Karnack, Texas

60256135

April 2014

Path: E:\Group\IT_GIS\GIS Projects\Longhorn\MXDs\LHAAP-12\2014_June_18\Figure 2-4 LHAAP-12 Groundwater COC Concentrations.mxd

Table 2 1: Groundwater Elevation Data – LHAAP-12

Well ID	Sampling Date	Top of Casing Elevation (ft)	Depth to Water (ft)	Groundwater Elevation (ft)	Total Depth (ft)	Screen Interval (ft)
12WW20	6/15/2010	199.15	17.98	181.17	38.85	28.85-38.85
	6/7/2011	199.15	19.78	179.37		
	12/8/2012	199.15	22.03	177.12		
	1/8/2014	199.15	20.71	178.44		
12WW21	6/15/2010	202.07	21.85	180.22	41.7	31.70-41.70
	6/7/2011	202.07	23.35	178.72		
	12/3/2012	202.07	24.21	177.86		
	1/8/2014	202.07	24.56	177.51		
12WW22	6/15/2010	190.2	7.93	182.27	38.36	28.36-38.36
	6/7/2011	190.2	9.72	180.48		
	12/3/2012	190.2	13.46	176.74		
	1/8/2014	190.2	10.57	179.63		
12WW23	6/16/2010	196.97	18.28	178.69	25.14	15.14-25.14
	6/7/2011	196.97	19.40	177.57		
	12/3/2012	196.97	20.38	176.59		
	1/8/2014	196.97	20.80	176.17		
12WW24	6/16/2010	203.17	22.50	180.67	26	15.50-25.50
	6/7/2011	203.17	24.15	179.02		
	12/3/2012	203.17	Dry	Dry		
	12/9/2013	203.17	26.00	177.17		

Table 2-2: Groundwater Analytical Results, Year 6 - LHAAP-12

Location ID: Sample Date:	Units	MCL/ MSC	12WW20-010814 1/8/2014	12WW21-010814 1/8/2014	12WW22-010814 1/8/2014	12WW23-010814 1/8/2014	12WW24-12111 12/11/2013	12WW25(30)-080914 08/12/2014
Volatile Organic Compounds (8260B)								
1,1,1,2-TETRACHLOROETHANE	ug/L	110	<0.500 U	<0.500 U	<0.500 U	<0.500 U	<0.500 U	<0.500 U
1,1,1-TRICHLOROETHANE	ug/L	200	<0.500 U	<0.500 U	<0.500 U	<0.500 U	<0.500 U	<0.500 U
1,1,2,2-TETRACHLOROETHANE	ug/L	14	<0.400 U	<0.400 U	<0.400 U	<0.400 U	<0.400 U	<0.400 U
1,1,2-TRICHLOROETHANE	ug/L	5	<0.500 U	<0.500 U	<0.500 U	<0.500 U	<0.500 U	<0.500 U
1,1-DICHLOROETHANE	ug/L	10000	<0.250 U	<0.250 U	<0.250 U	<0.250 U	0.733 J	<0.250 U
1,1-DICHLOROETHENE	ug/L	7	<1.00 U	<1.00 U	<1.00 U	<1.00 U	0.888 J	<1.00 U
1,1-DICHLOROPROPENE	ug/L	2.9	<0.500 U	<0.500 U	<0.500 U	<0.500 U	<0.500 U	<0.500 U
1,2,3-TRICHLOROBENZENE	ug/L	310	<0.300 U	<0.300 U	<0.300 U	<0.300 U	<0.300 U	<0.300 U
1,2,3-TRICHLOROPROPANE	ug/L	0.004	<1.00 U	<1.00 U	<1.00 U	<1.00 U	<1.00 U	<1.00 U
1,2,4-TRICHLOROBENZENE	ug/L	70	<0.400 U	<0.400 U	<0.400 U	<0.400 U	<0.400 U	<0.400 U
1,2,4-TRIMETHYLBENZENE	ug/L	5100	<0.500 U	<0.500 U	<0.500 U	<0.500 U	<0.500 U	<0.500 U
1,2-DIBROMO-3-CHLOROPROPANE	ug/L	0.2	<2.00 U	<2.00 U	<2.00 U	<2.00 U	<2.00 U	<2.00 U
1,2-DIBROMOETHANE	ug/L	0.005	<0.500 U	<0.500 U	<0.500 U	<0.500 U	<0.500 U	<0.500 U
1,2-DICHLOROBENZENE	ug/L	600	<0.250 U	<0.250 U	<0.250 U	<0.250 U	<0.250 U	<0.250 U
1,2-DICHLOROETHANE	ug/L	5	<0.500 U	<0.500 U	<0.500 U	<0.500 U	<0.500 U	<0.500 U
1,2-DICHLOROPROPANE	ug/L	5	<0.400 U	<0.400 U	<0.400 U	<0.400 U	<0.400 U	<0.400 U
1,3,5-TRIMETHYLBENZENE	ug/L	5100	<0.500 U	<0.500 U	<0.500 U	<0.500 U	<0.500 U	<0.500 U
1,3-DICHLOROBENZENE	ug/L	3100	<0.500 U	<0.500 U	<0.500 U	<0.500 U	<0.500 U	<0.500 U
1,3-DICHLOROPROPANE	ug/L	29	<0.400 U	<0.400 U	<0.400 U	<0.400 U	<0.400 U	<0.400 U
1,4-DICHLOROBENZENE	ug/L	75	<0.250 U	<0.250 U	<0.250 U	<0.250 U	3.64	0.293 J
2,2-DICHLOROPROPANE	ug/L	42	<0.500 U	<0.500 U	<0.500 U	<0.500 U	<0.500 U	<0.500 U
2-BUTANONE	ug/L	61000	<5.00 U	<5.00 U	<5.00 U	<5.00 U	<5.00 U	<5.00 U
2-CHLOROTOLUENE	ug/L	2000	<0.250 U	<0.250 U	<0.250 U	<0.250 U	<0.250 U	<0.250 U
2-HEXANONE	ug/L	6100	<5.00 U	<5.00 U	<5.00 U	<5.00 U	<5.00 U	<5.00 U
4-CHLOROTOLUENE	ug/L	2000	<0.500 U	<0.500 U	<0.500 U	<0.500 U	<0.500 U	<0.500 U
4-METHYL-2-PENTANONE	ug/L	8200	<5.00 U	<5.00 U	<5.00 U	<5.00 U	<5.00 U	<5.00 U
ACETONE	ug/L	92000	<5.00 U	<5.00 U	<5.00 U	8.76 J	7.45 J	5.15 J
BENZENE	ug/L	5	<0.250 U	<0.250 U	<0.250 U	<0.250 U	0.619 J	0.38 J
BROMOBENZENE	ug/L	2000	<0.250 U	<0.250 U	<0.250 U	<0.250 U	<0.250 U	<0.250 U
BROMOCHLOROMETHANE	ug/L	4100	<0.400 U	<0.400 U	<0.400 U	<0.400 U	<0.400 U	<0.400 U
BROMODICHLOROMETHANE	ug/L	4.6	<0.500 U	<0.500 U	<0.500 U	<0.500 U	<0.500 U	<0.500 U
BROMOFORM	ug/L	36	<1.00 U	<1.00 U	<1.00 U	<1.00 U	<1.00 U	<1.00 U
BROMOMETHANE	ug/L	140	<1.00 U	<1.00 U	<1.00 U	<1.00 U	<1.00 U	<1.00 UJ
CARBON DISULFIDE	ug/L	10000	<1.00 U	<1.00 U	<1.00 U	<1.00 U	<1.00 U	<1.00 U
CARBON TETRACHLORIDE	ug/L	5	<0.500 U	<0.500 U	<0.500 U	<0.500 U	<0.500 U	<0.500 U
CHLOROBENZENE	ug/L	100	<0.250 U	<0.250 U	<0.250 U	<0.250 U	7.32	0.873 J
CHLOROETHANE	ug/L	41000	<1.00 U	<1.00 U	<1.00 U	<1.00 U	<1.00 U	<1.00 U
CHLOROFORM	ug/L	1000	<0.250 U	<0.250 U	<0.250 U	<0.250 U	0.143 J	<0.250 U
CHLOROMETHANE	ug/L	220	<1.00 U	<1.00 U	<1.00 U	<1.00 U	<1.00 U	<1.00 U
CIS-1,2-DICHLOROETHENE	ug/L	70	0.552 J	<0.500 U	<0.500 U	<0.500 U	66.1	0.402 J
CIS-1,3-DICHLOROPROPENE	ug/L	5.3	<0.500 U	<0.500 U	<0.500 U	<0.500 U	<0.500 U	<0.500 U
DIBROMOCHLOROMETHANE	ug/L	34	<0.500 U	<0.500 U	<0.500 U	<0.500 U	<0.500 U	<0.500 U
DIBROMOMETHANE	ug/L	380	<0.500 U	<0.500 U	<0.500 U	<0.500 U	<0.500 U	<0.500 U
DICHLORODIFLUOROMETHANE	ug/L	20000	<0.500 U	<0.500 U	<0.500 U	<0.500 U	<0.500 U	<0.500 UJ
ETHYLBENZENE	ug/L	700	<0.500 U	<0.500 U	<0.500 U	<0.500 U	<0.500 U	<0.500 U
HEXACHLOROBUTADIENE	ug/L	20	<0.500 U	<0.500 U	<0.500 U	<0.500 U	<0.500 U	<0.500 U
ISOPROPYLBENZENE	ug/L	1000	<0.500 U	<0.500 U	<0.500 U	<0.500 U	<0.500 U	<0.500 U
m,p-Xylene	ug/L	10000	<1.00 U	<1.00 U	<1.00 U	<1.00 U	<1.00 U	<1.00 U
METHYLENE CHLORIDE	ug/L	5	<0.500 U	<0.500 U	<0.500 U	<0.500 U	<0.500 U	0.388 J
NAPHTHALENE	ug/L	2000	<0.400 U	<0.400 U	<0.400 U	<0.400 U	<0.400 U	<0.400 U
N-BUTYLBENZENE	ug/L	4100	<0.500 U	<0.500 U	<0.500 U	<0.500 U	<0.500 U	<0.500 U
N-PROPYLBENZENE	ug/L	4100	<0.250 U	<0.250 U	<0.250 U	<0.250 U	<0.250 U	<0.250 U
O-XYLENE	ug/L	10000	<0.500 U	<0.500 U	<0.500 U	<0.500 U	<0.500 U	<0.500 U
P-ISOPROPYLTOLUENE	ug/L	10000	<0.500 U	<0.500 U	<0.500 U	<0.500 U	<0.500 U	<0.500 U
SEC-BUTYLBENZENE	ug/L	4100	<0.500 U	<0.500 U	<0.500 U	<0.500 U	<0.500 U	<0.500 U
STYRENE	ug/L	100	<0.250 U	<0.250 U	<0.250 U	<0.250 U	<0.250 U	<0.250 U
TERT-BUTYLBENZENE	ug/L	4100	<0.500 U	<0.500 U	<0.500 U	<0.500 U	<0.500 U	<0.500 U
TETRACHLOROETHENE	ug/L	5	<0.500 U	<0.500 U	<0.500 U	<0.500 U	1.54	<0.500 U
TOLUENE	ug/L	1000	<0.500 U	<0.500 U	<0.500 U	<0.500 U	<0.500 U	<0.500 U
TRANS-1,2-DICHLOROETHENE	ug/L	100	<0.500 U	<0.500 U	<0.500 U	<0.500 U	0.276 J	<0.500 U
TRANS-1,3-DICHLOROPROPENE	ug/L	29	<1.00 U	<1.00 U	<1.00 U	<1.00 U	<1.00 U	<1.00 U
TRICHLOROETHENE	ug/L	5	0.721 J	<0.500 U	<0.500 U	<0.500 U	*259	0.317 J
TRICHLOROFLUOROMETHANE	ug/L	31000	<0.500 U	<0.500 U	<0.500 U	<0.500 U	<0.500 U	<0.500 U
VINYL CHLORIDE	ug/L	2	<0.500 U	<0.500 U	<0.500 U	<0.500 U	0.873 J	<0.500 U

Blue Highlighting Indicates Analyte Detected Above MCL/MSC.

* Analyte was diluted 5X

J - Estimated value; analyte concentration was less than the limit of quantification

MCL - maximum contaminant level

MSC - medium specific concentrations

NA - not analyzed

U - Analyte was not detected.

µg/L - microgram per liter

Table 2-3: Historic TCE Concentrations (ug/L) at LHAAP-12 Monitoring Wells

Sampling Date	Monitoring Wells				
	12WW20	12WW21	12WW22	12WW23	12WW24
Dec 2006	0.713	ND(1)	ND(1)	ND(1)	404
Sept 2007	1.34	ND(1)	ND(1)	ND(1)	272
Dec 2007	1.19	ND(1)	ND(1)	ND(1)	313
Mar 2008	0.999J	ND(0.25)	ND(0.25)	ND(0.25)	301
Jun 2008	1.04	ND(0.25)	ND(0.25)	ND(0.25)	237
Sept 2008	0.985	ND(0.25)	ND(0.25)	ND(0.25)	185
Feb 2009	1.18	ND(0.25)	ND(0.25)	ND(0.25)	334
Apr 2009	0.997	ND(0.25)	ND(0.25)	ND(0.25)	197
Jul 2009	0.931	ND(0.25)	ND(0.25)	ND(0.25)	204
Jun 2010	0.353J	ND(0.25)	ND(0.25)	ND(0.25)	145
Jun 2011	0.263J	ND(0.25)	ND(0.25)	ND(0.25)	147
Dec 2012	0.5J	0.582J	ND(0.5)	ND(0.5)	Dry Well

Notes:

J	estimated result
ND	not detected; values within parentheses denote detection limits

3 CONCLUSIONS

Physical inspections and groundwater monitoring continue to be completed at LHAAP-12 in compliance with the ROD for LHAAP-12 (Shaw, 2006). No damage to bollards, pads, or protective casings was observed, and no encroachment of weeds or brush on the well pads was observed. Monitoring well identification tag replacement, as well as painting/re-labeling as needed, for wells outside the current monitoring network was completed in fall 2013. No change in land or groundwater use has occurred at the site. LUCs were verified, and the use of the site is still consistent with that mandated by the ROD.

In accordance with the Groundwater Sampling Plan, found in Appendix A of the RD Addendum for LHAAP-12 (Shaw, 2007), annual sampling of wells will continue until the next Five-Year Review. Results for Year 6 are documented in this report.

Monitoring well 12WW24 was sampled on December 11, 2013 for VOCs. TCE was detected above its MCL at 259 μg/L. The MCL for TCE is 5 μg/L. VOC concentrations in 12WW24 have shown a decreasing trend over the past several years excluding this most recent year, where all three COCs increased. Some seasonal variation is likely present in the levels of the COCs over time as the data were collected in variable seasons; however, the long-term trend is a declining one. 12WW24 had detections for cis-1,2-DCE (66.1 μg/L), VC (0.873 μg/L), but they were not above the MCL/medium specific concentration (MSC).

Monitoring wells 12WW20, 12WW21, 12WW22, and 12WW23 were sampled on January 8, 2014 for VOCs. No contaminants were detected above their MCLs. Monitoring well 12WW20 had detections for cis-1,2-DCE (0.552 μg/L) and TCE (0.721 μg/L), but they were not above the MCL/MSC. Based upon recommendations from the Five-Year Review, a new plume area well is planned for installation in 2014.

4 REFERENCES

AECOM, 2013, *Standard Operating Procedures, Groundwater Sampling Procedures*, Longhorn Army Ammunition Plant, Karnack, Texas, June.

AECOM, 2014, *Final 2013 Five-Year Review Report*, Longhorn Army Ammunition Plant, Karnack, Texas, May.

Shaw, 2006, *Final Record of Decision, Landfill 12 (LHAAP-12)*, Longhorn Army Ammunition Plant, Karnack, Texas, August.

Shaw, 2007, *Final Remedial Design Addendum Landfill 12 (LHAAP-12)*, Longhorn Army Ammunition Plant, Karnack, Texas, June.

Shaw, 2011, *Draft Annual Remedial Action Operation Report, Years 1 and 2, Landfill 12 (LHAAP-12)*, Longhorn Army Ammunition Plant, Karnack, Texas, June.

APPENDIX A: PHOTO LOG

LHAAP-12 entry – signage, fencing, and gate in good condition – November 2013

Fencing along site in good condition – November 2013

LHAAP-12 identification sign (located at entry of site) – November 2013

Downed tree on eastern fence (has been removed, and fence repaired) – November 2013

12WW05 - December 2012

12WW05 - October 2013

12WW20 - December 2012

12WW20 - October 2013

12WW23 - December 2012

12WW23 - October 2013

12WW24 - December 2012

12WW24 - October 2013

APPENDIX B: LUC INSPECTION AND MAINTENANCE LOG

LUC Inspection and Maintenance Log - LHAAP 12

<table>
<tr><th rowspan="3">Date</th><th rowspan="3">Inspected by:</th><th colspan="5">Activities
Yearly, at a minimum</th><th rowspan="3">Corrective action or repairs required?</th><th rowspan="3">Repairs / Action Taken</th></tr>
<tr><th colspan="4">Protect landfill integrity</th><th>Prevent human exposure to groundwater</th></tr>
<tr><th>Vegetative Cover maintained: i.e. grass mowed at least annually</th><th>Fence and signage maintained</th><th>Observance of landfill cover degredation -e.g. desiccation cracks, erosion, or gullying</th><th>Continued compliance verified for no digging or disturbance of landfill cover or contents</th><th>Verified no withdrawl of use of groundwater (other than environmental testing)</th></tr>
<tr><td>10/29/2013</td><td>Wacker</td><td>Completed and maintained except as noted in corrective action section.</td><td>Completed and maintained</td><td>Vegetative cover lacking in 6 locations requiring re-seeding or erosion control matting to be installed.</td><td>Evidence of animal burrows along north east edge of cap; and two depressed areas of subsidence requiring soil and seeding</td><td>Completed and verified.</td><td>Reseeding of bare areas completed, followed by erosion control matting in the spring if seeding not effective; Addition of soil and seeding to areas of subsidence and animal borrows</td><td>Re-seeding with winter rye completed November 2013.</td></tr>
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APPENDIX C: MONITORING WELL SAMPLING FORMS

AECOM

MONITORING WELL SAMPLE COLLECTION FORM

LOCATION	Site: 12	LocID: 12WW20	Date: 1/8/14
	Project: Longhorn Army Ammunition Plant	Project No. 60256135.0005AA	Recorded By: Scott Beesinger Checked By:
EQUIPMENT	Water Quality Meter Type/ID #: Horiba U-52	Water Interface Probe: Water Level Indicator ID# Solinist 101	Min Recharge Level = (TD-DTW(0.80)) - TD
	Unit #	Sampling Equipment: Peristaltic/Bladder/Bailer ID#:	
WELL INFO	Casing I.D. (in) [a]: 4"	Static Water Level Reading (ft) [c]: 20.71	Weather Conditions: Cloudy 39°F
	Total Well Depth (ft) [d]: 39.23	Screened Interval/Pump placement: 28-38 33.00	Condition of Well/Remarks: Good

CASING INFO	Casing I.D. (in) [a]:	0.75	1.5	2.0	2.2	3.0	4.0	4.3	5.0	6.0	7.0	8.0
	Unit Casing Volume (gal/lin ft) [b]:	0.023	0.09	0.16	0.20	0.37	0.65	0.75	1.0	1.5	2.0	2.6

Date	Time (24 hr)	Water Level (FTOC)	Pumping Rate (mL/min)	Temp. (°C)	pH	Cond (mS/cm)	DO (mg/L)	Turb. (NTU)	ORP (mv)	Remarks (odor, clarity, etc.)
1-8-14	1350	20.69	100	14.32	5.82	0.991	2.42	0.0	165	
1-8-14	1355	20.71	100	16.22	5.75	0.977	0.73	0.2	203	
1-8-14	1400	20.73	100	17.05	5.69	0.967	0.35	0.6	241	
1-8-14	1405	20.75	100	17.29	5.69	0.966	0.20	0.4	265	
1-8-14	1410	20.77	100	17.56	5.70	0.964	0.18	0.0	284	
1-8-14	1415	20.79	100	17.65	5.70	0.964	0.12	0.0	312	
1-8-14	1420	20.81	100	17.74	5.70	0.964	0.11	0.0	315	
1-8-14	1425	20.83	100	17.80	5.69	0.964	0.10	0.0	317	
1-8-14	1430	20.85	100	17.75	5.88	0.964	0.10	0.0	318	

Pump Rate: <=0.5 L/min **Drawdown:** <0.33 ft **Measurements:** 3-5 min **Stabilization:** +/-10% C, +/-0.1 pH, +/-3% Cond, +/-10% DO, +/-10%Turb(<=10 NTU ideal), for 4 consecutive readings

SAMPLE ID: 12WW20-010814 **TIME:** 1430

No. Containers/Volume/Type	Preserv.	Filter (Y/N)	Pump OR Bailer	Parameter(s)
3 - 40 mL glass	HCL	No	Pump	VOC

DUPLICATE (D): YES/NO NO

MATRIX SPIKE (MS): YES/NO NO

MATRIX DUPLICATE (MD): YES/NO NO

CO= LEL= OXY= H2S=

AECOM

MONITORING WELL SAMPLE COLLECTION FORM

Page 1 of 1
00192797

LOCATION	Site: 12	LocID: 12WW21	Date: 1/8/14
	Project: Longhorn Army Ammunition Plant	Project No. 60256135.0005AA	Recorded By: Scott Beesinger Checked By:
EQUIPMENT	Water Quality Meter Type/ID #: Horiba U-52	Water Interface Probe: Water Level Indicator ID# Solinist 101	Min Recharge Level = (TD-DTW(0.80)) - TD
	Unit #	Sampling Equipment: Peristaltic/Bladder/Bailer ID#:	
WELL INFO	Casing I.D. (in) [a]: 4"	Static Water Level Reading (ft) [c]: 24.56	Weather Conditions: Cloudy 39°F
	Total Well Depth (ft) [d]: 41.80	Screened Interval/Pump placement: 31-41 36.00	Condition of Well/Remarks: Good

CASING INFO	Casing I.D. (in) [a]:	0.75	1.5	2.0	2.2	3.0	4.0	4.3	5.0	6.0	7.0	8.0
	Unit Casing Volume (gal/lin ft) [b]:	0.023	0.09	0.16	0.20	0.37	0.65	0.75	1.0	1.5	2.0	2.6

Date	Time (24 hr)	Water Level (FTOC)	Pumping Rate (mL/min)	Temp. (°C)	pH	Cond (mS/cm)	DO (mg/L)	Turb. (NTU)	ORP (mv)	Remarks (odor, clarity, etc.)
1-8-14	1235	24.55	100	11.93	6.34	5.33	2.13	1.1	26	
1-8-14	1240	24.56	100	14.70	6.13	5.30	0.21	2.1	13	
1-8-14	1245	24.57	100	15.45	6.10	5.45	0.06	1.6	10	
1-8-14	1250	24.58	100	15.75	6.04	5.47	0.02	0.3	7	
1-8-14	1255	24.59	100	15.93	6.08	5.50	0.00	0.0	5	
1-8-14	1300	24.60	100	16.12	6.08	5.51	0.00	0.0	3	
1-8-14	1305	24.61	100	16.07	6.08	5.51	0.00	0.0	2	
1-8-14	1310	24.62	100	16.00	6.07	5.52	0.00	0.0	0	
1-8-14	1315	24.63	100	16.07	6.07	5.52	0.00	0.0	-1	

Pump Rate: <=0.5 L/min **Drawdown:** <0.33 ft **Measurements:** 3-5 min **Stabilization: +/-10% C, +/-0.1 pH, +/-3% Cond, +/-10% DO, +/-10%Turb(<=10 NTU ideal), for 4 consecutive readings**

SAMPLE ID: 12WW21-010814 TIME: 13:15

No. Containers/Volume/Type	Preserv.	Filter (Y/N)	Pump OR Bailer	Parameter(s)
3 - 40 mL glass	HCL	No	Pump	VOC

DUPLICATE (D): YES/NO No
MATRIX SPIKE (MS): YES/NO No
MATRIX DUPLICATE (MD): YES/NO No

CO= LEL= OXY= H2S=

AECOM

MONITORING WELL SAMPLE COLLECTION FORM

LOCATION	Site: 12	LocID: 12WW22	Date: 1/8/14
	Project: Longhorn Army Ammunition Plant	Project No. 60256135.0005AA	Recorded By: Scott Beesinger Checked By:
EQUIPMENT	Water Quality Meter Type/ID #: Horiba U-52	Water Interface Probe: Water Level Indicator ID# Solinist 101	Min Recharge Level = (TD-DTW(0.80)) - TD
	Unit #	Sampling Equipment: Peristaltic/Bladder/Bailer ID#:	
WELL INFO	Casing I.D. (in) [a]: 4"	Static Water Level Reading (ft) [c]: 10.57	Weather Conditions: Cloudy 35°F
	Total Well Depth (ft) [d]: 38.68	Screened Interval/Pump placement: 28-38 33.00	Condition of Well/Remarks: GOOD

CASING INFO	Casing I.D. (in) [a]:	0.75	1.5	2.0	2.2	3.0	4.0	4.3	5.0	6.0	7.0	8.0
	Unit Casing Volume (gal/lin ft) [b]:	0.023	0.09	0.16	0.20	0.37	0.65	0.75	1.0	1.5	2.0	2.6

Date	Time (24 hr)	Water Level (FTOC)	Pumping Rate (mL/min)	Temp. (°C)	pH	Cond (mS/cm)	DO (mg/L)	Turb. (NTU)	ORP (mv)	Remarks (odor, clarity, etc.)
1-8-14	1005	10.58	100	13.12	7.13	1.20	0.77	29.2	-17	
1-8-14	1010	10.60	100	13.56	7.45	1.26	0.26	30.3	-37	
1-8-14	1015	10.62	100	14.17	7.44	1.26	0.13	21.4	-35	
1-8-14	1020	10.63	100	14.30	7.46	1.26	0.11	20.5	-28	
1-8-14	1025	10.64	100	14.47	7.45	1.26	0.10	20.9	-23	
1-8-14	1030	10.65	100	14.50	7.45	1.27	0.09	20.5	-21	
1-8-14	1035	10.66	100	14.57	7.45	1.28	0.08	20.7	-20	
1-8-14	1040	10.67	100	14.60	7.45	1.28	0.08	20.6	-19	
1-8-14	1045	10.68	100	14.65	7.45	1.29	0.08	20.8	-19	

Pump Rate: <=0.5 L/min **Drawdown:** <0.33 ft **Measurements:** 3-5 min **Stabilization: +/-10% C, +/-0.1 pH, +/-3% Cond, +/-10% DO, +/-10%Turb(<=10 NTU ideal), for 4 consecutive readings**

SAMPLE ID: 12WW22-010814 **TIME:** 1045	**No. Containers/Volume/Type**	**Preserv.**	**Filter (Y/N)**	**Pump OR Bailer**	**Parameter(s)**
	3 - 40 mL glass	**HCL**	**No**	Pump	**VOC**
DUPLICATE (D): YES/NO NO					
MATRIX SPIKE (MS): YES/NO NO					
MATRIX DUPLICATE (MD): YES/NO NO					
CO= LEL= OXY= H2S=					

AECOM

MONITORING WELL SAMPLE COLLECTION FORM

LOCATION	Site: 12	LocID: 12WW23	Date: 1/8/14
	Project: Longhorn Army Ammunition Plant	Project No. 60256135.0005AA	Recorded By: Scott Beesinger Checked By:
EQUIPMENT	Water Quality Meter Type/ID #: Horiba U-52	Water Interface Probe: Water Level Indicator ID# Solinist 101	Min Recharge Level = (TD-DTW(0.80)) - TD
	Unit #	Sampling Equipment: Peristaltic/Bladder/Bailer ID#:	
WELL INFO	Casing I.D. (in) [a]: 4"	Static Water Level Reading (ft) [c]: 20.80	Weather Conditions: Cloudy 34°F
	Total Well Depth (ft) [d]: 25.48	Screened Interval/Pump placement: 15-25 23.00	Condition of Well/Remarks: Good

CASING INFO	Casing I.D. (in) [a]:	0.75	1.5	2.0	2.2	3.0	4.0	4.3	5.0	6.0	7.0	8.0
	Unit Casing Volume (gal/lin ft) [b]:	0.023	0.09	0.16	0.20	0.37	0.65	0.75	1.0	1.5	2.0	2.6

Date	Time (24 hr)	Water Level (FTOC)	Pumping Rate (mL/min)	Temp. (°C)	pH	Cond (mS/cm)	DO (mg/L)	Turb. (NTU)	ORP (mv)	Remarks (odor, clarity, etc.)
1-8-14	0850	20.79	100	13.50	6.06	0.579	1.91	5.8	1	
1-8-14	0855	20.82	100	14.90	6.12	0.527	1.00	5.1	-15	
1-8-14	0900	20.84	100	15.79	6.12	0.508	0.59	2.2	-20	
1-8-14	0905	20.86	100	16.17	6.12	0.500	0.26	3.6	-23	
1-8-14	0910	20.88	100	16.40	6.10	0.500	0.13	3.5	-22	
1-8-14	0915	20.90	100	16.52	6.09	0.499	0.10	2.5	-24	
1-8-14	0920	20.92	100	16.55	6.09	0.498	0.09	2.0	-24	
1-8-14	0925	20.94	100	16.59	6.09	0.498	0.08	2.0	-24	

Pump Rate: <=0.5 L/min **Drawdown:** <0.33 ft **Measurements:** 3-5 min **Stabilization:** +/-10% C, +/-0.1 pH, +/-3% Cond, +/-10% DO, +/-10%Turb(<=10 NTU ideal), for 4 consecutive readings

SAMPLE ID: 12WW23-010814 **TIME:** 0925

No. Containers/Volume/Type	Preserv.	Filter (Y/N)	Pump OR Bailer	Parameter(s)
3 - 40 mL glass	HCL	No	Pump	VOC

DUPLICATE (D): YES/NO NO
MATRIX SPIKE (MS): YES/NO NO
MATRIX DUPLICATE (MD): YES/NO NO

CO= LEL= OXY= H2S=

AECOM

MONITORING WELL SAMPLE COLLECTION FORM

LOCATION	Site: 12	LocID: 12WW24	Date: 12/9/13
	Project: Longhorn Army Ammunition Plant	Project No. 60256135.0005AA	Recorded By: Scott Beesinger Checked By:
EQUIPMENT	Water Quality Meter Type/ID #: Horiba U-52	Water Interface Probe: Water Level Indicator ID# Solinist 101	Min Recharge Level = (TD-DTW(0.80)) - TD
	Unit # 21238	Sampling Equipment: Peristaltic/Bladder/Bailer ID#:	
WELL INFO	Casing I.D. (in) [a]: 4"	Static Water Level Reading (ft) [c]: 26.00	Weather Conditions: Clear 45°F
	Total Well Depth (ft) [d]: 28.23	Screened Interval/Pump placement: 15.5 -25.5	Condition of Well/Remarks: GOOD

CASING INFO	Casing I.D. (in) [a]:	**0.75**	1.5	**2.0**	2.2	3.0	**4.0**	4.3	5.0	6.0	7.0	8.0
	Unit Casing Volume (gal/lin ft) [b]:	**0.023**	0.09	**0.16**	0.20	0.37	**0.65**	0.75	1.0	1.5	2.0	2.6

Date	Time (24 hr)	Water Level (FTOC)	Pumping Rate (mL/min)	Temp. (°C)	pH	Cond (mS/cm)	DO (mg/L)	Turb. (NTU)	ORP (mv)	Remarks (odor, clarity, etc.)
12-10-13	1445	26.00	NA							only 2 ft water bailing well
12-10-13	1453	28.20	NA							Bailed 1.75 gallons RAN Dry
12-11-13	0730	26.05	NA	14.66	6.85	1.45	6.64	26.0	198	

Pump Rate: <=0.5 L/min **Drawdown:** <0.33 ft **Measurements:** 3-5 min **Stabilization:** +/-10% C, +/-0.1 pH, +/-3% Cond, +/-10% DO, +/-10%Turb(<=10 NTU ideal), for 4 consecutive readings

SAMPLE ID: 12ww24-121113 TIME: 0730

DUPLICATE (D): YES/NO NO

MATRIX SPIKE (MS): YES/NO NO

MATRIX DUPLICATE (MD): YES/NO NO

CO= LEL= OXY= H2S=

No. Containers/Volume/Type	Preserv.	Filter (Y/N)	Pump OR Bailer	Parameter(s)
3 - 40 mL glass	HCL	N	Bailer	VOC

APPENDIX D: LABORATORY ANALYTICAL RESULTS

QUALITY CONTROL SUMMARY REPORT
FOR
LANDFILL 12 (LHAAP-12)
LONGHORN ARMY AMMUNITION PLANT
KARNACK, TEXAS

Prepared For:

U.S. Army Corps of Engineers

Prepared By:

AECOM Technical Services

June 2014

Table of Contents

List of Tables

1 INTRODUCTION

AECOM reviewed one data package from Microbac Laboratory Services, Marietta, OH. Groundwater samples were collected December 11, 2013 and January 8, 2014 at Site 12 at Longhorn Army Ammunition Plant (LHAAP), Karnack, Texas. Data were reviewed for conformance to the requirements of the following guidance documents: Automated Data Review by Laboratory Data Consultants (ADR.net), United States Environmental Protection Agency (EPA) Contract Laboratory Program National Functional Guidelines for Inorganic Data Review, (EPA, July 2002), and EPA Contract Laboratory Program National Functional Guidelines for Low Concentration Organic Data Review, (EPA, June 2001).

1.1 Intended Use of Data

The objective of this sampling event for LHAAP-12 is to monitor remedy performance by natural attenuation with land use controls.

Analyses requested included:

- SW8260 – Volatiles by GC/MS

Table 2 lists the sample identifications and their associated laboratory identifications. Table 3 lists qualified results with the associated quality control parameter that was exceeded.

1.2 Preservation and Holding Times

Sample identification data were evaluated for agreement with the chain-of-custody (COC). All samples were received in appropriate containers, within the proper temperature range, in good condition, and with the required signatures.

1.3 Calibrations

Initial calibration criteria modification includes RSD< or = to 30%, two compounds allowed up to 40%. If the continuing calibration verification (CCV) compound exceeds 30% drift, the compound is checked in the LCS, if both are outside recovery limits, the compound is rejected, R. If only the CCV exceeds recovery criteria and is less than ± 40% drift, then the compound is qualified J or UJ.

1.3.1 Continuing Calibration Verifications (CCV)

CCVs are within limits.

1.3.2 Blanks

Where contamination by a target analyte of one of the various blanks was found, if the sample result for an associated sample was non-detect or less than 5X (10X for common laboratory contaminants) the analyte concentration in the blank, the corresponding sample result for the analyte was qualified B. Where the sample result for the affected analyte was greater than 5X the amount in the blank, no qualifier was applied.

All blanks show no contamination.

1.3.3 Surrogates

All surrogates are within criteria.

1.3.4 Laboratory Control Sample (LCS)

All LCS are within criteria.

2 DATA USABILITY SUMMARY

The data are usable for the intended purposes of the project. The data quality objectives have been met for the project.

Table 1: Completeness by Method

Method	Total Analytes	No. of Rejected Results	% Completeness
SW8260	320	0	100

Table 2: Field Sample Identification and Laboratory Identification

ClientSampleID	LabSampleID	Collected	SW8260
12WW24-121113	L13120825-01	12/11/2013	X
Trip blank	L13120825-02	12/11/2013	X
12WW23-010814	L14010285-01	1/8/2014	X
12WW22-010814	L14010285-02	1/8/2014	X
12WW21-010814	L14010285-03	1/8/2014	X
12WW20-010814	L14010285-04	1/8/2014	X
Trip blank	L14010285-05	1/8/2014	X

Table 3: Qualified Analytical Data

ClientSampleID	LabSampleID	AnalyteName	DVQualOverall	Reason
NO QUALIFIED DATA				

Microbac

Laboratory Report Number: L13120825

Linda Raabe
AECOM Technical Services, Inc.
112 East Pecan
San Antonio, TX 78205

Please find enclosed the analytical results for the samples you submitted to Microbac Laboratories. Review and compilation of your report was completed by Microbac's Ohio Valley Division (OVD). If you have any questions, comments, or require further assistance regarding this report, please contact your service representative listed below.

Laboratory Contact:
Kathy Albertson – Team Chemist/Data Specialist
(740) 373-4071
Kathy.Albertson@microbac.com

I certify that all test results meet all of the requirements of the DoD QSM and other applicable contract terms and conditions. Any exceptions are attached to this cover page or addressed in the method narratives presented in the report. All results for soil samples are reported on a 'dry-weight' basis unless specified otherwise. Analytical results for water and wastes are reported on a 'as received' basis unless specified otherwise. A statement of uncertainty for each analysis is available upon request. This laboratory report shall not be reproduced, except in full, without the written approval of Microbac Laboratories, DoD ELAP certification number 2936.01. The reported results are related only to the samples analyzed as received.

This report was certified on December 26 2013

David E. Vandenberg

David Vandenberg – Managing Director

State of Origin: TX
Accrediting Authority: Texas Commission on Environmental Quality ID:T104704252-07-TX
QAPP: DOD Ver 4.1

Ethics Service Quality ACIL 2010 Seal of Excellence Program

ACCREDITED IN ACCORDANCE WITH nelac

Microbac

Lab Report #: L13120825
Lab Project #: 2551.096
Project Name: Longhorn Army Ammunition
Lab Contact: Kathy Albertson

Record of Sample Receipt and Inspection

Comments/Discrepancies

This is the record of the shipment conditions and the inspection records for the samples received and reported as a sample delivery group (SDG). All of the samples were inspected and observed to conform to our receipt policies, except as noted below.

There were no discrepancies.

Discrepancy	Resolution

Coolers

Cooler #	Temperature Gun	Temperature	COC #	Airbill #	Temp Required?
0014778	H	0.0		J2317155207	X
0013613	H	1.0		J2317155190	X

Inspection Checklist

#	Question	Result
1	Were shipping coolers sealed?	Yes
2	Were custody seals intact?	Yes
3	Were cooler temperatures in range of 0-6?	Yes
4	Was ice present?	Yes
5	Were COC's received/information complete/signed and dated?	Yes
6	Were sample containers intact and match COC?	Yes
7	Were sample labels intact and match COC?	Yes
8	Were the correct containers and volumes received?	Yes
9	Were samples received within EPA hold times?	Yes
10	Were correct preservatives used? (water only)	Yes
11	Were pH ranges acceptable? (voa's excluded)	NA
12	Were VOA samples free of headspace (less than 6mm)?	Yes

Samples Received

Client ID	Laboratory ID	Date Collected	Date Received
12WW24-12111	L13120825-01	12/11/2013 07:30	12/13/2013 10:21
TRIP BLANK	L13120825-02	12/11/2013 00:01	12/13/2013 10:21

Microbac REPORT L13120825
PREPARED FOR AECOM Technical Services, Inc.
WORK ID:

1.0 Summary Data

1.1 Narratives

Texas Risk Reduction Program (TRRP) Checklist

Laboratory Name:	Microbac OVD	**Laboratory Log Number:**	L13120825
Project Name:		**Method:**	8260
Prep Batch Number(s):	457314, 457423	**Reviewer Name:**	Michael Albertson
LRC Date:	2013-12-26 00:00:00		

Laboratory Data Package Cover Page

X	R1	Field chain-of-custody documentation;
X	R2	Sample identification cross-reference;
X	R3	Test reports (analytical data sheets) for each environmental sample that includes: (a) Items consistent with NELAC Chapter 5, (b) dilution factors, (c) preparation methods, (d) cleanup methods, and (e) a.if required for the project, tentatively identified compounds (TICs).
X	R4	Surrogate recovery data including: (a) Calculated recovery (%R), and (b) the laboratory's surrogate QC limits.
X	R5	Test reports/summary forms for blank samples;
X	R6	Test reports/summary forms for laboratory control samples (LCSs) including: (a) LCS spiking amounts, (b) calculated %R for each analyte, and (c) the laboratory's LCS QC limits.
X	R7	Test reports for project matrix spike/matrix spike duplicates (MS/MSDs) including: (a) samples associated with the MS/MSD clearly identified, (b) MS/MSD spiking compounds, (c) concentration of each MS/MSD analyte measured in the parent and spiked samples, (d) calculated %Rs and relative percent differences (RPDs), and (e) the laboratory's MS/MSD QC limits.
X	R8	Laboratory analytical duplicate (if applicable) recovery and precision: (a) the amount of analyte measured in the duplicate, (b) the calculated RPD, and (c) the laboratory's QC limits for analytical duplicates.
X	R9	List of method quantitation limits (MQLs) and detectability check sample results for each analyte for each method and matrix.
X	R10	Other problems or anomalies.

Name (Printed)	Signature	Official Title (Printed)	Date
Michael Albertson		Volatiles Supervisor	2013-12-26 21:17:36

RG-366/TRRP-13 May 2010 **ID:** 4307

Texas Risk Reduction Program (TRRP) Checklist

Laboratory Name:	Microbac OVD	**Laboratory Log Number:**	L13120825
Project Name:		**Method:**	8260
Prep Batch Number(s):	457314, 457423	**Reviewer Name:**	Michael Albertson
LRC Date:	2013-12-26 00:00:00		

Description	Yes	No	NA	NR	ER#
Chain-of-custody (C-O-C)					
Did samples meet the laboratory's standard conditions of sample acceptability upon receipt?	X				
Were all departures from standard conditions described in an exception report?	X				
Sample and quality control (QC) identification	X				
Are all field sample ID numbers cross-referenced to the laboratory ID numbers?	X				
Are all laboratory ID numbers cross-referenced to the corresponding QC data?	X				
Test reports					
Were all samples prepared and analyzed within holding times?	X				
Other than those results < MQL, were all other raw values bracketed by calibration standards?	X				
Were calculations checked by a peer or supervisor?	X				
Were all analyte identifications checked by a peer or supervisor?	X				
Were sample detection limits reported for all analytes not detected?	X				
Were all results for soil and sediment samples reported on a dry weight basis?	X				
Were % moisture (or solids) reported for all soil and sediment samples?	X				
Were bulk soils/solids samples for volatile analysis extracted with methanol per SW846 Method 5035?			X		
If required for the project, are TICs reported?			X		
Surrogate recovery data					
Were surrogates added prior to extraction?	X				
Were surrogate percent recoveries in all samples within the laboratory QC limits?	X				
Test reports/summary forms for blank samples	X				
Were appropriate type(s) of blanks analyzed?	X				
Were blanks analyzed at the appropriate frequency?	X				
Were method blanks taken through the entire analytical process, including preparation and, if applicable, cleanup procedures?	X				
Were blank concentrations < MQL?	X				
Laboratory control samples (LCS):					
Were all COCs included in the LCS?	X				

Microbac

Texas Risk Reduction Program (TRRP) Checklist

Laboratory Name:	Microbac OVD	**Laboratory Log Number:**	L13120825
Project Name:		**Method:**	8260
Prep Batch Number(s):	457314, 457423	**Reviewer Name:**	Michael Albertson
LRC Date:	2013-12-26 00:00:00		

Was each LCS taken through the entire analytical procedure, including prep and cleanup steps?	X				
Were LCSs analyzed at the required frequency?	X				
Were LCS (and LCSD, if applicable) %Rs within the laboratory QC limits?		X			1
Does the detectability check sample data document the laboratory's capability to detect the COCs at the MDL used to calculate the SDLs?	X				
Was the LCSD RPD within QC limits?	X				
Matrix spike (MS) and matrix spike duplicate (MSD) data					
Were the project/method specified analytes included in the MS and MSD?			X		
Were MS/MSD analyzed at the appropriate frequency?			X		
Were MS (and MSD, if applicable) %Rs within the laboratory QC limits?			X		
Were MS/MSD RPDs within laboratory QC limits?			X		
Analytical duplicate data					
Were appropriate analytical duplicates analyzed for each matrix?			X		
Were analytical duplicates analyzed at the appropriate frequency?			X		
Were RPDs or relative standard deviations within the laboratory QC limits?			X		
Method quantitation limits (MQLs):					
Are the MQLs for each method analyte included in the laboratory data package?	X				
Do the MQLs correspond to the concentration of the lowest non-zero calibration standard?	X				
Are unadjusted MQLs and DCSs included in the laboratory data package?	X				
Other problems/anomalies					
Are all known problems/anomalies/special conditions noted in this LRC and ER?	X				
Was applicable and available technology used to lower the SDL to minimize the matrix interference effects on the sample results?	X				
Is the laboratory NELAC-accredited under the Texas Laboratory Accreditation Program for the analytes, matrices and methods associated with this laboratory data package?	X				
Initial calibration (ICAL)					
Were response factors and/or relative response factors for each analyte within QC limits?	X				
Were percent RSDs or correlation coefficient criteria met?	X				

Texas Risk Reduction Program (TRRP) Checklist

Laboratory Name:	Microbac OVD	**Laboratory Log Number:**	L13120825
Project Name:		**Method:**	8260
Prep Batch Number(s):	457314, 457423	**Reviewer Name:**	Michael Albertson
LRC Date:	2013-12-26 00:00:00		

Was the number of standards recommended in the method used for all analytes?	X				
Were all points generated between the lowest and highest standard used to calculate the curve?	X				
Are ICAL data available for all instruments used?	X				
Has the initial calibration curve been verified using an appropriate second source standard?	X				
Initial and continuing calibration verification (ICCV and CCV) and continuing calibration blank (CCB):					
Was the CCV analyzed at the method-required frequency?	X				
Were percent differences for each analyte within the method-required QC limits?		X			3
Was the ICAL curve verified for each analyte?		X			2
Was the absolute value of the analyte concentration in the inorganic CCB < MDL?			X		
Mass spectral tuning					
Was the appropriate compound for the method used for tuning?	X				
Were ion abundance data within the method-required QC limits?	X				
Internal standards (IS)					
Were IS area counts and retention times within the method-required QC limits?	X				
Raw data (NELAC Section 5.5.10)					
Were the raw data (for example, chromatograms, spectral data) reviewed by an analyst?	X				
Were data associated with manual integrations flagged on the raw data?	X				
Dual column confirmation					
Did dual column confirmation results meet the method-required QC?			X		
Tentatively identified compounds (TICs)					
If TICs were requested, were the mass spectra and TIC data subject to appropriate checks?			X		
Interference Check Sample (ICS) results					
Were percent recoveries within method QC limits?			X		
Serial dilutions, post digestion spikes, and method of standard additions					
Were percent differences, recoveries, and the linearity within the QC limits specified in the method?			X		
Method detection limit (MDL) studies					

Texas Risk Reduction Program (TRRP) Checklist

Laboratory Name:	Microbac OVD	**Laboratory Log Number:**	L13120825
Project Name:		**Method:**	8260
Prep Batch Number(s):	457314, 457423	**Reviewer Name:**	Michael Albertson
LRC Date:	2013-12-26 00:00:00		

Was a MDL study performed for each reported analyte?	X				
Is the MDL either adjusted or supported by the analysis of DCSs?	X				
Proficiency test reports					
Was the laboratory's performance acceptable on the applicable proficiency tests or evaluation studies?	X				
Standards documentation					
Are all standards used in the analyses NIST-traceable or obtained from other appropriate sources?	X				
Compound/analyte identification procedures					
Are the procedures for compound/analyte identification documented?	X				
Demonstration of analyst competency (DOC)					
Was DOC conducted consistent with NELAC Chapter 5?	X				
Is documentation of the analyst's competency up-to-date and on file?	X				
Verification/validation documentation for methods (NELAC Chapter 5)					
Are all the methods used to generate the data documented, verified, and validated, where applicable?	X				
Laboratory standard operating procedures (SOPs)					
Are laboratory SOPs current and on file for each method performed	X				

1. Items identified by the letter “R” must be included in the laboratory data package submitted in the TRRP-required report(s). Items identified by the letter “S” should be retained and made available upon request for the appropriate retention period;
2. O = organic analyses; I = inorganic analyses (and general chemistry, when applicable);
3. NA = Not applicable;
4. NR = Not reviewed;
5. ER# = Exception Report identification number (an Exception Report should be completed for an item if “NR” or “No” is checked).

The Exception Report for each “No” or “Not Reviewed (NR)” item in Laboratory Review Checklist and for each analyte, matrix, and method for which the laboratory does not hold NELAC accreditation under the Texas Laboratory Accreditation Program.

Release Statement: I am responsible for the release of this laboratory data package. This laboratory is NELAC accredited under the Texas Laboratory Accreditation Program for all the methods, analytes, and matrices reported in this data package except as noted in the Exception Reports. The data have been reviewed and are technically compliant with the requirements of the methods used, except where noted by the laboratory in the Exception Reports. By my signature

Texas Risk Reduction Program (TRRP) Checklist

Laboratory Name:	Microbac OVD	**Laboratory Log Number:**	L13120825
Project Name:		**Method:**	8260
Prep Batch Number(s):	457314, 457423	**Reviewer Name:**	Michael Albertson
LRC Date:	2013-12-26 00:00:00		

below, I affirm to the best of my knowledge all problems/anomalies observed by the laboratory have been identified in the Laboratory Review Checklist, and no information affecting the quality of the data has been knowingly withheld.

Check, if applicable: [ ] This laboratory meets an exception under 30 TAC §25.6 and was last inspection by [ ] TCEQ or [ ] ___________ on **(enter date of last inspection)**. Any findings affecting the data in this laboratory data package are noted in the Exception Reports herein. The official signing the cover page of the report in which these data are used is responsible for releasing this data package and is by signature affirming the above release statement is true.

Exceptions Report

1) Recoveries out of range were observed for the following analytes: acetone. Please see the applicable QC report for a detailed presentation of the failures.
2) Recoveries out of range were observed for the following analytes: dichlorodifluoromethane. Please see the applicable QC report for a detailed presentation of the failures.
3) Recoveries out of range were observed for the following analytes: acetone. Please see the applicable QC report for a detailed presentation of the failures.

1.2 Certificate of Analysis

Lab Report #: L13120825
Lab Project #: 2551.096
Project Name: Longhorn Army Ammunition
Lab Contact: Kathy Albertson

Certificate of Analysis

Sample #:	L13120825-01	**PrePrep Method:**	N/A	**Instrument:**	HPMS17
Client ID:	12WW24-12111	**Prep Method:**	5030B/5030C/5035A	**Prep Date:**	N/A
Matrix:	Water	**Analytical Method:**	8260B	**Cal Date:**	11/15/2013 19:13
Workgroup #:	WG457314	**Analyst:**	ADC	**Run Date:**	12/23/2013 02:05
Collect Date:	12/11/2013 07:30	**Dilution:**	1	**File ID:**	17M001857
Sample Tag:	01	**Units:**	ug/L		

Analyte	CAS #	Result	Qual	LOQ	LOD	DL
Acetone	67-64-1	7.45	J	10.0	5.00	2.50
Benzene	71-43-2	0.619	J	1.00	0.250	0.125
Bromobenzene	108-86-1	0.250	U	1.00	0.250	0.125
Bromochloromethane	74-97-5	0.400	U	1.00	0.400	0.200
Bromodichloromethane	75-27-4	0.500	U	1.00	0.500	0.250
Bromoform	75-25-2	1.00	U	2.00	1.00	0.500
Bromomethane	74-83-9	1.00	U	2.00	1.00	0.500
2-Butanone	78-93-3	5.00	U	10.0	5.00	2.50
n-Butylbenzene	104-51-8	0.500	U	1.00	0.500	0.250
sec-Butylbenzene	135-98-8	0.500	U	1.00	0.500	0.250
tert-Butylbenzene	98-06-6	0.500	U	1.00	0.500	0.250
Carbon disulfide	75-15-0	1.00	U	2.00	1.00	0.500
Carbon tetrachloride	56-23-5	0.500	U	1.00	0.500	0.250
Chlorobenzene	108-90-7	7.32		1.00	0.250	0.125
Chlorodibromomethane	124-48-1	0.500	U	1.00	0.500	0.250
Chloroethane	75-00-3	1.00	U	2.00	1.00	0.500
Chloroform	67-66-3	0.143	J	1.00	0.250	0.125
Chloromethane	74-87-3	1.00	U	2.00	1.00	0.500
2-Chlorotoluene	95-49-8	0.250	U	1.00	0.250	0.125
4-Chlorotoluene	106-43-4	0.500	U	1.00	0.500	0.250
1,2-Dibromo-3-chloropropane	96-12-8	2.00	U	5.00	2.00	1.00
1,2-Dibromoethane	106-93-4	0.500	U	1.00	0.500	0.250
Dibromomethane	74-95-3	0.500	U	1.00	0.500	0.250
1,2-Dichlorobenzene	95-50-1	0.250	U	1.00	0.250	0.125
1,3-Dichlorobenzene	541-73-1	0.500	U	1.00	0.500	0.250
1,4-Dichlorobenzene	106-46-7	3.64		1.00	0.250	0.125
Dichlorodifluoromethane	75-71-8	0.500	U	1.00	0.500	0.250
1,1-Dichloroethane	75-34-3	0.733	J	1.00	0.250	0.125
1,2-Dichloroethane	107-06-2	0.500	U	1.00	0.500	0.250
1,1-Dichloroethene	75-35-4	0.888	J	2.00	1.00	0.500
cis-1,2-Dichloroethene	156-59-2	66.1		1.00	0.500	0.250
trans-1,2-Dichloroethene	156-60-5	0.276	J	1.00	0.500	0.250

Analyte	CAS #	Result	Qual	LOQ	LOD	DL
1,2-Dichloropropane	78-87-5	0.400	U	1.00	0.400	0.200
1,3-Dichloropropane	142-28-9	0.400	U	1.00	0.400	0.200
2,2-Dichloropropane	594-20-7	0.500	U	1.00	0.500	0.250
cis-1,3-Dichloropropene	10061-01-5	0.500	U	1.00	0.500	0.250
trans-1,3-Dichloropropene	10061-02-6	1.00	U	2.00	1.00	0.500
1,1-Dichloropropene	563-58-6	0.500	U	1.00	0.500	0.250
Ethylbenzene	100-41-4	0.500	U	1.00	0.500	0.250
2-Hexanone	591-78-6	5.00	U	10.0	5.00	2.50
Hexachlorobutadiene	87-68-3	0.500	U	1.00	0.500	0.250
Isopropylbenzene	98-82-8	0.500	U	1.00	0.500	0.250
p-Isopropyltoluene	99-87-6	0.500	U	1.00	0.500	0.250
4-Methyl-2-pentanone	108-10-1	5.00	U	10.0	5.00	2.50
Methylene chloride	75-09-2	0.500	U	1.00	0.500	0.250
Naphthalene	91-20-3	0.400	U	1.00	0.400	0.200
n-Propylbenzene	103-65-1	0.250	U	1.00	0.250	0.125
Styrene	100-42-5	0.250	U	1.00	0.250	0.125
1,1,1,2-Tetrachloroethane	630-20-6	0.500	U	1.00	0.500	0.250
1,1,2,2-Tetrachloroethane	79-34-5	0.400	U	1.00	0.400	0.200
Tetrachloroethene	127-18-4	1.54		1.00	0.500	0.250
Toluene	108-88-3	0.500	U	1.00	0.500	0.250
1,2,3-Trichlorobenzene	87-61-6	0.300	U	1.00	0.300	0.150
1,2,4-Trichlorobenzene	120-82-1	0.400	U	1.00	0.400	0.200
1,1,1-Trichloroethane	71-55-6	0.500	U	1.00	0.500	0.250
1,1,2-Trichloroethane	79-00-5	0.500	U	1.00	0.500	0.250
Trichlorofluoromethane	75-69-4	0.500	U	1.00	0.500	0.250
1,2,3-Trichloropropane	96-18-4	1.00	U	2.00	1.00	0.500
1,2,4-Trimethylbenzene	95-63-6	0.500	U	1.00	0.500	0.250
1,3,5-Trimethylbenzene	108-67-8	0.500	U	1.00	0.500	0.250
Vinyl chloride	75-01-4	0.873	J	1.00	0.500	0.250
o-Xylene	95-47-6	0.500	U	1.00	0.500	0.250
m-,p-Xylene	179601-23-1	1.00	U	2.00	1.00	0.500

Surrogate	Recovery	Lower Limit	Upper Limit	Q
Dibromofluoromethane	103	85	115	
1,2-Dichloroethane-d4	95.9	70	120	
Toluene-d8	99.0	85	120	
4-Bromofluorobenzene	91.2	75	120	

J	Estimated value ; the analyte concentration was less than the LOQ.
J	Estimated value ; the analyte concentration was greater than the highest standard
U	Analyte was not detected. The concentration is below the reported LOD.

Certificate of Analysis

Sample #:	L13120825-01	**PrePrep Method:**	N/A	**Instrument:**	HPMS11
Client ID:	12WW24-12111	**Prep Method:**	5030B/5030C/5035A	**Prep Date:**	N/A
Matrix:	Water	**Analytical Method:**	8260B	**Cal Date:**	11/05/2013 21:39
Workgroup #:	WG457423	**Analyst:**	FJB	**Run Date:**	12/23/2013 19:04
Collect Date:	12/11/2013 07:30	**Dilution:**	5	**File ID:**	11M97812
Sample Tag:	DL01	**Units:**	ug/L		

Analyte	CAS #	Result	Qual	LOQ	LOD	DL
Acetone	67-64-1	39.0	B	50.0	25.0	12.5
Benzene	71-43-2	1.17	J	5.00	1.25	0.625
Bromobenzene	108-86-1	1.25	U	5.00	1.25	0.625
Bromochloromethane	74-97-5	2.00	U	5.00	2.00	1.00
Bromodichloromethane	75-27-4	2.50	U	5.00	2.50	1.25
Bromoform	75-25-2	5.00	U	10.0	5.00	2.50
Bromomethane	74-83-9	5.00	U	10.0	5.00	2.50
2-Butanone	78-93-3	25.0	U	50.0	25.0	12.5
n-Butylbenzene	104-51-8	2.50	U	5.00	2.50	1.25
sec-Butylbenzene	135-98-8	2.50	U	5.00	2.50	1.25
tert-Butylbenzene	98-06-6	2.50	U	5.00	2.50	1.25
Carbon disulfide	75-15-0	5.00	U	10.0	5.00	2.50
Carbon tetrachloride	56-23-5	2.50	U	5.00	2.50	1.25
Chlorobenzene	108-90-7	7.64		5.00	1.25	0.625
Chlorodibromomethane	124-48-1	2.50	U	5.00	2.50	1.25
Chloroethane	75-00-3	5.00	U	10.0	5.00	2.50
Chloroform	67-66-3	1.25	U	5.00	1.25	0.625
Chloromethane	74-87-3	5.00	U	10.0	5.00	2.50
2-Chlorotoluene	95-49-8	1.25	U	5.00	1.25	0.625
4-Chlorotoluene	106-43-4	2.50	U	5.00	2.50	1.25
1,2-Dibromo-3-chloropropane	96-12-8	10.0	U	25.0	10.0	5.00
1,2-Dibromoethane	106-93-4	2.50	U	5.00	2.50	1.25
Dibromomethane	74-95-3	2.50	U	5.00	2.50	1.25
1,2-Dichlorobenzene	95-50-1	1.25	U	5.00	1.25	0.625
1,3-Dichlorobenzene	541-73-1	2.50	U	5.00	2.50	1.25
1,4-Dichlorobenzene	106-46-7	4.24	J	5.00	1.25	0.625
Dichlorodifluoromethane	75-71-8	2.50	U	5.00	2.50	1.25
1,1-Dichloroethane	75-34-3	0.776	J	5.00	1.25	0.625
1,2-Dichloroethane	107-06-2	2.50	U	5.00	2.50	1.25
1,1-Dichloroethene	75-35-4	5.00	U	10.0	5.00	2.50
cis-1,2-Dichloroethene	156-59-2	60.2		5.00	2.50	1.25

Analyte	CAS #	Result	Qual	LOQ	LOD	DL
trans-1,2-Dichloroethene	156-60-5	2.50	U	5.00	2.50	1.25
1,2-Dichloropropane	78-87-5	2.00	U	5.00	2.00	1.00
1,3-Dichloropropane	142-28-9	2.00	U	5.00	2.00	1.00
2,2-Dichloropropane	594-20-7	2.50	U	5.00	2.50	1.25
cis-1,3-Dichloropropene	10061-01-5	2.50	U	5.00	2.50	1.25
trans-1,3-Dichloropropene	10061-02-6	5.00	U	10.0	5.00	2.50
1,1-Dichloropropene	563-58-6	2.50	U	5.00	2.50	1.25
Ethylbenzene	100-41-4	2.50	U	5.00	2.50	1.25
2-Hexanone	591-78-6	25.0	U	50.0	25.0	12.5
Hexachlorobutadiene	87-68-3	1.30	J	5.00	2.50	1.25
Isopropylbenzene	98-82-8	2.50	U	5.00	2.50	1.25
p-Isopropyltoluene	99-87-6	2.50	U	5.00	2.50	1.25
4-Methyl-2-pentanone	108-10-1	25.0	U	50.0	25.0	12.5
Methylene chloride	75-09-2	2.50	U	5.00	2.50	1.25
Naphthalene	91-20-3	3.73	J	5.00	2.00	1.00
n-Propylbenzene	103-65-1	1.25	U	5.00	1.25	0.625
Styrene	100-42-5	1.25	U	5.00	1.25	0.625
1,1,1,2-Tetrachloroethane	630-20-6	2.50	U	5.00	2.50	1.25
1,1,2,2-Tetrachloroethane	79-34-5	2.00	U	5.00	2.00	1.00
Tetrachloroethene	127-18-4	1.41	J	5.00	2.50	1.25
Toluene	108-88-3	2.50	U	5.00	2.50	1.25
1,2,3-Trichlorobenzene	87-61-6	1.53	J	5.00	1.50	0.750
1,2,4-Trichlorobenzene	120-82-1	1.26	J	5.00	2.00	1.00
1,1,1-Trichloroethane	71-55-6	2.50	U	5.00	2.50	1.25
1,1,2-Trichloroethane	79-00-5	2.50	U	5.00	2.50	1.25
Trichloroethene	79-01-6	259		5.00	2.50	1.25
Trichlorofluoromethane	75-69-4	2.50	U	5.00	2.50	1.25
1,2,3-Trichloropropane	96-18-4	5.00	U	10.0	5.00	2.50
1,2,4-Trimethylbenzene	95-63-6	2.50	U	5.00	2.50	1.25
1,3,5-Trimethylbenzene	108-67-8	2.50	U	5.00	2.50	1.25
Vinyl chloride	75-01-4	2.50	U	5.00	2.50	1.25
o-Xylene	95-47-6	2.50	U	5.00	2.50	1.25
m-,p-Xylene	179601-23-1	5.00	U	10.0	5.00	2.50

Surrogate	Recovery	Lower Limit	Upper Limit	Q
Dibromofluoromethane	92.0	85	115	
1,2-Dichloroethane-d4	97.3	70	120	
Toluene-d8	107	85	120	
4-Bromofluorobenzene	115	75	120	

B	The reported result is associated with a contaminated method blank.

J	Estimated value ; the analyte concentration was less than the LOQ.
U	Analyte was not detected. The concentration is below the reported LOD.

Certificate of Analysis

Sample #:	L13120825-02	**PrePrep Method:**	N/A	**Instrument:**	HPMS17
Client ID:	TRIP BLANK	**Prep Method:**	5030B/5030C/5035A	**Prep Date:**	N/A
Matrix:	Water	**Analytical Method:**	8260B	**Cal Date:**	11/15/2013 19:13
Workgroup #:	WG457314	**Analyst:**	ADC	**Run Date:**	12/22/2013 23:35
Collect Date:	12/11/2013 00:01	**Dilution:**	1	**File ID:**	17M001852
Sample Tag:	01	**Units:**	ug/L		

Analyte	CAS #	Result	Qual	LOQ	LOD	DL
Acetone	67-64-1	5.00	U	10.0	5.00	2.50
Benzene	71-43-2	0.250	U	1.00	0.250	0.125
Bromobenzene	108-86-1	0.250	U	1.00	0.250	0.125
Bromochloromethane	74-97-5	0.400	U	1.00	0.400	0.200
Bromodichloromethane	75-27-4	0.500	U	1.00	0.500	0.250
Bromoform	75-25-2	1.00	U	2.00	1.00	0.500
Bromomethane	74-83-9	1.00	U	2.00	1.00	0.500
2-Butanone	78-93-3	5.00	U	10.0	5.00	2.50
n-Butylbenzene	104-51-8	0.500	U	1.00	0.500	0.250
sec-Butylbenzene	135-98-8	0.500	U	1.00	0.500	0.250
tert-Butylbenzene	98-06-6	0.500	U	1.00	0.500	0.250
Carbon disulfide	75-15-0	1.00	U	2.00	1.00	0.500
Carbon tetrachloride	56-23-5	0.500	U	1.00	0.500	0.250
Chlorobenzene	108-90-7	0.250	U	1.00	0.250	0.125
Chlorodibromomethane	124-48-1	0.500	U	1.00	0.500	0.250
Chloroethane	75-00-3	1.00	U	2.00	1.00	0.500
Chloroform	67-66-3	0.250	U	1.00	0.250	0.125
Chloromethane	74-87-3	1.00	U	2.00	1.00	0.500
2-Chlorotoluene	95-49-8	0.250	U	1.00	0.250	0.125
4-Chlorotoluene	106-43-4	0.500	U	1.00	0.500	0.250
1,2-Dibromo-3-chloropropane	96-12-8	2.00	U	5.00	2.00	1.00
1,2-Dibromoethane	106-93-4	0.500	U	1.00	0.500	0.250
Dibromomethane	74-95-3	0.500	U	1.00	0.500	0.250
1,2-Dichlorobenzene	95-50-1	0.250	U	1.00	0.250	0.125
1,3-Dichlorobenzene	541-73-1	0.500	U	1.00	0.500	0.250
1,4-Dichlorobenzene	106-46-7	0.250	U	1.00	0.250	0.125
Dichlorodifluoromethane	75-71-8	0.500	U	1.00	0.500	0.250
1,1-Dichloroethane	75-34-3	0.250	U	1.00	0.250	0.125
1,2-Dichloroethane	107-06-2	0.500	U	1.00	0.500	0.250
1,1-Dichloroethene	75-35-4	1.00	U	2.00	1.00	0.500
cis-1,2-Dichloroethene	156-59-2	0.500	U	1.00	0.500	0.250

Analyte	CAS #	Result	Qual	LOQ	LOD	DL
trans-1,2-Dichloroethene	156-60-5	0.500	U	1.00	0.500	0.250
1,2-Dichloropropane	78-87-5	0.400	U	1.00	0.400	0.200
1,3-Dichloropropane	142-28-9	0.400	U	1.00	0.400	0.200
2,2-Dichloropropane	594-20-7	0.500	U	1.00	0.500	0.250
cis-1,3-Dichloropropene	10061-01-5	0.500	U	1.00	0.500	0.250
trans-1,3-Dichloropropene	10061-02-6	1.00	U	2.00	1.00	0.500
1,1-Dichloropropene	563-58-6	0.500	U	1.00	0.500	0.250
Ethylbenzene	100-41-4	0.500	U	1.00	0.500	0.250
2-Hexanone	591-78-6	5.00	U	10.0	5.00	2.50
Hexachlorobutadiene	87-68-3	0.500	U	1.00	0.500	0.250
Isopropylbenzene	98-82-8	0.500	U	1.00	0.500	0.250
p-Isopropyltoluene	99-87-6	0.500	U	1.00	0.500	0.250
4-Methyl-2-pentanone	108-10-1	5.00	U	10.0	5.00	2.50
Methylene chloride	75-09-2	0.500	U	1.00	0.500	0.250
Naphthalene	91-20-3	0.400	U	1.00	0.400	0.200
n-Propylbenzene	103-65-1	0.250	U	1.00	0.250	0.125
Styrene	100-42-5	0.250	U	1.00	0.250	0.125
1,1,1,2-Tetrachloroethane	630-20-6	0.500	U	1.00	0.500	0.250
1,1,2,2-Tetrachloroethane	79-34-5	0.400	U	1.00	0.400	0.200
Tetrachloroethene	127-18-4	0.500	U	1.00	0.500	0.250
Toluene	108-88-3	0.500	U	1.00	0.500	0.250
1,2,3-Trichlorobenzene	87-61-6	0.300	U	1.00	0.300	0.150
1,2,4-Trichlorobenzene	120-82-1	0.400	U	1.00	0.400	0.200
1,1,1-Trichloroethane	71-55-6	0.500	U	1.00	0.500	0.250
1,1,2-Trichloroethane	79-00-5	0.500	U	1.00	0.500	0.250
Trichloroethene	79-01-6	0.500	U	1.00	0.500	0.250
Trichlorofluoromethane	75-69-4	0.500	U	1.00	0.500	0.250
1,2,3-Trichloropropane	96-18-4	1.00	U	2.00	1.00	0.500
1,2,4-Trimethylbenzene	95-63-6	0.500	U	1.00	0.500	0.250
1,3,5-Trimethylbenzene	108-67-8	0.500	U	1.00	0.500	0.250
Vinyl chloride	75-01-4	0.500	U	1.00	0.500	0.250
o-Xylene	95-47-6	0.500	U	1.00	0.500	0.250
m-,p-Xylene	179601-23-1	1.00	U	2.00	1.00	0.500

Surrogate	Recovery	Lower Limit	Upper Limit	Q
Dibromofluoromethane	101	85	115	
1,2-Dichloroethane-d4	96.0	70	120	
Toluene-d8	101	85	120	
4-Bromofluorobenzene	95.2	75	120	

U	Analyte was not detected. The concentration is below the reported LOD.

2.0 Full Sample Data Package

2.1 Volatiles Data

2.1.1 Volatiles GCMS Data (8260)

2.1.1.1 Summary Data

Certificate of Analysis

Sample #:	L13120825-01	**PrePrep Method:**	N/A	**Instrument:**	HPMS17
Client ID:	12WW24-12111	**Prep Method:**	5030B/5030C/5035A	**Prep Date:**	N/A
Matrix:	Water	**Analytical Method:**	8260B	**Cal Date:**	11/15/2013 19:13
Workgroup #:	WG457314	**Analyst:**	ADC	**Run Date:**	12/23/2013 02:05
Collect Date:	12/11/2013 07:30	**Dilution:**	1	**File ID:**	17M001857
Sample Tag:	01	**Units:**	ug/L		

Analyte	CAS #	Result	Qual	LOQ	LOD	DL
Acetone	67-64-1	7.45	J	10.0	5.00	2.50
Benzene	71-43-2	0.619	J	1.00	0.250	0.125
Bromobenzene	108-86-1	0.250	U	1.00	0.250	0.125
Bromochloromethane	74-97-5	0.400	U	1.00	0.400	0.200
Bromodichloromethane	75-27-4	0.500	U	1.00	0.500	0.250
Bromoform	75-25-2	1.00	U	2.00	1.00	0.500
Bromomethane	74-83-9	1.00	U	2.00	1.00	0.500
2-Butanone	78-93-3	5.00	U	10.0	5.00	2.50
n-Butylbenzene	104-51-8	0.500	U	1.00	0.500	0.250
sec-Butylbenzene	135-98-8	0.500	U	1.00	0.500	0.250
tert-Butylbenzene	98-06-6	0.500	U	1.00	0.500	0.250
Carbon disulfide	75-15-0	1.00	U	2.00	1.00	0.500
Carbon tetrachloride	56-23-5	0.500	U	1.00	0.500	0.250
Chlorobenzene	108-90-7	7.32		1.00	0.250	0.125
Chlorodibromomethane	124-48-1	0.500	U	1.00	0.500	0.250
Chloroethane	75-00-3	1.00	U	2.00	1.00	0.500
Chloroform	67-66-3	0.143	J	1.00	0.250	0.125
Chloromethane	74-87-3	1.00	U	2.00	1.00	0.500
2-Chlorotoluene	95-49-8	0.250	U	1.00	0.250	0.125
4-Chlorotoluene	106-43-4	0.500	U	1.00	0.500	0.250
1,2-Dibromo-3-chloropropane	96-12-8	2.00	U	5.00	2.00	1.00
1,2-Dibromoethane	106-93-4	0.500	U	1.00	0.500	0.250
Dibromomethane	74-95-3	0.500	U	1.00	0.500	0.250
1,2-Dichlorobenzene	95-50-1	0.250	U	1.00	0.250	0.125
1,3-Dichlorobenzene	541-73-1	0.500	U	1.00	0.500	0.250
1,4-Dichlorobenzene	106-46-7	3.64		1.00	0.250	0.125
Dichlorodifluoromethane	75-71-8	0.500	U	1.00	0.500	0.250
1,1-Dichloroethane	75-34-3	0.733	J	1.00	0.250	0.125
1,2-Dichloroethane	107-06-2	0.500	U	1.00	0.500	0.250
1,1-Dichloroethene	75-35-4	0.888	J	2.00	1.00	0.500
cis-1,2-Dichloroethene	156-59-2	66.1		1.00	0.500	0.250
trans-1,2-Dichloroethene	156-60-5	0.276	J	1.00	0.500	0.250

Analyte	CAS #	Result	Qual	LOQ	LOD	DL
1,2-Dichloropropane	78-87-5	0.400	U	1.00	0.400	0.200
1,3-Dichloropropane	142-28-9	0.400	U	1.00	0.400	0.200
2,2-Dichloropropane	594-20-7	0.500	U	1.00	0.500	0.250
cis-1,3-Dichloropropene	10061-01-5	0.500	U	1.00	0.500	0.250
trans-1,3-Dichloropropene	10061-02-6	1.00	U	2.00	1.00	0.500
1,1-Dichloropropene	563-58-6	0.500	U	1.00	0.500	0.250
Ethylbenzene	100-41-4	0.500	U	1.00	0.500	0.250
2-Hexanone	591-78-6	5.00	U	10.0	5.00	2.50
Hexachlorobutadiene	87-68-3	0.500	U	1.00	0.500	0.250
Isopropylbenzene	98-82-8	0.500	U	1.00	0.500	0.250
p-Isopropyltoluene	99-87-6	0.500	U	1.00	0.500	0.250
4-Methyl-2-pentanone	108-10-1	5.00	U	10.0	5.00	2.50
Methylene chloride	75-09-2	0.500	U	1.00	0.500	0.250
Naphthalene	91-20-3	0.400	U	1.00	0.400	0.200
n-Propylbenzene	103-65-1	0.250	U	1.00	0.250	0.125
Styrene	100-42-5	0.250	U	1.00	0.250	0.125
1,1,1,2-Tetrachloroethane	630-20-6	0.500	U	1.00	0.500	0.250
1,1,2,2-Tetrachloroethane	79-34-5	0.400	U	1.00	0.400	0.200
Tetrachloroethene	127-18-4	1.54		1.00	0.500	0.250
Toluene	108-88-3	0.500	U	1.00	0.500	0.250
1,2,3-Trichlorobenzene	87-61-6	0.300	U	1.00	0.300	0.150
1,2,4-Trichlorobenzene	120-82-1	0.400	U	1.00	0.400	0.200
1,1,1-Trichloroethane	71-55-6	0.500	U	1.00	0.500	0.250
1,1,2-Trichloroethane	79-00-5	0.500	U	1.00	0.500	0.250
Trichloroethene	79-01-6	310	J	1.00	0.500	0.250
Trichlorofluoromethane	75-69-4	0.500	U	1.00	0.500	0.250
1,2,3-Trichloropropane	96-18-4	1.00	U	2.00	1.00	0.500
1,2,4-Trimethylbenzene	95-63-6	0.500	U	1.00	0.500	0.250
1,3,5-Trimethylbenzene	108-67-8	0.500	U	1.00	0.500	0.250
Vinyl chloride	75-01-4	0.873	J	1.00	0.500	0.250
o-Xylene	95-47-6	0.500	U	1.00	0.500	0.250
m-,p-Xylene	179601-23-1	1.00	U	2.00	1.00	0.500

Surrogate	Recovery	Lower Limit	Upper Limit	Q
Dibromofluoromethane	103	85	115	
1,2-Dichloroethane-d4	95.9	70	120	
Toluene-d8	99.0	85	120	
4-Bromofluorobenzene	91.2	75	120	

J	Estimated value ; the analyte concentration was less than the LOQ.
J	Estimated value ; the analyte concentration was greater than the highest standard

U	Analyte was not detected. The concentration is below the reported LOD.

Certificate of Analysis

Sample #:	L13120825-01	**PrePrep Method:**	N/A	**Instrument:**	HPMS11
Client ID:	12WW24-12111	**Prep Method:**	5030B/5030C/5035A	**Prep Date:**	N/A
Matrix:	Water	**Analytical Method:**	8260B	**Cal Date:**	11/05/2013 21:39
Workgroup #:	WG457423	**Analyst:**	FJB	**Run Date:**	12/23/2013 19:04
Collect Date:	12/11/2013 07:30	**Dilution:**	5	**File ID:**	11M97812
Sample Tag:	DL01	**Units:**	ug/L		

Analyte	CAS #	Result	Qual	LOQ	LOD	DL
Acetone	67-64-1	39.0	B	50.0	25.0	12.5
Benzene	71-43-2	1.17	J	5.00	1.25	0.625
Bromobenzene	108-86-1	1.25	U	5.00	1.25	0.625
Bromochloromethane	74-97-5	2.00	U	5.00	2.00	1.00
Bromodichloromethane	75-27-4	2.50	U	5.00	2.50	1.25
Bromoform	75-25-2	5.00	U	10.0	5.00	2.50
Bromomethane	74-83-9	5.00	U	10.0	5.00	2.50
2-Butanone	78-93-3	25.0	U	50.0	25.0	12.5
n-Butylbenzene	104-51-8	2.50	U	5.00	2.50	1.25
sec-Butylbenzene	135-98-8	2.50	U	5.00	2.50	1.25
tert-Butylbenzene	98-06-6	2.50	U	5.00	2.50	1.25
Carbon disulfide	75-15-0	5.00	U	10.0	5.00	2.50
Carbon tetrachloride	56-23-5	2.50	U	5.00	2.50	1.25
Chlorobenzene	108-90-7	7.64		5.00	1.25	0.625
Chlorodibromomethane	124-48-1	2.50	U	5.00	2.50	1.25
Chloroethane	75-00-3	5.00	U	10.0	5.00	2.50
Chloroform	67-66-3	1.25	U	5.00	1.25	0.625
Chloromethane	74-87-3	5.00	U	10.0	5.00	2.50
2-Chlorotoluene	95-49-8	1.25	U	5.00	1.25	0.625
4-Chlorotoluene	106-43-4	2.50	U	5.00	2.50	1.25
1,2-Dibromo-3-chloropropane	96-12-8	10.0	U	25.0	10.0	5.00
1,2-Dibromoethane	106-93-4	2.50	U	5.00	2.50	1.25
Dibromomethane	74-95-3	2.50	U	5.00	2.50	1.25
1,2-Dichlorobenzene	95-50-1	1.25	U	5.00	1.25	0.625
1,3-Dichlorobenzene	541-73-1	2.50	U	5.00	2.50	1.25
1,4-Dichlorobenzene	106-46-7	4.24	J	5.00	1.25	0.625
Dichlorodifluoromethane	75-71-8	2.50	U	5.00	2.50	1.25
1,1-Dichloroethane	75-34-3	0.776	J	5.00	1.25	0.625
1,2-Dichloroethane	107-06-2	2.50	U	5.00	2.50	1.25
1,1-Dichloroethene	75-35-4	5.00	U	10.0	5.00	2.50
cis-1,2-Dichloroethene	156-59-2	60.2		5.00	2.50	1.25

Analyte	CAS #	Result	Qual	LOQ	LOD	DL
trans-1,2-Dichloroethene	156-60-5	2.50	U	5.00	2.50	1.25
1,2-Dichloropropane	78-87-5	2.00	U	5.00	2.00	1.00
1,3-Dichloropropane	142-28-9	2.00	U	5.00	2.00	1.00
2,2-Dichloropropane	594-20-7	2.50	U	5.00	2.50	1.25
cis-1,3-Dichloropropene	10061-01-5	2.50	U	5.00	2.50	1.25
trans-1,3-Dichloropropene	10061-02-6	5.00	U	10.0	5.00	2.50
1,1-Dichloropropene	563-58-6	2.50	U	5.00	2.50	1.25
Ethylbenzene	100-41-4	2.50	U	5.00	2.50	1.25
2-Hexanone	591-78-6	25.0	U	50.0	25.0	12.5
Hexachlorobutadiene	87-68-3	1.30	J	5.00	2.50	1.25
Isopropylbenzene	98-82-8	2.50	U	5.00	2.50	1.25
p-Isopropyltoluene	99-87-6	2.50	U	5.00	2.50	1.25
4-Methyl-2-pentanone	108-10-1	25.0	U	50.0	25.0	12.5
Methylene chloride	75-09-2	2.50	U	5.00	2.50	1.25
Naphthalene	91-20-3	3.73	J	5.00	2.00	1.00
n-Propylbenzene	103-65-1	1.25	U	5.00	1.25	0.625
Styrene	100-42-5	1.25	U	5.00	1.25	0.625
1,1,1,2-Tetrachloroethane	630-20-6	2.50	U	5.00	2.50	1.25
1,1,2,2-Tetrachloroethane	79-34-5	2.00	U	5.00	2.00	1.00
Tetrachloroethene	127-18-4	1.41	J	5.00	2.50	1.25
Toluene	108-88-3	2.50	U	5.00	2.50	1.25
1,2,3-Trichlorobenzene	87-61-6	1.53	J	5.00	1.50	0.750
1,2,4-Trichlorobenzene	120-82-1	1.26	J	5.00	2.00	1.00
1,1,1-Trichloroethane	71-55-6	2.50	U	5.00	2.50	1.25
1,1,2-Trichloroethane	79-00-5	2.50	U	5.00	2.50	1.25
Trichloroethene	79-01-6	259		5.00	2.50	1.25
Trichlorofluoromethane	75-69-4	2.50	U	5.00	2.50	1.25
1,2,3-Trichloropropane	96-18-4	5.00	U	10.0	5.00	2.50
1,2,4-Trimethylbenzene	95-63-6	2.50	U	5.00	2.50	1.25
1,3,5-Trimethylbenzene	108-67-8	2.50	U	5.00	2.50	1.25
Vinyl chloride	75-01-4	2.50	U	5.00	2.50	1.25
o-Xylene	95-47-6	2.50	U	5.00	2.50	1.25
m-,p-Xylene	179601-23-1	5.00	U	10.0	5.00	2.50

Surrogate	Recovery	Lower Limit	Upper Limit	Q
Dibromofluoromethane	92.0	85	115	
1,2-Dichloroethane-d4	97.3	70	120	
Toluene-d8	107	85	120	
4-Bromofluorobenzene	115	75	120	

B	The reported result is associated with a contaminated method blank.

J	Estimated value ; the analyte concentration was less than the LOQ.
U	Analyte was not detected. The concentration is below the reported LOD.

Certificate of Analysis

Sample #:	L13120825-02	**PrePrep Method:**	N/A	**Instrument:**	HPMS17
Client ID:	TRIP BLANK	**Prep Method:**	5030B/5030C/5035A	**Prep Date:**	N/A
Matrix:	Water	**Analytical Method:**	8260B	**Cal Date:**	11/15/2013 19:13
Workgroup #:	WG457314	**Analyst:**	ADC	**Run Date:**	12/22/2013 23:35
Collect Date:	12/11/2013 00:01	**Dilution:**	1	**File ID:**	17M001852
Sample Tag:	01	**Units:**	ug/L		

Analyte	CAS #	Result	Qual	LOQ	LOD	DL
Acetone	67-64-1	5.00	U	10.0	5.00	2.50
Benzene	71-43-2	0.250	U	1.00	0.250	0.125
Bromobenzene	108-86-1	0.250	U	1.00	0.250	0.125
Bromochloromethane	74-97-5	0.400	U	1.00	0.400	0.200
Bromodichloromethane	75-27-4	0.500	U	1.00	0.500	0.250
Bromoform	75-25-2	1.00	U	2.00	1.00	0.500
Bromomethane	74-83-9	1.00	U	2.00	1.00	0.500
2-Butanone	78-93-3	5.00	U	10.0	5.00	2.50
n-Butylbenzene	104-51-8	0.500	U	1.00	0.500	0.250
sec-Butylbenzene	135-98-8	0.500	U	1.00	0.500	0.250
tert-Butylbenzene	98-06-6	0.500	U	1.00	0.500	0.250
Carbon disulfide	75-15-0	1.00	U	2.00	1.00	0.500
Carbon tetrachloride	56-23-5	0.500	U	1.00	0.500	0.250
Chlorobenzene	108-90-7	0.250	U	1.00	0.250	0.125
Chlorodibromomethane	124-48-1	0.500	U	1.00	0.500	0.250
Chloroethane	75-00-3	1.00	U	2.00	1.00	0.500
Chloroform	67-66-3	0.250	U	1.00	0.250	0.125
Chloromethane	74-87-3	1.00	U	2.00	1.00	0.500
2-Chlorotoluene	95-49-8	0.250	U	1.00	0.250	0.125
4-Chlorotoluene	106-43-4	0.500	U	1.00	0.500	0.250
1,2-Dibromo-3-chloropropane	96-12-8	2.00	U	5.00	2.00	1.00
1,2-Dibromoethane	106-93-4	0.500	U	1.00	0.500	0.250
Dibromomethane	74-95-3	0.500	U	1.00	0.500	0.250
1,2-Dichlorobenzene	95-50-1	0.250	U	1.00	0.250	0.125
1,3-Dichlorobenzene	541-73-1	0.500	U	1.00	0.500	0.250
1,4-Dichlorobenzene	106-46-7	0.250	U	1.00	0.250	0.125
Dichlorodifluoromethane	75-71-8	0.500	U	1.00	0.500	0.250
1,1-Dichloroethane	75-34-3	0.250	U	1.00	0.250	0.125
1,2-Dichloroethane	107-06-2	0.500	U	1.00	0.500	0.250
1,1-Dichloroethene	75-35-4	1.00	U	2.00	1.00	0.500
cis-1,2-Dichloroethene	156-59-2	0.500	U	1.00	0.500	0.250

Analyte	CAS #	Result	Qual	LOQ	LOD	DL
trans-1,2-Dichloroethene	156-60-5	0.500	U	1.00	0.500	0.250
1,2-Dichloropropane	78-87-5	0.400	U	1.00	0.400	0.200
1,3-Dichloropropane	142-28-9	0.400	U	1.00	0.400	0.200
2,2-Dichloropropane	594-20-7	0.500	U	1.00	0.500	0.250
cis-1,3-Dichloropropene	10061-01-5	0.500	U	1.00	0.500	0.250
trans-1,3-Dichloropropene	10061-02-6	1.00	U	2.00	1.00	0.500
1,1-Dichloropropene	563-58-6	0.500	U	1.00	0.500	0.250
Ethylbenzene	100-41-4	0.500	U	1.00	0.500	0.250
2-Hexanone	591-78-6	5.00	U	10.0	5.00	2.50
Hexachlorobutadiene	87-68-3	0.500	U	1.00	0.500	0.250
Isopropylbenzene	98-82-8	0.500	U	1.00	0.500	0.250
p-Isopropyltoluene	99-87-6	0.500	U	1.00	0.500	0.250
4-Methyl-2-pentanone	108-10-1	5.00	U	10.0	5.00	2.50
Methylene chloride	75-09-2	0.500	U	1.00	0.500	0.250
Naphthalene	91-20-3	0.400	U	1.00	0.400	0.200
n-Propylbenzene	103-65-1	0.250	U	1.00	0.250	0.125
Styrene	100-42-5	0.250	U	1.00	0.250	0.125
1,1,1,2-Tetrachloroethane	630-20-6	0.500	U	1.00	0.500	0.250
1,1,2,2-Tetrachloroethane	79-34-5	0.400	U	1.00	0.400	0.200
Tetrachloroethene	127-18-4	0.500	U	1.00	0.500	0.250
Toluene	108-88-3	0.500	U	1.00	0.500	0.250
1,2,3-Trichlorobenzene	87-61-6	0.300	U	1.00	0.300	0.150
1,2,4-Trichlorobenzene	120-82-1	0.400	U	1.00	0.400	0.200
1,1,1-Trichloroethane	71-55-6	0.500	U	1.00	0.500	0.250
1,1,2-Trichloroethane	79-00-5	0.500	U	1.00	0.500	0.250
Trichloroethene	79-01-6	0.500	U	1.00	0.500	0.250
Trichlorofluoromethane	75-69-4	0.500	U	1.00	0.500	0.250
1,2,3-Trichloropropane	96-18-4	1.00	U	2.00	1.00	0.500
1,2,4-Trimethylbenzene	95-63-6	0.500	U	1.00	0.500	0.250
1,3,5-Trimethylbenzene	108-67-8	0.500	U	1.00	0.500	0.250
Vinyl chloride	75-01-4	0.500	U	1.00	0.500	0.250
o-Xylene	95-47-6	0.500	U	1.00	0.500	0.250
m-,p-Xylene	179601-23-1	1.00	U	2.00	1.00	0.500

Surrogate	Recovery	Lower Limit	Upper Limit	Q
Dibromofluoromethane	101	85	115	
1,2-Dichloroethane-d4	96.0	70	120	
Toluene-d8	101	85	120	
4-Bromofluorobenzene	95.2	75	120	

U	Analyte was not detected. The concentration is below the reported LOD.

2.1.1.2 QC Summary Data

Example 8260 Calculations

1.0 Calculating the Response Factor (RF) from the initial calibration (ICAL) data:

RF = [(Ax) (Cis)] / [(Ais) (Cx)]

where:

	Example
Ax = Area of the characteristic ion for the compound being measured:	3399156
Cis = Concentration of the specific internal standard (ug/mL)	25
Ais = Area of the characteristic ion of the specific internal standard	846471
Cx = Concentration of the compound in the standard being measured (ug/mL)	100
RF = Calculated Response Factor	**1.0039**

2.0 Calculating the concentration (C) of a compound in water using the average RF: *

Cx = [(Ax) (Cis) (Vn)(D)] / [(Ais) (RF) (Vs)]

where:

	Example
Ax = Area of the characteristic ion for the compound being measured	**3122498**
Cis = Concentration of the specific internal standard (ug/L)	**25**
D = Dilution factor for sample as a multiplier (10x = 10)	**1**
Ais = Area of the characteristic ion of the specific internal standard	**611048**
RF = Average RF from the ICAL	**1.004**
Vs = Purge volume of sample (mL)	**10**
Vn = Nominal purge volume of sample (mL) (10.0 mL)	**10**
Cx = Concentration of the compound in the sample being measured (ug/L)	**127.2428**

3.0 Calculating the concentration (C) of a compound in soil using the average RF: *

Cx = [(Ax) (Cis) (Wn)(D)] / [(Ais) (RF) (Ws)]

where:

	Example
Ax = Area of the characteristic ion for the compound being measured	**3122498**
Cis = Concentration of the specific internal standard (ug/L)	**25**
D = Dilution factor for sample as a multiplier (10x = 10)	**1**
Ais = Area of the characteristic ion of the specific internal standard	**611048**
RF = Average RF from the ICAL	**1.004**
Ws = Weight of sample purged (g)	**5**
Wn = Nominal purge weight (g) (5.0 g)	**5**
Cx = Concentration of the compound in the sample being measured (ug/L)	**127.2428**

Dry weight correction:

Percent solids (PCT_S)	**50**
Cd = (Cx) (100)/PCT_S	**254.4856**

* Concentrations appearing on the instrument quantitation reports are on-column results and do not take into account initial volume, final volume, and the dilution factor.

4.0 Concentration from Linear Regression

Step 1: Retrieve Curve Data From Plot, y = mx + b

y = response ratio = response of analyte / response of IS = Ax/Ais

x = amount ratio = concentration analyte/concentration internal standard = Cx / Cis

m = slope from curve = 0.213

b = intercept from curve = - 0.00642

Step 2: Calculate y from Quantitation Report

y = 86550/593147 = 0.1459

Step 3: Solve for x

x = (y - b)/m = [(0.1459 -(- 0.00642)]/ 0.213 = 0.7152

Step 4: Solve for analyte concentration Cx

Cx = Cis (x) = (25.0)(0.7152) = 17.88

Example Spreadsheet Calculation:

Slope from curve, m:	**0.213**
Intercept from curve, b:	**-0.00642**
Area of analyte, Ax:	**86550**
Area of Internal Standard , Ais:	**593147**
Concentration of IS, Cis	**25.00**
Response Ratio:	**0.145917**
Amount Ratio:	**0.715195**
Concentration:	**17.87988**
Units of Internal Standard:	**ug/L**

5.0 Concentration from Quadratic Regression

Step 1 - Retrieve Curve Data from Plot, y = Ax^2 + Bx + C
Where:
Ax^2 + Bx + (C - y) = 0
A, B, C = constants from the ICAL quadratic regression
y = Response ratio = Area of analyte/Area of internal standard (IS)
x = Amount ratio = Concentration of analyte/concentration of IS

Step 2: Calculate y from Quantitation Report

y = Ax/Ais

Step 3: Solve for x using the quadratic formula
Ax^2 + Bx + C - y = 0

$$x = \frac{b \pm \sqrt{\left(b^2 - 4a\left(c - y\right)\right)}}{2a}$$

(Two possible solutions)

Step 4: Solve for analyte concentration Cx

Cx = (Cis)(Amount ratio)

Example Spreadsheet Calculation:

Value of A from plot:	**-0.00629**	
Value of B from plot:	**0.511**	
Value of C from plot:	**-0.0276**	
Area of unknown from quantitation report:	**293821**	
Area of IS from quantiation report:	**784848**	
Response ratio, y:	**0.374367**	
C - y:	**-0.40197**	
Root 1 - Computed amount ratio , X1:	**80.44567**	
Root 2 - Computed amount ratio , X2:	**0.794396**	use this solution
Concentration of IS, Cis:	**25.00**	
Concentration of analyte, Cx:	**19.86**	ug/L

Run Log ID: **56448**

Microbac Laboratories Inc.

Instrument Run Log

Instrument: HPMS17
Dataset: 101313
Analyst1: MES
Analyst2: NA
Method: 8260B
SOP: MSV01
Rev: 17
Method: 624
SOP: MSV10
Rev: 10
Method: 5030B/5030C/5035A
SOP: PAT01
Rev: 13
Maintenance Log ID: 47805

Internal Standard: STD60409
Surrogate Standard: STD60842
CCV: STD60752
LCS: STD60749
MS/MSD: NA

Column 1 ID: RTX502.2
Column 2 ID: NA
Workgroups: WG448463

Comments: Rerun MDLs for isobutanol and cyclohexanone.

File ID	Sample Information	pH	Mat	Dil	Reference	Date/Time
17M000183	WG448462-01 50NG BFB STD 8260	NA	1	1	STD60561	10/13/13 16:29
17M000184	WG448462-01 50NG BFB STD 8260	NA	1	1	STD60561	10/13/13 16:45
17M000185	WG448466-02 50ug/L WATER STD 8260	NA	1	1	STD60687	10/13/13 17:20
17M000186	WG448462-02 5ug/L APPIX STD	NA	1	1	STD60752	10/13/13 17:48
17M000187	WG448462-03 20ug/L APPIX STD	NA	1	1	STD60752	10/13/13 18:15
17M000188	WG448462-04 50ug/L APPIX STD	NA	1	1	STD60752	10/13/13 18:43
17M000189	WG448462-05 100ug/L APPIX STD	NA	1	1	STD60752	10/13/13 19:11
17M000190	WG448462-06 200ug/L APPIX STD	NA	1	1	STD60752	10/13/13 19:39
17M000191	WG448462-07 300ug/L APPIX STD	NA	1	1	STD60752	10/13/13 20:07
17M000192	WG448462-08 400ug/L APPIX STD	NA	1	1	STD60752	10/13/13 20:35
17M000193	WG448462-09 500ug/L APPIX STD	NA	1	1	STD60752	10/13/13 21:03
17M000194	RINSE	NA	1	1		10/13/13 21:31
17M000195	WG448462-10 100ug/L APPIX ALT SRC	NA	1	1	STD60749	10/13/13 22:00
17M000196	RINSE	NA	1	1		10/13/13 22:27
17M000197	L13100005-12 BLANK	NA	1	1		10/13/13 22:55
17M000198	L13100005-13 BLANK	NA	1	1		10/13/13 23:23
17M000199	L13100005-01 MDL	NA	1	1	STD60752	10/13/13 23:51
17M000200	L13100005-02 MDL	NA	1	1	STD60752	10/14/13 00:18
17M000201	L13100005-03 MDL	NA	1	1	STD60752	10/14/13 00:47
17M000202	L13100005-04 MDL	NA	1	1	STD60752	10/14/13 01:14
17M000203	L13100005-05 MDL	NA	1	1	STD60752	10/14/13 01:43
17M000204	L13100005-06 MDL	NA	1	1	STD60752	10/14/13 02:11
17M000205	L13100005-07 MDL	NA	1	1	STD60752	10/14/13 02:39

Approved: October 18, 2013

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Microbac Laboratories Inc.

Instrument Run Log

Instrument: HPMS11
Dataset: 110513
Analyst1: FJB
Analyst2: TMB
Method: 8260B
SOP: MSV01 / OVAP MSV01
Rev: 18 / 0
Method: 5030B/5030C/5035A
SOP: PAT01 / OVAP PAT01
Rev: 15 / 0
Method: 624
SOP: MSV10
Rev: 11
Maintenance Log ID: 48078

Internal Standard: STD60878
Surrogate Standard: STD60879
CCV: NA
LCS: STD61121
MS/MSD: NA

Column 1 ID: RTX502.2
Column 2 ID: NA
Workgroups: WG451178

Comments: Retuned on a clean source with new filaments. Had to adjust the tune targets. Passed 3 BFBs in a row.

File ID	Sample Information	pH	Mat	Dil	Reference	Date/Time
11M96653	BFB CHECK	NA	1	1		11/05/13 07:13
11M96654	BFB CHECK	NA	1	1		11/05/13 07:29
11M96655	BFB CHECK	NA	1	1		11/05/13 08:01
11M96656	BFB CHECK	NA	1	1		11/05/13 08:42
11M96657	BFB CHECK	NA	1	1		11/05/13 08:54
11M96658	BFB CHECK	NA	1	1		11/05/13 09:07
11M96659	RINSE	NA	1	1		11/05/13 09:32
11M96660	WG451178-01 BFB 50ng 8260	NA	1	1	STD61161	11/05/13 15:39
11M96661	WG451178-01 BFB 50ng 8260	NA	1	1	STD61161	11/05/13 15:54
11M96662	WG451178-02 0.3ug/L STD 8260	NA	1	1	STD61183	11/05/13 16:30
11M96663	WG451178-03 0.4ug/L STD 8260	NA	1	1	STD61183	11/05/13 17:02
11M96664	WG451178-04 1ug/L STD 8260	NA	1	1	STD61183	11/05/13 17:37
11M96665	WG451178-05 2ug/L STD 8260	NA	1	1	STD61183	11/05/13 18:22
11M96666	WG451178-06 5ug/L STD 8260	NA	1	1	STD61183	11/05/13 18:54
11M96667	WG451178-07 20ug/L STD 8260	NA	1	1	STD61183	11/05/13 19:34
11M96668	WG451178-08 50ug/L STD 8260	NA	1	1	STD61183	11/05/13 20:05
11M96669	WG451178-09 100ug/L STD 8260	NA	1	1	STD61183	11/05/13 20:36
11M96670	WG451178-10 200ug/L STD 8260	NA	1	1	STD61183	11/05/13 21:08
11M96671	WG451178-11 300ug/L STD 8260	NA	1	1	STD61183	11/05/13 21:39
11M96672	RINSE	NA	1	1		11/05/13 22:10
11M96673	WG451178-12 20ug/L ALT SRC 8260	NA	1	1	STD61121	11/05/13 22:42
11M96674	RINSE	NA	1	1		11/05/13 23:13

Comments

Seq.	Rerun	Dil.	Reason	Analytes
21				

File ID: 11M96673

Surrogates spiked at 10ppb instead of 25ppb.

Approved: November 07, 2013

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Microbac Laboratories Inc.

Instrument Run Log

Instrument:	HPMS17	Dataset:	111513		
Analyst1:	ADC	Analyst2:	NA		
Method:	8260B	SOP:	MSV01	Rev:	18
Method:	5030C/5035A	SOP:	PAT01	Rev:	15

Maintenance Log ID: 48243

Internal Standard: STD61201 Surrogate Standard: STD61086

CCV: STD61183 LCS: STD61121 MS/MSD: STD61121

Column 1 ID: RTX502.2 Column 2 ID: NA

Workgroups: WG453012

Comments:

File ID	Sample Information	pH	Mat	Dil	Reference	Date/Time
17M001017.R	RINSE	NA	1	1		11/15/13 11:03
17M001018.R	RINSE	NA	1	1		11/15/13 11:31
17M001019	BFB CHECK	NA	1	1		11/15/13 14:07
17M001020	BFB CHECK	NA	1	1		11/15/13 14:19
17M001021	WG453012-01 50ng BFB 8260	NA	1	1	STD60561	11/15/13 14:34
17M001022.R	WG453012-02 0.3ug/L STD 8260	NA	1	1	STD61183	11/15/13 14:58
17M001023.R	WG453012-03 0.4ug/L STD 8260	NA	1	1	STD61183	11/15/13 15:26
17M001024.R	WG453012-04 1.0ug/L STD 8260	NA	1	1	STD61183	11/15/13 15:55
17M001025.R	WG453012-05 2.0ug/L STD 8260	NA	1	1	STD61183	11/15/13 16:23
17M001026.R	WG453012-06 5.0ug/L STD 8260	NA	1	1	STD61183	11/15/13 16:51
17M001027.R	WG453012-07 20.0ug/L STD 8260	NA	1	1	STD61183	11/15/13 17:19
17M001028.R	WG453012-08 50.0ug/L STD 8260	NA	1	1	STD61183	11/15/13 17:48
17M001029.R	WG453012-09 100.0ug/L STD 8260	NA	1	1	STD61183	11/15/13 18:17
17M001030.R	WG453012-10 200.0ug/L STD 8260	NA	1	1	STD61183	11/15/13 18:45
17M001031.R	WG453012-11 300.0ug/L STD 8260	NA	1	1	STD61183	11/15/13 19:13
17M001032.R	RINSE	NA	1	1		11/15/13 19:43
17M001033.R	WG453012-12 50.0ug/L ALTSRC 8260	NA	1	1	STD61121	11/15/13 20:12
17M001034.R	rinse	NA	1	1		11/16/13 17:52
17M001035.R	rinse	NA	1	1		11/16/13 18:22
17M001036.R	rinse	NA	1	1		11/16/13 18:50
17M001037.R	rinse	NA	1	1		11/16/13 19:18

Approved: November 20, 2013

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Microbac Laboratories Inc.

Instrument Run Log

Instrument: HPMS11
Dataset: 120413
Analyst1: FJB
Analyst2: NA
Method: 8260B
SOP: MSV1
Rev: 19
Method: 5030B/5030C/5035A
SOP: PAT01
Rev: 16

Maintenance Log ID: 48563

Internal Standard: STD61448
Surrogate Standard: STD61328
CCV: NA
LCS: STD61663
MS/MSD: NA

Column 1 ID: RTX502.2
Column 2 ID: NA
Workgroups: WG455130

Comments:

File ID	Sample Information	pH	Mat	Dil	Reference	Date/Time
11M97408	WG455130-01 BFB 50ng A9FOO	NA	1	1	STD61161	12/04/13 15:09
11M97409	RINSE	NA	1	1		12/04/13 15:34
11M97410	WG455130-02 5ug/L STD A9FOO	NA	1	1	STD61356	12/04/13 16:06
11M97411	WG455130-03 20ug/L STD A9FOO	NA	1	1	STD61356	12/04/13 16:38
11M97412	WG455130-04 50ug/L STD A9FOO	NA	1	1	STD61356	12/04/13 17:10
11M97413	WG455130-05 100ug/L STD A9FOO	NA	1	1	STD61356	12/04/13 17:41
11M97414	WG455130-06 200ug/L STD A9FOO	NA	1	1	STD61356	12/04/13 18:13
11M97415	WG455130-07 300ug/L STD A9FOO	NA	1	1	STD61356	12/04/13 18:44
11M97416	WG455130-08 400ug/L STD A9FOO	NA	1	1	STD61356	12/04/13 19:15
11M97417	WG455130-09 500ug/L STD A9FOO	NA	1	1	STD61356	12/04/13 19:47
11M97418	RINSE	NA	1	1		12/04/13 20:18
11M97419	WG455130-10 100ug/L ALT SRC A9FOO	NA	1	1	STD61663	12/04/13 20:50

Approved: December 19, 2013

Microbac Laboratories Inc.

Instrument Run Log

Instrument: HPMS17
Dataset: 122213
Analyst1: ADC
Analyst2: NA
Method: 8260B
SOP: MSV01
Rev: 19
Method: 5030C/5035A
SOP: PAT01
Rev: 16

Maintenance Log ID: 48652

Internal Standard: STD61929
Surrogate Standard: STD61555
CCV: STD61850
LCS: STD61695
MS/MSD: STD61695

Column 1 ID: RTX502.2
Column 2 ID: NA
Workgroups: WG457314

Comments:

File ID	Sample Information	pH	Mat	Dil	Reference	Date/Time
17M001840	WG457313-01 BFB 50ng 8260	NA	1	1	STD61669	12/22/13 17:09
17M001841	WG457313-02 50ug/L CCV 8260	NA	1	1	STD61850	12/22/13 17:32
17M001842	RINSE	NA	1	1	STDXXXXX	12/22/13 18:32
17M001843	WG457314-01 VBLK1222 BLANK 8260	NA	1	1		12/22/13 19:02
17M001844	WG457314-02 20ug/L LCS 8260	NA	1	1	STD61695	12/22/13 19:32
17M001845	L13120748-20 A MS 826-SPE	<2	1	1	STD61695	12/22/13 20:02
17M001846	L13120748-21 A MSD 826-SPE	<2	1	1	STD61695	12/22/13 20:32
17M001847	L13120748-05 B 5X 826-SPE	<2	1	5		12/22/13 21:03
17M001848	L13120838-02 B 10X 826-SPE	5	1	10		12/22/13 21:34
17M001849	L13120838-07 B 10X 826-SPE	7	1	10		12/22/13 22:04
17M001850	L13120838-09 B 10X 826-SPE	3	1	10		12/22/13 22:34
17M001851	L13120838-13 B 10X 826-SPE	6	1	10		12/22/13 23:04
17M001852	L13120825-02 A 826-LOW	<2	1	1		12/22/13 23:35
17M001853	L13120858-05 A 826-SPE	<2	1	1		12/23/13 00:05
17M001854	L13120748-19 A 826-SPE	<2	1	1		12/23/13 00:35
17M001855	L13120748-22 A 826-SPE	<2	1	1		12/23/13 01:05
17M001856	L13120748-24 A 826-SPE	<2	1	1		12/23/13 01:35
17M001857	L13120825-01 A 826-LOW	<2	1	1		12/23/13 02:05
17M001858	L13120858-01 A 826-SPE	<2	1	1		12/23/13 02:34
17M001859	L13120858-02 A 826-SPE	<2	1	1		12/23/13 03:04
17M001860	L13120858-03 A 826-SPE	<2	1	1		12/23/13 03:34
17M001861	L13120858-04 A 826-SPE	<2	1	1		12/23/13 04:04
17M001862	L13120858-06 A 826-SPE	<2	1	1		12/23/13 04:33
17M001863	L13120858-07 A 826-SPE	<2	1	1		12/23/13 05:02
17M001864	RINSE	NA	1	1		12/23/13 05:31
17M001865	RINSE	NA	1	1		12/23/13 06:00
17M001866	RINSE	NA	1	1		12/23/13 06:28

Comments

Seq.	Rerun	Dil.	Reason	Analytes
18 File ID: 17M001857				
	rr 5x			

Approved: December 26, 2013

Microbac Laboratories Inc.

Instrument Run Log

Instrument:	HPMS17	Dataset:	122213		
Analyst1:	ADC	Analyst2:	NA		
Method:	8260B	SOP:	MSV01	Rev:	19
Method:	5030C/5035A	SOP:	PAT01	Rev:	16

Maintenance Log ID: 48652

Internal Standard:	STD61929	Surrogate Standard:	STD61555		
CCV:	STD61850	LCS:	STD61695	MS/MSD:	STD61695

Column 1 ID: RTX502.2

Column 2 ID: NA

Workgroups: WG457314

Comments:

Comments

Seq.	Rerun	Dil.	Reason	Analytes
23 File ID: 17M001862				
	rr 10x			

Approved: December 26, 2013

Run Log ID: **57934**

00192851

Microbac Laboratories Inc.

Instrument Run Log

Instrument: HPMS11
Dataset: 122313
Analyst1: FJB
Analyst2: NA
Method: 8260B
SOP: MSV01
Rev: 19
Method: 5030B/5030C/5035A
SOP: PAT01
Rev: 16
Method: 624
SOP: MSV10
Rev: 12
Maintenance Log ID: 48615

Internal Standard: STD61448
Surrogate Standard: STD61766
CCV: STD61850
LCS: STD61695
MS/MSD: STD61695

Column 1 ID: RTX502.2
Column 2 ID: NA
Workgroups: WG457423

Comments:

File ID	Sample Information	pH	Mat	Dil	Reference	Date/Time
11M97804	WG457422-01 BFB 50ng 8260	NA	1	1	STD61669	12/23/13 15:01
11M97805	WG457422-01 BFB 50ng 8260	NA	1	1		12/23/13 15:27
11M97806	WG457422-02 50ug/L CCV 8260	NA	1	1	STD61850	12/23/13 15:55
11M97807	WG457XXX-01 100ug/L CCV A9	NA	1	1	STDXXXXX	12/23/13 16:27
11M97808	WG457423-01 VBLK1223 BLANK 8260	NA	1	1		12/23/13 16:58
11M97809	WG457423-01 VBLK1223 BLANK 8260	NA	1	1		12/23/13 17:30
11M97810	WG457423-02 20ug/L LCS 8260	NA	1	1	STD61695	12/23/13 18:01
11M97811	WG457423-03 20ug/L LCS DUP 8260	NA	1	1	STD61695	12/23/13 18:32
11M97812	L13120825-01 5X B 826-LOW D1	<2	1	5		12/23/13 19:04
11M97813	L13120858-06 10X B 826-SPE D1	<2	1	10		12/23/13 19:35
11M97814	L13120858-13 TB A 826-SPE	<2	1	1		12/23/13 20:07
11M97815	L13120903-01 TB A 826-SPE	<2	1	1		12/23/13 20:38
11M97816	L13120838-06 B 826-SPE	<2	1	1		12/23/13 21:10
11M97817	L13120838-08 B 826-SPE	<2	1	1		12/23/13 21:41
11M97818	L13120838-10 B 826-SPE	4	1	1		12/23/13 22:13
11M97819	L13120858-11 A 826-SPE	<2	1	1		12/23/13 22:44
11M97820	L13120903-02 A 826-SPE	<2	1	1		12/23/13 23:15
11M97821	L13120903-03 A 826-SPE	<2	1	1		12/23/13 23:46
11M97822	L13120903-05 A 826-SPE	<2	1	1		12/24/13 00:18
11M97823	L13120858-12 2X A 826-SPE	<2	1	2		12/24/13 00:50
11M97824	L13120983-05 5000X A 826-LOW	<2	1	5000		12/24/13 01:21
11M97825	L13120983-02 10X A 826-LOW	<2	1	10		12/24/13 01:52
11M97826	L13120983-03 5X A 826-LOW	<2	1	5		12/24/13 02:24
11M97827	L13120903-04 A 826-SPE	<2	1	1		12/24/13 02:55
11M97828	L13120983-01 A 826-LOW	<2	1	1		12/24/13 03:26
11M97829	RINSE	NA	1	1		12/24/13 03:58
11M97830	WG457423-04 BLANK 624	NA	2	1		12/24/13 04:29
11M97831	L13121247-01 10X B 624-SPE	<2	2	10		12/24/13 05:01
11M97832	L13121277-01 200X B 624-SPE D1	10	2	200		12/24/13 05:32
11M97833	GRO	NA	1	1		12/24/13 06:04
11M97834	CCV	NA	1	1		12/24/13 06:35
11M97835	RINSE	NA	1	1		12/24/13 07:07
11M97836	RINSE	NA	1	1		12/24/13 07:38

Approved: December 26, 2013

Page: 1

Microbac Laboratories Inc.

Instrument Run Log

Instrument: HPMS11 Dataset: 122313
Analyst1: FJB Analyst2: NA
Method: 8260B SOP: MSV01 Rev: 19
Method: 5030B/5030C/5035A SOP: PAT01 Rev: 16
Method: 624 SOP: MSV10 Rev: 12
Maintenance Log ID: 48615

Internal Standard: STD61448 Surrogate Standard: STD61766
CCV: STD61850 LCS: STD61695 MS/MSD: STD61695

Column 1 ID: RTX502.2 Column 2 ID: NA
Workgroups: WG457423

Comments:

Comments

Seq.	Rerun	Dil.	Reason	Analytes
5	X			
File ID:	11M97808			
	acetone in blank			
6				
File ID:	11M97809			
	blank still has acetone, but it's below the RL for most clients			
13				
File ID:	11M97816			
	b flag acetone			
14				
File ID:	11M97817			
	b flag acetone			
15				
File ID:	11M97818			
	b flag acetone			
20	X	10	Over Calibration Range	11-dca
File ID:	11M97823			
21	X	5000	Carry-over contamination	
File ID:	11M97824			
22	X	10	Carry-over contamination	
File ID:	11M97825			
23	X	50	Over Calibration Range	tce
File ID:	11M97826			
24	X	10	Over Calibration Range	cis-12
File ID:	11M97827			
	possibly has some tce c/o			
25	X	1	Carry-over contamination	
File ID:	11M97828			

Approved: December 26, 2013

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Checklist ID: 81270

Microbac Laboratories Inc.

Data Checklist

Date: 13-OCT-2013
Analyst: MES
Analyst: NA
Method: 8260/624
Instrument: HPMS17
Curve Workgroup: NA
Runlog ID: 56448
Analytical Workgroups: WG448463

System Performance Check	NA
BFB	X
Initial Calibration	X
Average RF	X
Linear Reg or Higher Order Curve	X
Second Source standard % Difference	X
Continuing Calibration /Check Standards	X
Project/Client Specific Requirements	X
Special Standards	X
Blanks	X
TCL's	X
Surrogates	X
LCS (Laboratory Control Sample)	NA
Recoveries	NA
Surrogates	NA
MS/MSD/Duplicates	NA
Samples	X
TCL Hits	X
Spectra of TCL Hits	X
Surrogates	NA
Internal Standards Criteria	X
Library Searches	NA
Calculations & Correct Factors	X
Dilutions Run	NA
Reruns	X
Manual Integrations	NA
Case Narrative	NA
Results Reporting/Data Qualifiers	X
KOBRA Workgroup Data	X
Check for Completeness	X
Primary Reviewer	MES
Secondary Reviewer	MDA
Check for compliance with method and project specific requirements	X
Check the completeness of reported information	X
Check the information for the report narrative	X
Check the reasonableness of the results	X

Primary Reviewer:
17-OCT-2013
Mary Schilling

Secondary Reviewer:
18-OCT-2013

CHECKLIST1 - Modified 03/05/2008
Generated: OCT-18-2013 08:13:54

Microbac Laboratories Inc.

Data Checklist

Date: 05-NOV-2013
Analyst: FJB
Analyst: TMB
Method: 8260B / 624
Instrument: HPMS11
Curve Workgroup: NA
Runlog ID: 56925
Analytical Workgroups: WG451178

System Performance Check	X
BFB	X
Initial Calibration	X
Average RF	X
Linear Reg or Higher Order Curve	X
Second Source standard % Difference	X
Continuing Calibration /Check Standards	X
Project/Client Specific Requirements	X
Special Standards	NA
Blanks	X
TCL's	X
Surrogates	X
LCS (Laboratory Control Sample)	X
Recoveries	X
Surrogates	X
MS/MSD/Duplicates	NA
Samples	NA
TCL Hits	NA
Spectra of TCL Hits	NA
Surrogates	NA
Internal Standards Criteria	NA
Library Searches	NA
Calculations & Correct Factors	NA
Dilutions Run	NA
Reruns	NA
Manual Integrations	NA
Case Narrative	X
Results Reporting/Data Qualifiers	X
KOBRA Workgroup Data	X
Check for Completeness	X
Primary Reviewer	FJB
Secondary Reviewer	MDA
Check for compliance with method and project specific requirements	X
Check the completeness of reported information	X
Check the information for the report narrative	X
Check the reasonableness of the results	X

Primary Reviewer:
06-NOV-2013

Secondary Reviewer:
07-NOV-2013

CHECKLIST1 - Modified 03/05/2008
Generated: NOV-07-2013 12:42:59

Checklist ID: 82586

Microbac Laboratories Inc.

Data Checklist

Date: 15-NOV-2013
Analyst: ADC
Analyst: NA
Method: 8260
Instrument: HPMS17
Curve Workgroup: WG453012
Runlog ID: 57227
Analytical Workgroups:

System Performance Check	NA
BFB	X
Initial Calibration	X
Average RF	X
Linear Reg or Higher Order Curve	X
Second Source standard % Difference	X
Continuing Calibration /Check Standards	NA
Project/Client Specific Requirements	NA
Special Standards	NA
Blanks	NA
TCL's	NA
Surrogates	NA
LCS (Laboratory Control Sample)	NA
Recoveries	NA
Surrogates	NA
MS/MSD/Duplicates	NA
Samples	NA
TCL Hits	NA
Spectra of TCL Hits	X
Surrogates	NA
Internal Standards Criteria	NA
Library Searches	NA
Calculations & Correct Factors	X
Dilutions Run	NA
Reruns	NA
Manual Integrations	X
Case Narrative	X
Results Reporting/Data Qualifiers	X
KOBRA Workgroup Data	X
Check for Completeness	X
Primary Reviewer	ADC
Secondary Reviewer	MDA
Check for compliance with method and project specific requirements	X
Check the completeness of reported information	X
Check the information for the report narrative	X
Check the reasonableness of the results	X

Primary Reviewer:
20-NOV-2013

Secondary Reviewer:
20-NOV-2013

CHECKLIST1 - Modified 03/05/2008
Generated: NOV-20-2013 13:43:34

Microbac Laboratories Inc.

Data Checklist

Date: 04-DEC-2013
Analyst: FJB
Analyst: NA
Method: 8260B
Instrument: HPMS11
Curve Workgroup: NA
Runlog ID: 57820
Analytical Workgroups: WG455130

System Performance Check	X
BFB	X
Initial Calibration	X
Average RF	X
Linear Reg or Higher Order Curve	X
Second Source standard % Difference	X
Continuing Calibration /Check Standards	X
Project/Client Specific Requirements	X
Special Standards	X
Blanks	X
TCL's	X
Surrogates	X
LCS (Laboratory Control Sample)	X
Recoveries	X
Surrogates	X
MS/MSD/Duplicates	NA
Samples	NA
TCL Hits	NA
Spectra of TCL Hits	NA
Surrogates	NA
Internal Standards Criteria	NA
Library Searches	NA
Calculations & Correct Factors	NA
Dilutions Run	NA
Reruns	NA
Manual Integrations	NA
Case Narrative	X
Results Reporting/Data Qualifiers	X
KOBRA Workgroup Data	X
Check for Completeness	X
Primary Reviewer	FJB
Secondary Reviewer	MDA
Check for compliance with method and project specific requirements	X
Check the completeness of reported information	X
Check the information for the report narrative	X
Check the reasonableness of the results	X

Primary Reviewer:
18-DEC-2013

Secondary Reviewer:
19-DEC-2013

CHECKLIST1 - Modified 03/05/2008
Generated: DEC-19-2013 08:33:22

Microbac®

Checklist ID: 83801

Microbac Laboratories Inc.

Data Checklist

Date: 22-DEC-2013
Analyst: ADC
Analyst: NA
Method: 8260
Instrument: HPMS17
Curve Workgroup: NA
Runlog ID: 57985
Analytical Workgroups: WG457314

System Performance Check	NA
BFB	X
Initial Calibration	X
Average RF	X
Linear Reg or Higher Order Curve	X
Second Source standard % Difference	X
Continuing Calibration /Check Standards	X
Project/Client Specific Requirements	X
Special Standards	X
Blanks	X
TCL's	X
Surrogates	X
LCS (Laboratory Control Sample)	X
Recoveries	X
Surrogates	X
MS/MSD/Duplicates	X
Samples	X
TCL Hits	X
Spectra of TCL Hits	X
Surrogates	X
Internal Standards Criteria	X
Library Searches	NA
Calculations & Correct Factors	X
Dilutions Run	X
Reruns	NA
Manual Integrations	NA
Case Narrative	X
Results Reporting/Data Qualifiers	X
KOBRA Workgroup Data	X
Check for Completeness	X
Primary Reviewer	ADC
Secondary Reviewer	MDA
Check for compliance with method and project specific requirements	X
Check the completeness of reported information	X
Check the information for the report narrative	X
Check the reasonableness of the results	X

Primary Reviewer:
26-DEC-2013

Secondary Reviewer:
26-DEC-2013

CHECKLIST1 - Modified 03/05/2008
Generated: DEC-26-2013 15:33:22

Microbac

Checklist ID: 83729

Microbac Laboratories Inc.

Data Checklist

Date: 23-DEC-2013
Analyst: FJB
Analyst: NA
Method: 8260B
Instrument: HPMS11
Curve Workgroup: NA
Runlog ID: 57934
Analytical Workgroups: WG457423

System Performance Check	X
BFB	X
Initial Calibration	X
Average RF	X
Linear Reg or Higher Order Curve	X
Second Source standard % Difference	X
Continuing Calibration /Check Standards	X
Project/Client Specific Requirements	X
Special Standards	NA
Blanks	X
TCL's	X
Surrogates	X
LCS (Laboratory Control Sample)	X
Recoveries	X
Surrogates	X
MS/MSD/Duplicates	NA
Samples	X
TCL Hits	X
Spectra of TCL Hits	FJB
Surrogates	X
Internal Standards Criteria	X
Library Searches	NA
Calculations & Correct Factors	X
Dilutions Run	X
Reruns	X
Manual Integrations	NA
Case Narrative	X
Results Reporting/Data Qualifiers	X
KOBRA Workgroup Data	X
Check for Completeness	X
Primary Reviewer	FJB
Secondary Reviewer	MDA
Check for compliance with method and project specific requirements	X
Check the completeness of reported information	X
Check the information for the report narrative	X
Check the reasonableness of the results	X

Primary Reviewer:
24-DEC-2013

Secondary Reviewer:
26-DEC-2013

CHECKLIST1 - Modified 03/05/2008
Generated: DEC-26-2013 09:01:41

HOLDING TIMES
EQUIVALENT TO AFCEE FORM 9

Analytical Method: 8260B

AAB#: WG457314

Login Number: L13120825

Client ID	ID	Date Collected	TCLP Date	Time Held	Max Hold	Q	Extract Date	Time Held	Max Hold	Q	Run Date	Time Held	Max Hold	Q
12WW24-12111	01	12/11/13					12/23/2013	11.8	14		12/23/13	11.8	14	
TRIP BLANK	02	12/11/13					12/22/2013	12	14		12/22/13	12	14	

* = SEE PROJECT QAPP REQUIREMENTS

HOLD_TIMES - Modified 03/06/2008
PDF File ID: 3285212
Report generated 12/26/2013 16:06

Microbac Laboratories Inc.

HOLDING TIMES
EQUIVALENT TO AFCEE FORM 9

Analytical Method: 8260B

AAB#: WG457423

Login Number: L13120825

Client ID	ID	Date Collected	TCLP Date	Time Held	Max Hold	Q	Extract Date	Time Held	Max Hold	Q	Run Date	Time Held	Max Hold	Q
12WW24-12111	01	12/11/13					12/23/2013	12.5	14		12/23/13	12.5	14	

* = SEE PROJECT QAPP REQUIREMENTS

HOLD_TIMES - Modified 03/06/2008
PDF File ID: 3285212
Report generated 12/26/2013 16:06

Microbac Laboratories Inc.
SURROGATE STANDARDS

Login Number: L13120825
Instrument Id: HPMS17
Workgroup (AAB#): WG457314

Method: 8260
CAL ID: HPMS17 - 15-NOV-13
Matrix: Water

Sample Number	Dilution	Tag	1	2	3	4
L13120825-01	1.00	01	95.9	103	91.2	99.0
L13120825-02	1.00	01	96.0	101	95.2	101
WG457314-01	1.00	01	98.1	103	92.4	100
WG457314-02	1.00	01	101	107	90.5	100

	Surrogates	Surrogate Limits		
1	- 1,2-Dichloroethane-d4	70	-	120
2	- Dibromofluoromethane	85	-	115
3	- 4-Bromofluorobenzene	75	-	120
4	- Toluene-d8	85	-	120

Underline = Result out of surrogate limits

DL = surrogate diluted out
ND = surrogate not detected

SURROGATES - Modified 03/06/2008
PDF File ID: 3288062
Report generated: 12/26/2013 16:06

Microbac Laboratories Inc.
SURROGATE STANDARDS

Login Number: L13120825
Instrument Id: HPMS11
Workgroup (AAB#): WG457423

Method: 8260
CAL ID: HPMS11 - 05-NOV-13
Matrix: Water

Sample Number	Dilution	Tag	1	2	3	4
L13120825-01	5.00	DL01	97.3	92.0	115	107
WG457423-01	1.00	01	94.4	88.8	114	108
WG457423-02	1.00	01	95.9	93.7	111	107
WG457423-03	1.00	01	93.9	92.2	109	106
WG457423-04	1.00	01	91.4	90.1	110	107

Surrogates	Surrogate Limits		
1 - 1,2-Dichloroethane-d4	70	-	120
2 - Dibromofluoromethane	85	-	115
3 - 4-Bromofluorobenzene	75	-	120
4 - Toluene-d8	85	-	120

<u>Underline</u> = Result out of surrogate limits

DL = surrogate diluted out
ND = surrogate not detected

SURROGATES - Modified 03/06/2008
PDF File ID: 3288062
Report generated: 12/26/2013 16:06

Microbac Laboratories Inc.

METHOD BLANK SUMMARY

Login Number:	L13120825	Work Group:	WG457423
Blank File ID:	11M97809	Blank Sample ID:	WG457423-01
Prep Date:	12/23/13 17:30	Instrument ID:	HPMS11
Analyzed Date:	12/23/13 17:30	Method:	8260B
Analyst:	FJB		

This Method Blank Applies To The Following Samples:

Client ID	Lab Sample ID	Lab File ID	Time Analyzed	TAG
LCS	WG457423-02	11M97810	12/23/13 18:01	01
LCS2	WG457423-03	11M97811	12/23/13 18:32	01
12WW24-12111	L13120825-01	11M97812	12/23/13 19:04	DL01

Report Name: BLANK_SUMMARY
PDF File ID: 3287992
Report generated 12/26/2013 16:06

METHOD BLANK SUMMARY

Login Number: L13120825
Blank File ID: 17M001843
Prep Date: 12/22/13 19:02
Analyzed Date: 12/22/13 19:02
Analyst: ADC

Work Group: WG457314
Blank Sample ID: WG457314-01
Instrument ID: HPMS17
Method: 8260B

This Method Blank Applies To The Following Samples:

Client ID	Lab Sample ID	Lab File ID	Time Analyzed	TAG
LCS	WG457314-02	17M001844	12/22/13 19:32	01
TRIP BLANK	L13120825-02	17M001852	12/22/13 23:35	01
12WW24-12111	L13120825-01	17M001857	12/23/13 02:05	01

Report Name: BLANK_SUMMARY
PDF File ID: 3287992
Report generated 12/26/2013 16:06

Microbac Laboratories Inc.
METHOD BLANK REPORT

Login Number: L13120825
Prep Date: 12/23/13 17:30
Sample ID: WG457423-01
Instrument ID: HPMS11
Run Date: 12/23/13 17:30
Prep Method: 5030B/5030C/503
File ID: 11M97809
Analyst: FJB
Method: 8260B
Workgroup (AAB#): WG457423
Matrix: Water
Units: ug/L
Contract #:
Cal ID: HPMS11 - 05-NOV-13

Analytes	DL	LOQ	Concentration	Dilution	Qualifier
Acetone	2.50	10.0	9.70	1	*
Benzene	0.125	1.00	0.125	1	U
Bromobenzene	0.125	1.00	0.125	1	U
Bromochloromethane	0.200	1.00	0.200	1	U
Bromodichloromethane	0.250	1.00	0.250	1	U
Bromoform	0.500	2.00	0.500	1	U
Bromomethane	0.500	2.00	0.500	1	U
2-Butanone	2.50	10.0	2.50	1	U
n-Butylbenzene	0.250	1.00	0.250	1	U
sec-Butylbenzene	0.250	1.00	0.250	1	U
tert-Butylbenzene	0.250	1.00	0.250	1	U
Carbon disulfide	0.500	2.00	0.500	1	U
Carbon tetrachloride	0.250	1.00	0.250	1	U
Chlorobenzene	0.125	1.00	0.125	1	U
Chlorodibromomethane	0.250	1.00	0.250	1	U
Chloroethane	0.500	2.00	0.500	1	U
Chloroform	0.125	1.00	0.125	1	U
Chloromethane	0.500	2.00	0.500	1	U
2-Chlorotoluene	0.125	1.00	0.125	1	U
4-Chlorotoluene	0.250	1.00	0.250	1	U
1,2-Dibromo-3-chloropropane	1.00	5.00	1.00	1	U
1,2-Dibromoethane	0.250	1.00	0.250	1	U
Dibromomethane	0.250	1.00	0.250	1	U
1,2-Dichlorobenzene	0.125	1.00	0.125	1	U
1,3-Dichlorobenzene	0.250	1.00	0.250	1	U
1,4-Dichlorobenzene	0.125	1.00	0.125	1	U
Dichlorodifluoromethane	0.250	1.00	0.250	1	U
1,1-Dichloroethane	0.125	1.00	0.125	1	U
1,2-Dichloroethane	0.250	1.00	0.250	1	U
1,1-Dichloroethene	0.500	2.00	0.500	1	U
cis-1,2-Dichloroethene	0.250	1.00	0.250	1	U
trans-1,2-Dichloroethene	0.250	1.00	0.250	1	U
1,2-Dichloropropane	0.200	1.00	0.200	1	U
1,3-Dichloropropane	0.200	1.00	0.200	1	U
2,2-Dichloropropane	0.250	1.00	0.250	1	U
cis-1,3-Dichloropropene	0.250	1.00	0.250	1	U
trans-1,3-Dichloropropene	0.500	2.00	0.500	1	U
1,1-Dichloropropene	0.250	1.00	0.250	1	U
Ethylbenzene	0.250	1.00	0.250	1	U
2-Hexanone	2.50	10.0	2.50	1	U
Hexachlorobutadiene	0.250	1.00	0.250	1	U
Isopropylbenzene	0.250	1.00	0.250	1	U

Report Name: BLANK
PDF ID: 3287994
26-DEC-2013 16:06

Microbac Laboratories Inc.
METHOD BLANK REPORT

Login Number:	L13120825	Prep Date:	12/23/13 17:30	Sample ID:	WG457423-01
Instrument ID:	HPMS11	Run Date:	12/23/13 17:30	Prep Method:	5030B/5030C/503
File ID:	11M97809	Analyst:	FJB	Method:	8260B
Workgroup (AAB#):	WG457423	Matrix:	Water	Units:	ug/L
Contract #:		Cal ID:	HPMS11 - 05-NOV-13		

Analytes	DL	LOQ	Concentration	Dilution	Qualifier
p-Isopropyltoluene	0.250	1.00	0.250	1	U
4-Methyl-2-pentanone	2.50	10.0	2.50	1	U
Methylene chloride	0.250	1.00	0.250	1	U
Naphthalene	0.200	1.00	0.200	1	U
n-Propylbenzene	0.125	1.00	0.125	1	U
Styrene	0.125	1.00	0.125	1	U
1,1,1,2-Tetrachloroethane	0.250	1.00	0.250	1	U
1,1,2,2-Tetrachloroethane	0.200	1.00	0.200	1	U
Tetrachloroethene	0.250	1.00	0.250	1	U
Toluene	0.250	1.00	0.250	1	U
1,2,3-Trichlorobenzene	0.150	1.00	0.150	1	U
1,2,4-Trichlorobenzene	0.200	1.00	0.200	1	U
1,1,1-Trichloroethane	0.250	1.00	0.250	1	U
1,1,2-Trichloroethane	0.250	1.00	0.250	1	U
Trichloroethene	0.250	1.00	0.250	1	U
Trichlorofluoromethane	0.250	1.00	0.250	1	U
1,2,3-Trichloropropane	0.500	2.00	0.500	1	U
1,2,4-Trimethylbenzene	0.250	1.00	0.250	1	U
1,3,5-Trimethylbenzene	0.250	1.00	0.250	1	U
Vinyl chloride	0.250	1.00	0.250	1	U
o-Xylene	0.250	1.00	0.250	1	U
m-,p-Xylene	0.500	2.00	0.500	1	U

Surrogates	% Recovery	Surrogate Limits	Qualifier
Dibromofluoromethane	88.8	85 - 115	PASS
1,2-Dichloroethane-d4	94.4	70 - 120	PASS
Toluene-d8	108	85 - 120	PASS
4-Bromofluorobenzene	114	75 - 120	PASS

DL	Method Detection Limit
LOQ	Reporting/Practical Quantitation Limit
ND	Analyte Not detected at or above reporting limit
*	|Analyte concentration| > 1/2 RL

Report Name:BLANK
PDF ID: 3287994
26-DEC-2013 16:06

Microbac Laboratories Inc.
METHOD BLANK REPORT

Login Number: L13120825
Prep Date: 12/22/13 19:02
Sample ID: WG457314-01
Instrument ID: HPMS17
Run Date: 12/22/13 19:02
Prep Method: 5030B/5030C/503
File ID: 17M001843
Analyst: ADC
Method: 8260B
Workgroup (AAB#): WG457314
Matrix: Water
Units: ug/L
Contract #:
Cal ID: HPMS17 - 15-NOV-13

Analytes	DL	LOQ	Concentration	Dilution	Qualifier
Acetone	2.50	10.0	2.50	1	U
Benzene	0.125	1.00	0.125	1	U
Bromobenzene	0.125	1.00	0.125	1	U
Bromochloromethane	0.200	1.00	0.200	1	U
Bromodichloromethane	0.250	1.00	0.250	1	U
Bromoform	0.500	2.00	0.500	1	U
Bromomethane	0.500	2.00	0.500	1	U
2-Butanone	2.50	10.0	2.50	1	U
n-Butylbenzene	0.250	1.00	0.250	1	U
sec-Butylbenzene	0.250	1.00	0.250	1	U
tert-Butylbenzene	0.250	1.00	0.250	1	U
Carbon disulfide	0.500	2.00	0.500	1	U
Carbon tetrachloride	0.250	1.00	0.250	1	U
Chlorobenzene	0.125	1.00	0.125	1	U
Chlorodibromomethane	0.250	1.00	0.250	1	U
Chloroethane	0.500	2.00	0.500	1	U
Chloroform	0.125	1.00	0.125	1	U
Chloromethane	0.500	2.00	0.500	1	U
2-Chlorotoluene	0.125	1.00	0.125	1	U
4-Chlorotoluene	0.250	1.00	0.250	1	U
1,2-Dibromo-3-chloropropane	1.00	5.00	1.00	1	U
1,2-Dibromoethane	0.250	1.00	0.250	1	U
Dibromomethane	0.250	1.00	0.250	1	U
1,2-Dichlorobenzene	0.125	1.00	0.125	1	U
1,3-Dichlorobenzene	0.250	1.00	0.250	1	U
1,4-Dichlorobenzene	0.125	1.00	0.125	1	U
Dichlorodifluoromethane	0.250	1.00	0.250	1	U
1,1-Dichloroethane	0.125	1.00	0.125	1	U
1,2-Dichloroethane	0.250	1.00	0.250	1	U
1,1-Dichloroethene	0.500	2.00	0.500	1	U
cis-1,2-Dichloroethene	0.250	1.00	0.250	1	U
trans-1,2-Dichloroethene	0.250	1.00	0.250	1	U
1,2-Dichloropropane	0.200	1.00	0.200	1	U
1,3-Dichloropropane	0.200	1.00	0.200	1	U
2,2-Dichloropropane	0.250	1.00	0.250	1	U
cis-1,3-Dichloropropene	0.250	1.00	0.250	1	U
trans-1,3-Dichloropropene	0.500	2.00	0.500	1	U
1,1-Dichloropropene	0.250	1.00	0.250	1	U
Ethylbenzene	0.250	1.00	0.250	1	U
2-Hexanone	2.50	10.0	2.50	1	U
Hexachlorobutadiene	0.250	1.00	0.250	1	U
Isopropylbenzene	0.250	1.00	0.250	1	U

Report Name: BLANK
PDF ID: 3287994
26-DEC-2013 16:06

Microbac Laboratories Inc.
METHOD BLANK REPORT

Login Number: L13120825
Prep Date: 12/22/13 19:02
Sample ID: WG457314-01
Instrument ID: HPMS17
Run Date: 12/22/13 19:02
Prep Method: 5030B/5030C/503
File ID: 17M001843
Analyst: ADC
Method: 8260B
Workgroup (AAB#): WG457314
Matrix: Water
Units: ug/L
Contract #:
Cal ID: HPMS17 - 15-NOV-13

Analytes	DL	LOQ	Concentration	Dilution	Qualifier
p-Isopropyltoluene	0.250	1.00	0.250	1	U
4-Methyl-2-pentanone	2.50	10.0	2.50	1	U
Methylene chloride	0.250	1.00	0.250	1	U
Naphthalene	0.200	1.00	0.200	1	U
n-Propylbenzene	0.125	1.00	0.125	1	U
Styrene	0.125	1.00	0.125	1	U
1,1,1,2-Tetrachloroethane	0.250	1.00	0.250	1	U
1,1,2,2-Tetrachloroethane	0.200	1.00	0.200	1	U
Tetrachloroethene	0.250	1.00	0.250	1	U
Toluene	0.250	1.00	0.250	1	U
1,2,3-Trichlorobenzene	0.150	1.00	0.150	1	U
1,2,4-Trichlorobenzene	0.200	1.00	0.200	1	U
1,1,1-Trichloroethane	0.250	1.00	0.250	1	U
1,1,2-Trichloroethane	0.250	1.00	0.250	1	U
Trichloroethene	0.250	1.00	0.290	1	J
Trichlorofluoromethane	0.250	1.00	0.250	1	U
1,2,3-Trichloropropane	0.500	2.00	0.500	1	U
1,2,4-Trimethylbenzene	0.250	1.00	0.250	1	U
1,3,5-Trimethylbenzene	0.250	1.00	0.250	1	U
Vinyl chloride	0.250	1.00	0.250	1	U
o-Xylene	0.250	1.00	0.250	1	U
m-,p-Xylene	0.500	2.00	0.500	1	U

Surrogates	% Recovery	Surrogate Limits	Qualifier
Dibromofluoromethane	103	85 - 115	PASS
1,2-Dichloroethane-d4	98.1	70 - 120	PASS
Toluene-d8	100	85 - 120	PASS
4-Bromofluorobenzene	92.4	75 - 120	PASS

DL	Method Detection Limit
LOQ	Reporting/Practical Quantitation Limit
ND	Analyte Not detected at or above reporting limit
*	|Analyte concentration| > 1/2 RL

Report Name:BLANK
PDF ID: 3287994
26-DEC-2013 16:06

Microbac Laboratories Inc.
LABORATORY CONTROL SAMPLE (LCS)

Login Number:	L13120825	Run Date:	12/22/2013	Sample ID:	WG457314-02
Instrument ID:	HPMS17	Run Time:	19:32	Prep Method:	5030B/5030C/503
File ID:	17M001844	Analyst:	ADC	Method:	8260B
Workgroup (AAB#):	WG457314	Matrix:	Water	Units:	ug/L

QC Key: DOD4 Lot#: STD61695 Cal ID: HPMS17 - 15-NOV-13

Analytes	Expected	Found	% Rec	LCS Limits	Q
Acetone	20.0	28.8	144	40 - 140	*
Benzene	20.0	20.3	102	80 - 120	
Bromobenzene	20.0	20.4	102	75 - 125	
Bromochloromethane	20.0	21.4	107	65 - 130	
Bromodichloromethane	20.0	20.4	102	75 - 120	
Bromoform	20.0	20.0	100	70 - 130	
Bromomethane	20.0	17.0	85.1	30 - 145	
2-Butanone	20.0	23.1	116	30 - 150	
n-Butylbenzene	20.0	18.3	91.4	70 - 135	
sec-Butylbenzene	20.0	20.2	101	70 - 125	
tert-Butylbenzene	20.0	20.2	101	70 - 130	
Carbon disulfide	20.0	18.6	93.2	35 - 160	
Carbon tetrachloride	20.0	21.0	105	65 - 140	
Chlorobenzene	20.0	20.4	102	80 - 120	
Chlorodibromomethane	20.0	21.2	106	60 - 135	
Chloroethane	20.0	20.2	101	60 - 135	
Chloroform	20.0	21.2	106	65 - 135	
Chloromethane	20.0	23.2	116	40 - 125	
2-Chlorotoluene	20.0	20.2	101	75 - 125	
4-Chlorotoluene	20.0	18.9	94.4	75 - 130	
1,2-Dibromo-3-chloropropane	20.0	20.8	104	50 - 130	
1,2-Dibromoethane	20.0	20.7	103	80 - 120	
Dibromomethane	20.0	21.4	107	75 - 125	
1,2-Dichlorobenzene	20.0	21.4	107	70 - 120	
1,3-Dichlorobenzene	20.0	20.2	101	75 - 125	
1,4-Dichlorobenzene	20.0	19.9	99.6	75 - 125	
Dichlorodifluoromethane	20.0	24.9	125	30 - 155	
1,1-Dichloroethane	20.0	20.5	102	70 - 135	
1,2-Dichloroethane	20.0	20.6	103	70 - 130	
1,1-Dichloroethene	20.0	19.2	96.0	70 - 130	
cis-1,2-Dichloroethene	20.0	20.2	101	70 - 125	
trans-1,2-Dichloroethene	20.0	19.9	99.5	60 - 140	
1,2-Dichloropropane	20.0	20.4	102	75 - 125	
1,3-Dichloropropane	20.0	20.7	104	75 - 125	
2,2-Dichloropropane	20.0	18.4	91.9	70 - 135	
cis-1,3-Dichloropropene	20.0	20.9	104	70 - 130	
trans-1,3-Dichloropropene	20.0	19.5	97.3	55 - 140	
1,1-Dichloropropene	20.0	20.2	101	75 - 130	
Ethylbenzene	20.0	18.8	94.2	75 - 125	
2-Hexanone	20.0	22.3	111	55 - 130	
Hexachlorobutadiene	20.0	18.1	90.4	50 - 140	

LCS - Modified 03/06/2008
PDF File ID: 3287996
Report generated: 12/26/2013 16:06

Microbac Laboratories Inc.
LABORATORY CONTROL SAMPLE (LCS)

Login Number: L13120825
Run Date: 12/22/2013
Sample ID: WG457314-02
Instrument ID: HPMS17
Run Time: 19:32
Prep Method: 5030B/5030C/503
File ID: 17M001844
Analyst: ADC
Method: 8260B
Workgroup (AAB#): WG457314
Matrix: Water
Units: ug/L
QC Key: DOD4
Lot#: STD61695
Cal ID: HPMS17 - 15-NOV-13

Analytes	Expected	Found	% Rec	LCS Limits	Q
Isopropylbenzene	20.0	20.5	103	75 - 125	
p-Isopropyltoluene	20.0	19.5	97.7	75 - 130	
4-Methyl-2-pentanone	20.0	22.7	113	60 - 135	
Methylene chloride	20.0	20.3	101	55 - 140	
Naphthalene	20.0	22.8	114	55 - 140	
n-Propylbenzene	20.0	19.5	97.5	70 - 130	
Styrene	20.0	19.4	96.8	65 - 135	
1,1,1,2-Tetrachloroethane	20.0	19.4	97.2	80 - 130	
1,1,2,2-Tetrachloroethane	20.0	22.9	114	65 - 130	
Tetrachloroethene	20.0	20.5	103	45 - 150	
Toluene	20.0	19.6	97.9	75 - 120	
1,2,3-Trichlorobenzene	20.0	20.3	102	55 - 140	
1,2,4-Trichlorobenzene	20.0	18.9	94.4	65 - 135	
1,1,1-Trichloroethane	20.0	20.5	102	65 - 130	
1,1,2-Trichloroethane	20.0	21.2	106	75 - 125	
Trichloroethene	20.0	19.6	97.8	70 - 125	
Trichlorofluoromethane	20.0	22.2	111	60 - 145	
1,2,3-Trichloropropane	20.0	21.3	106	75 - 125	
1,2,4-Trimethylbenzene	20.0	19.2	96.2	75 - 130	
1,3,5-Trimethylbenzene	20.0	19.3	96.4	75 - 130	
Vinyl chloride	20.0	21.2	106	50 - 145	
o-Xylene	20.0	19.8	98.9	80 - 120	
m-,p-Xylene	40.0	39.2	97.9	75 - 130	

Surrogates	% Recovery	Surrogate Limits	Qualifier
Dibromofluoromethane	107	85 - 115	PASS
1,2-Dichloroethane-d4	101	70 - 120	PASS
Toluene-d8	100	85 - 120	PASS
4-Bromofluorobenzene	90.5	75 - 120	PASS

* EXCEEDS %REC LIMIT

LCS - Modified 03/06/2008
PDF File ID: 3287996
Report generated: 12/26/2013 16:06

Microbac Laboratories Inc.
LABORATORY CONTROL SAMPLE (LCS)

Login Number: L13120825
Analyst: FJB
Prep Method: 5030B/5030C/503
Instrument ID: HPMS11
Matrix: Water
Method: 8260B
Workgroup (AAB#): WG457423
Units: ug/L
QC Key: DOD4
Lot #: STD61695

Sample ID: WG457423-02 LCS File ID: 11M97810 Run Date: 12/23/2013 18:01
Sample ID: WG457423-03 LCS2 File ID: 11M97811 Run Date: 12/23/2013 18:32

Analytes	LCS			LCS2			%RPD	%Rec Limits	RPD Lmt	Q
	Known	Found	% REC	Known	Found	% REC				
1,1,1,2-Tetrachloroethane	20.0	19.2	96.1	20.0	19.1	95.5	0.701	80 - 130	30	
1,1,1-Trichloroethane	20.0	20.1	100	20.0	19.6	98.1	2.23	65 - 130	30	
1,1,2,2-Tetrachloroethane	20.0	19.5	97.3	20.0	19.5	97.3	0.0475	65 - 130	30	
1,1,2-Trichloroethane	20.0	20.6	103	20.0	20.4	102	0.884	75 - 125	30	
1,1-Dichloroethane	20.0	20.7	103	20.0	20.0	100	3.00	70 - 135	30	
1,1-Dichloroethene	20.0	19.6	98.0	20.0	19.2	95.9	2.13	70 - 130	30	
1,1-Dichloropropene	20.0	20.2	101	20.0	19.2	95.9	5.19	75 - 130	30	
1,2,3-Trichlorobenzene	20.0	17.6	87.8	20.0	17.8	89.1	1.52	55 - 140	30	
1,2,3-Trichloropropane	20.0	20.1	101	20.0	20.3	101	0.732	75 - 125	30	
1,2,4-Trichlorobenzene	20.0	19.0	94.9	20.0	18.7	93.7	1.25	65 - 135	30	
1,2,4-Trimethylbenzene	20.0	21.5	107	20.0	21.1	106	1.71	75 - 130	30	
1,2-Dibromo-3-chloropropane	20.0	17.2	85.8	20.0	18.4	92.0	6.94	50 - 130	30	
1,2-Dibromoethane	20.0	20.1	100	20.0	20.0	100	0.317	80 - 120	30	
1,2-Dichlorobenzene	20.0	21.0	105	20.0	20.4	102	3.07	70 - 120	30	
1,2-Dichloroethane	20.0	21.1	106	20.0	20.3	102	3.89	70 - 130	30	
1,2-Dichloropropane	20.0	20.7	104	20.0	19.9	99.5	4.12	75 - 125	30	
1,3,5-Trimethylbenzene	20.0	21.8	109	20.0	21.1	105	3.41	75 - 130	30	
1,3-Dichlorobenzene	20.0	20.8	104	20.0	20.4	102	2.14	75 - 125	30	
1,3-Dichloropropane	20.0	20.7	104	20.0	20.6	103	0.428	75 - 125	30	
1,4-Dichlorobenzene	20.0	19.3	96.3	20.0	19.0	94.9	1.46	75 - 125	30	
2,2-Dichloropropane	20.0	17.2	85.8	20.0	16.5	82.4	4.14	70 - 135	30	
2-Butanone	20.0	22.4	112	20.0	23.2	116	3.47	30 - 150	30	
2-Chlorotoluene	20.0	23.5	117	20.0	23.2	116	1.13	75 - 125	30	
2-Hexanone	20.0	19.8	99.1	20.0	20.1	100	1.20	55 - 130	30	
4-Chlorotoluene	20.0	18.3	91.7	20.0	18.1	90.5	1.41	75 - 130	30	
4-Methyl-2-pentanone	20.0	18.7	93.5	20.0	19.6	98.1	4.73	60 - 135	30	
Acetone	20.0	36.0	180	20.0	34.9	175	2.96	40 - 140	30	*
Benzene	20.0	20.0	99.9	20.0	19.4	97.2	2.75	80 - 120	30	
Bromobenzene	20.0	19.4	97.1	20.0	19.2	95.8	1.39	75 - 125	30	
Bromochloromethane	20.0	20.1	100	20.0	19.9	99.7	0.587	65 - 130	30	
Bromodichloromethane	20.0	19.5	97.6	20.0	18.9	94.7	3.03	75 - 120	30	
Bromoform	20.0	18.5	92.5	20.0	18.8	93.8	1.38	70 - 130	30	
Bromomethane	20.0	22.8	114	20.0	20.9	104	8.67	30 - 145	30	
Carbon disulfide	20.0	20.3	102	20.0	19.9	99.5	2.17	35 - 160	30	
Carbon tetrachloride	20.0	19.9	99.7	20.0	19.6	98.2	1.58	65 - 140	30	
Chlorobenzene	20.0	20.6	103	20.0	20.6	103	0.0877	80 - 120	30	
Chloroethane	20.0	20.7	104	20.0	20.6	103	0.755	60 - 135	30	
Chloroform	20.0	20.3	101	20.0	19.5	97.4	4.16	65 - 135	30	
Chloromethane	20.0	24.8	124	20.0	24.6	123	0.856	40 - 125	30	
cis-1,2-Dichloroethene	20.0	19.3	96.6	20.0	18.7	93.7	3.02	70 - 125	30	

LCS_LCS2 - Modified 03/06/2008
PDF File ID: 3287998
Report generated: 12/26/2013 16:06

Microbac Laboratories Inc.
LABORATORY CONTROL SAMPLE (LCS)

Login Number:L13120825
Analyst:FJB
Prep Method:5030B/5030C/503
Instrument ID:HPMS11
Matrix:Water
Method:8260B
Workgroup (AAB#):WG457423
Units:ug/L
QC Key:DOD4
Lot #:STD61695

Sample ID:WG457423-02 LCS File ID:11M97810 Run Date:12/23/2013 18:01
Sample ID:WG457423-03 LCS2 File ID:11M97811 Run Date:12/23/2013 18:32

Analytes	LCS			LCS2			%RPD	%Rec Limits	RPD Lmt	Q
	Known	Found	% REC	Known	Found	% REC				
cis-1,3-Dichloropropene	20.0	20.2	101	20.0	19.6	98.2	2.62	70 - 130	30	
Chlorodibromomethane	20.0	19.6	98.2	20.0	19.5	97.3	0.894	60 - 135	30	
Dibromomethane	20.0	20.9	105	20.0	20.3	102	2.92	75 - 125	30	
Dichlorodifluoromethane	20.0	22.4	112	20.0	22.7	114	1.65	30 - 155	30	
Ethylbenzene	20.0	19.5	97.7	20.0	19.2	96.2	1.51	75 - 125	30	
Hexachlorobutadiene	20.0	17.6	87.9	20.0	17.2	86.2	1.99	50 - 140	30	
Isopropylbenzene	20.0	21.7	109	20.0	21.3	107	1.90	75 - 125	30	
m-,p-Xylene	40.0	41.5	104	40.0	40.4	101	2.80	75 - 130	30	
Methylene chloride	20.0	18.6	93.0	20.0	18.5	92.3	0.758	55 - 140	30	
n-Butylbenzene	20.0	22.4	112	20.0	21.9	110	2.19	70 - 135	30	
n-Propylbenzene	20.0	21.6	108	20.0	21.0	105	2.68	70 - 130	30	
Naphthalene	20.0	17.3	86.3	20.0	17.6	88.1	2.02	55 - 140	30	
o-Xylene	20.0	20.0	100	20.0	19.6	97.9	2.35	80 - 120	30	
p-Isopropyltoluene	20.0	21.5	108	20.0	21.3	107	1.08	75 - 130	30	
sec-Butylbenzene	20.0	22.7	113	20.0	22.5	112	0.896	70 - 125	30	
Styrene	20.0	19.5	97.3	20.0	19.3	96.4	0.915	65 - 135	30	
tert-Butylbenzene	20.0	20.6	103	20.0	19.8	99.1	3.96	70 - 130	30	
Tetrachloroethene	20.0	19.0	94.8	20.0	18.4	92.1	2.90	45 - 150	30	
Toluene	20.0	20.7	104	20.0	20.5	103	1.15	75 - 120	30	
trans-1,2-Dichloroethene	20.0	18.6	92.8	20.0	18.0	89.9	3.18	60 - 140	30	
trans-1,3-Dichloropropene	20.0	19.3	96.3	20.0	19.0	94.9	1.45	55 - 140	30	
Trichloroethene	20.0	19.2	95.8	20.0	18.7	93.6	2.34	70 - 125	30	
Trichlorofluoromethane	20.0	20.9	104	20.0	20.7	104	0.809	60 - 145	30	
Vinyl chloride	20.0	24.2	121	20.0	23.5	118	2.69	50 - 145	30	

Surogates	LCS	LCS2	Surrogate Limits	Qualifier
	% Recovery	% Recovery		
1,2-Dichloroethane-d4	95.9	93.9	70 - 120	PASS
Dibromofluoromethane	93.7	92.2	85 - 115	PASS
4-Bromofluorobenzene	111	109	75 - 120	PASS
Toluene-d8	107	106	85 - 120	PASS

* EXCEEDS %REC LIMIT

\# EXCEEDS RPD LIMIT

LCS_LCS2 - Modified 03/06/2008
PDF File ID: 3287998
Report generated: 12/26/2013 16:06

Microbac Laboratories Inc.
ORGANIC INSTRUMENT CHECK

BFB

Login Number:	L13120825	Tune ID:	WG451178-01
Instrument:	HPMS11	Run Date:	11/05/2013
Analyst:	FJB	Run Time:	15:54
Workgroup:	WG451178	File ID:	11M96661
		Cal ID:	HPMS11 -

Target Mass	Rel. to Mass	Lower Limit%	Upper Limit%	Rel. Abn%	Raw Abn	Result Pass/Fail
50.0	95.0	15.0	40.0	20.8	2847	PASS
75.0	95.0	30.0	60.0	51.7	7067	PASS
95.0	95.0	100	100	100	13657	PASS
96.0	95.0	5.00	9.00	7.89	1078	PASS
173	174	0	2.00	0	0	PASS
174	95.0	50.0	100	70.9	9677	PASS
175	174	5.00	9.00	6.61	640	PASS
176	174	95.0	101	95.5	9240	PASS
177	176	5.00	9.00	5.78	534	PASS

This check relates to the following samples:

Lab ID	Client ID	Tag	Date Analyzed	Q
WG451178-02	STD	01	11/05/2013 16:30	
WG451178-03	STD	01	11/05/2013 17:02	
WG451178-04	STD	01	11/05/2013 17:37	
WG451178-05	STD	01	11/05/2013 18:22	
WG451178-06	STD	01	11/05/2013 18:54	
WG451178-07	STD	01	11/05/2013 19:34	
WG451178-08	STD-CCV	01	11/05/2013 20:05	
WG451178-09	STD	01	11/05/2013 20:36	
WG451178-10	STD	01	11/05/2013 21:08	
WG451178-11	STD	01	11/05/2013 21:39	
WG451178-12	SSCV	01	11/05/2013 22:42	

* Sample past 12 hour tune limit

TUNE - Modified 03/06/2008
PDF File ID: 3288059
Report generated 12/26/2013 16:06

Microbac Laboratories Inc.
ORGANIC INSTRUMENT CHECK

BFB

Login Number:	L13120825	Tune ID:	WG455130-01
Instrument:	HPMS11	Run Date:	12/04/2013
Analyst:	FJB	Run Time:	15:09
Workgroup:	WG455130	File ID:	11M97408
		Cal ID:	HPMS11 - 04-DEC-13

Target Mass	Rel. to Mass	Lower Limit%	Upper Limit%	Rel. Abn%	Raw Abn	Result Pass/Fail
50.0	95.0	15.0	40.0	26.3	2601	PASS
75.0	95.0	30.0	60.0	52.3	5177	PASS
95.0	95.0	100	100	100	9902	PASS
96.0	95.0	5.00	9.00	6.82	675	PASS
173	174	0	2.00	0	0	PASS
174	95.0	50.0	100	65.0	6441	PASS
175	174	5.00	9.00	5.96	384	PASS
176	174	95.0	101	98.2	6328	PASS
177	176	5.00	9.00	8.12	514	PASS

This check relates to the following samples:

Lab ID	Client ID	Tag	Date Analyzed	Q
WG455130-02	STD	01	12/04/2013 16:06	
WG455130-03	STD	01	12/04/2013 16:38	
WG455130-04	STD	01	12/04/2013 17:10	
WG455130-05	STD	01	12/04/2013 17:41	
WG455130-06	STD-CCV	01	12/04/2013 18:13	
WG455130-07	STD	01	12/04/2013 18:44	
WG455130-08	STD	01	12/04/2013 19:15	
WG455130-09	STD	01	12/04/2013 19:47	
WG455130-10	SSCV	01	12/04/2013 20:50	

* Sample past 12 hour tune limit

TUNE - Modified 03/06/2008
PDF File ID: 3288059
Report generated 12/26/2013 16:06

Microbac Laboratories Inc.
ORGANIC INSTRUMENT CHECK

BFB

Login Number:	L13120825	Tune ID:	WG457422-01
Instrument:	HPMS11	Run Date:	12/23/2013
Analyst:	FJB	Run Time:	15:27
Workgroup:	WG457422	File ID:	11M97805
		Cal ID:	HPMS11 - 05-NOV-13

Target Mass	Rel. to Mass	Lower Limit%	Upper Limit%	Rel. Abn%	Raw Abn	Result Pass/Fail
50.0	95.0	15.0	40.0	23.3	11583	PASS
75.0	95.0	30.0	60.0	53.0	26416	PASS
95.0	95.0	100	100	100	49797	PASS
96.0	95.0	5.00	9.00	6.61	3290	PASS
173	174	0	2.00	0.768	249	PASS
174	95.0	50.0	100	65.1	32418	PASS
175	174	5.00	9.00	7.32	2373	PASS
176	174	95.0	101	99.2	32174	PASS
177	176	5.00	9.00	7.23	2327	PASS

This check relates to the following samples:

Lab ID	Client ID	Tag	Date Analyzed	Q
WG457422-02	CCV	01	12/23/2013 15:55	
WG457423-01	BLANK	01	12/23/2013 17:30	
WG457423-02	LCS	01	12/23/2013 18:01	
WG457423-03	LCS2	01	12/23/2013 18:32	
L13120825-01	12WW24-12111	DL01	12/23/2013 19:04	
WG457423-04	BLANK2	01	12/24/2013 04:29	*

* Sample past 12 hour tune limit

TUNE - Modified 03/06/2008
PDF File ID: 3288059
Report generated 12/26/2013 16:06

Microbac Laboratories Inc.
ORGANIC INSTRUMENT CHECK

BFB

Login Number: L13120825
Instrument: HPMS17
Analyst: MES
Workgroup: WG448462
Tune ID: WG448462-01
Run Date: 10/13/2013
Run Time: 16:45
File ID: 17M000184
Cal ID: HPMS17 - 13-OCT-13

Target Mass	Rel. to Mass	Lower Limit%	Upper Limit%	Rel. Abn%	Raw Abn	Result Pass/Fail
50.0	95.0	15.0	40.0	18.4	9603	PASS
75.0	95.0	30.0	60.0	46.9	24464	PASS
95.0	95.0	100	100	100	52213	PASS
96.0	95.0	5.00	9.00	7.19	3755	PASS
173	174	0	2.00	1.14	488	PASS
174	95.0	50.0	100	82.2	42925	PASS
175	174	5.00	9.00	7.26	3116	PASS
176	174	95.0	101	97.1	41672	PASS
177	176	5.00	9.00	6.38	2660	PASS

This check relates to the following samples:

Lab ID	Client ID	Tag	Date Analyzed	Q
WG448462-02	STD	01	10/13/2013 17:48	
WG448462-03	STD	01	10/13/2013 18:15	
WG448462-04	STD	01	10/13/2013 18:43	
WG448462-05	STD-CCV	01	10/13/2013 19:11	
WG448462-06	STD	01	10/13/2013 19:39	
WG448462-07	STD	01	10/13/2013 20:07	
WG448462-08	STD	01	10/13/2013 20:35	
WG448462-09	STD	01	10/13/2013 21:03	
WG448462-10	SSCV	01	10/13/2013 22:00	

* Sample past 12 hour tune limit

TUNE - Modified 03/06/2008
PDF File ID: 3288059
Report generated 12/26/2013 16:06

Microbac Laboratories Inc.
ORGANIC INSTRUMENT CHECK

BFB

Login Number: L13120825
Instrument: HPMS17
Analyst: ADC
Workgroup: WG453012

Tune ID: WG453012-01
Run Date: 11/15/2013
Run Time: 14:34
File ID: 17M001021
Cal ID: HPMS17 - 15-NOV-13

Target Mass	Rel. to Mass	Lower Limit%	Upper Limit%	Rel. Abn%	Raw Abn	Result Pass/Fail
50.0	95.0	15.0	40.0	19.8	10400	PASS
75.0	95.0	30.0	60.0	50.3	26333	PASS
95.0	95.0	100	100	100	52395	PASS
96.0	95.0	5.00	9.00	6.74	3532	PASS
173	174	0	2.00	1.07	519	PASS
174	95.0	50.0	100	92.9	48693	PASS
175	174	5.00	9.00	7.66	3728	PASS
176	174	95.0	101	95.5	46491	PASS
177	176	5.00	9.00	6.43	2990	PASS

This check relates to the following samples:

Lab ID	Client ID	Tag	Date Analyzed	Q
WG453012-02	STD	01	11/15/2013 14:58	
WG453012-03	STD	01	11/15/2013 15:26	
WG453012-04	STD	01	11/15/2013 15:55	
WG453012-05	STD	01	11/15/2013 16:23	
WG453012-06	STD	01	11/15/2013 16:51	
WG453012-07	STD	01	11/15/2013 17:19	
WG453012-08	STD-CCV	01	11/15/2013 17:48	
WG453012-09	STD	01	11/15/2013 18:17	
WG453012-10	STD	01	11/15/2013 18:45	
WG453012-11	STD	01	11/15/2013 19:13	
WG453012-12	SSCV	01	11/15/2013 20:12	

* Sample past 12 hour tune limit

TUNE - Modified 03/06/2008
PDF File ID: 3288059
Report generated 12/26/2013 16:06

Microbac Laboratories Inc.
ORGANIC INSTRUMENT CHECK

BFB

Login Number:	L13120825	Tune ID:	WG457313-01
Instrument:	HPMS17	Run Date:	12/22/2013
Analyst:	ADC	Run Time:	17:09
Workgroup:	WG457313	File ID:	17M001840
		Cal ID:	HPMS17 - 15-NOV-13

Target Mass	Rel. to Mass	Lower Limit%	Upper Limit%	Rel. Abn%	Raw Abn	Result Pass/Fail
50.0	95.0	15.0	40.0	19.6	6071	PASS
75.0	95.0	30.0	60.0	48.2	14959	PASS
95.0	95.0	100	100	100	31024	PASS
96.0	95.0	5.00	9.00	6.78	2102	PASS
173	174	0	2.00	0.372	107	PASS
174	95.0	50.0	100	92.7	28749	PASS
175	174	5.00	9.00	7.34	2109	PASS
176	174	95.0	101	96.2	27653	PASS
177	176	5.00	9.00	6.52	1804	PASS

This check relates to the following samples:

Lab ID	Client ID	Tag	Date Analyzed	Q
WG457313-02	CCV	01	12/22/2013 17:32	
WG457314-01	BLANK	01	12/22/2013 19:02	
WG457314-02	LCS	01	12/22/2013 19:32	
L13120825-02	TRIP BLANK	01	12/22/2013 23:35	
L13120825-01	12WW24-12111	01	12/23/2013 02:05	

* Sample past 12 hour tune limit

TUNE - Modified 03/06/2008
PDF File ID: 3288059
Report generated 12/26/2013 16:06

Calibration Table Report

Method: 8260_WT.M

Title: 8260B/624 (SOP: OVL MSV01) Water 11/05/13 HPMS11

Last Calibration: Wed Nov 06 14:52:21 2013

Curve: WG451178

Calibration Files

		0.3	0.4	1	2	5	20	50	100	200	300				
		11M96662.D	11M96663.D	11M96664.D	11M96665.D	11M96666.D	11M96667.D	11M96668.D	11M96669.D	11M96670.D	11M96671.D				
	Compound											Avg	%RSD	Linear	Quadratic
I	Fluorobenzene	ISTD													
T	Dichlorodifluoromethane		0.233	0.206	0.240	0.213	0.270	0.266	0.269	0.254	0.269	0.247	10.096		
P	Chloromethane		0.392	0.328	0.384	0.305	0.357	0.330	0.340	0.330	0.367	0.348	8.297		
C	Vinyl Chloride		0.343	0.305	0.364	0.305	0.353	0.350	0.351	0.326	0.272	0.330	9.201		
T	1,3-Butadiene					0.288	0.268	0.209	0.166	0.155	0.150	0.206	29.033		0.999
T	Bromomethane		0.132	0.117	0.157	0.130	0.131	0.124	0.144	0.160	0.179	0.142	14.333		
T	Chloroethane		0.176	0.176	0.209	0.185	0.195	0.196	0.199	0.190	0.201	0.192	5.802		
T	Trichlorofluoromethane		0.476	0.408	0.477	0.428	0.469	0.472	0.478	0.451	0.473	0.459	5.516		
T	Diethyl ether			0.188	0.191	0.182	0.186	0.196	0.198		0.207	0.193	4.300		
T	Isoprene		0.408	0.346	0.398	0.346	0.383	0.370	0.390	0.368	0.392	0.378	5.831		
T	Acrolein			0.002	0.003	0.004	0.003	0.004	0.004		0.005	0.004	20.594		0.998
T	1,1,2-Trichloro-1,2,2-Trifluoroet		0.280	0.228	0.293	0.251	0.271	0.271	0.276	0.263	0.279	0.268	7.172		
T	Acetone					0.071	0.049	0.053	0.057	0.059	0.059	0.058	12.753		
C	1,1-Dichloroethene		0.447	0.408	0.495	0.430	0.463	0.465	0.467	0.442	0.465	0.454	5.514		
T	Tert-Butyl Alcohol			0.017	0.018	0.017	0.017	0.019	0.020		0.020	0.018	8.086		
T	Dimethyl Sulfide		0.243	0.227	0.268	0.251	0.266	0.256	0.271	0.262	0.272	0.257	5.778		
T	Iodomethane					0.020	0.126	0.196	0.230	0.225	0.229	0.171	49.117	0.999	
T	Methyl acetate			0.173	0.183	0.174	0.156	0.158	0.166	0.165	0.171	0.168	5.325		
T	Methylene Chloride		0.389	0.276	0.308	0.263	0.276	0.271	0.278	0.269	0.280	0.290	13.529		
T	Carbon Disulfide		0.890	0.755	0.911	0.786	0.873	0.821	0.857	0.776	0.765	0.826	7.075		
T	Acrylonitrile			0.063	0.065	0.062	0.067	0.074	0.076		0.088	0.071	13.084		
T	Methyl Tert Butyl Ether		0.640	0.666	0.697	0.663	0.663	0.696	0.704	0.678	0.685	0.677	3.058		
T	trans-1,2-Dichloroethene		0.293	0.285	0.302	0.272	0.288	0.285	0.289	0.275	0.289	0.287	3.133		
T	n-Hexane			0.353	0.391	0.330	0.364	0.349	0.363	0.335	0.350	0.354	5.304		
T	Diisopropyl ether			0.937	0.957	0.868	0.902	0.919	0.887		0.876	0.907	3.607		
T	Vinyl Acetate		0.296	0.303	0.325	0.314	0.359	0.370	0.385	0.362	0.350	0.340	9.320		
P	1,1-Dichloroethane		0.527	0.501	0.561	0.495	0.526	0.526	0.531	0.501	0.515	0.520	3.875		
T	Ethyl-Tert-Butyl ether			0.858	0.851	0.807	0.818	0.852	0.826		0.821	0.834	2.393		
T	2-Butanone				0.097	0.081	0.073	0.082	0.086	0.085	0.087	0.084	8.801		
T	Propionitrile			0.022	0.021	0.021	0.022	0.025	0.026		0.027	0.024	9.507		
T	2,2-Dichloropropane		0.587	0.452	0.531	0.468	0.495	0.493	0.500	0.466	0.482	0.497	8.207		
T	cis-1,2-Dichloroethene		0.293	0.289	0.322	0.302	0.310	0.307	0.315	0.300	0.313	0.306	3.541		
C	Chloroform	0.592	0.554	0.497	0.567	0.485	0.517	0.516	0.518	0.486	0.496	0.523	6.974		
T	1-Bromopropane			0.044	0.061	0.048	0.057	0.054	0.058	0.056	0.058	0.055	10.469		
T	Bromochloromethane		0.132	0.159	0.187	0.166	0.178	0.177	0.182	0.175	0.178	0.170	9.785		
T	Tetrahydrofuran			0.052	0.045	0.047	0.046	0.053	0.053		0.055	0.050	8.288		
S	Dibromofluoromethane			0.350	0.371	0.278	0.290	0.280	0.288	0.279	0.284	0.302	12.055		
T	1,1,1-Trichloroethane		0.484	0.430	0.507	0.442	0.476	0.481	0.487	0.455	0.474	0.471	5.089		
T	Cyclohexane		0.565	0.486	0.529	0.458	0.486	0.467	0.492	0.464	0.485	0.493	6.969		
T	1,1-Dichloropropene		0.390	0.361	0.421	0.386	0.406	0.405	0.410	0.384	0.398	0.396	4.470		
T	Carbon Tetrachloride		0.433	0.398	0.451	0.410	0.437	0.449	0.453	0.424	0.440	0.433	4.398		
T	Tert-Amyl-Methyl ether			0.71	0.688	0.665	0.673	0.702	0.684		0.685	0.687	2.279		
S	1,2-Dichloroethane-d4			0.42	0.403	0.316	0.327	0.315	0.324	0.313	0.315	0.342	12.765		
T	1,2-Dichloroethane		0.356	0.356	0.401	0.368	0.383	0.389	0.394	0.376	0.378	0.378	4.173		
T	Benzene		1.303	1.163	1.206	1.046	1.106	1.078	1.069	0.945	0.901	1.091	11.397		
T	Trichloroethene		0.325	0.274	0.316	0.281	0.3	0.299	0.304	0.29	0.305	0.299	5.389		
T	Methylcyclohexane		0.439	0.383	0.448	0.383	0.433	0.407	0.426	0.398	0.414	0.414	5.759		
C	1,2-Dichloropropane		0.293	0.262	0.292	0.267	0.285	0.288	0.29	0.283	0.294	0.284	4.098		
T	1,4-Dioxane					0.001	0.002	0.002	0.002		0.002	0.002	14.514		
T	Bromodichloromethane		0.391	0.382	0.407	0.375	0.395	0.402	0.408	0.39	0.4	0.394	2.842		
T	Dibromomethane		0.152	0.135	0.159	0.152	0.154	0.16	0.162	0.159	0.163	0.155	5.504		
T	2-Chloroethyl Vinyl Ether			0.109	0.13	0.126	0.133	0.138	0.141	0.138	0.14	0.132	7.987		
T	4-Methyl-2-Pentanone			0.054	0.069	0.063	0.064	0.073	0.075	0.075	0.077	0.069	11.615		
T	cis-1,3-Dichloropropene		0.434	0.402	0.488	0.44	0.465	0.466	0.473	0.45	0.456	0.453	5.589		
T	Dimethyl Disulfide		0.248	0.209	0.249	0.228	0.253	0.25	0.267	0.264	0.272	0.249	7.959		

I	Chlorobenzene-d5	ISTD												
S	Toluene-d8				1.591	1.207	1.268	1.224	1.207	1.164	1.128	1.256	12.298	
C	Toluene		1.586	1.409	1.575	1.407	1.467	1.431	1.351	1.203	1.088	1.391	11.614	
T	Ethyl Methacrylate			0.309	0.316	0.336	0.336	0.354	0.364	0.368	0.358	0.343	6.450	
T	trans-1,3-Dichloropropene		0.469	0.488	0.499	0.479	0.513	0.529	0.519	0.511	0.5	0.501	3.911	
T	1,1,2-Trichloroethane		0.232	0.23	0.263	0.249	0.255	0.264	0.258	0.258	0.261	0.252	5.057	
T	2-Hexanone			0.143	0.155	0.153	0.143	0.169	0.167	0.171	0.165	0.158	7.140	
T	1,3-Dichloropropane		0.475	0.438	0.475	0.451	0.461	0.472	0.464	0.459	0.453	0.461	2.687	
T	Tetrachloroethene		0.322	0.269	0.328	0.279	0.298	0.291	0.285	0.281	0.291	0.294	6.617	
T	Dibromochloromethane		0.351	0.309	0.33	0.309	0.337	0.353	0.348	0.352	0.353	0.338	5.424	
T	1,2-Dibromoethane		0.237	0.241	0.259	0.246	0.26	0.27	0.268	0.27	0.27	0.258	5.133	
T	1-Chlorohexane		0.473	0.448	0.498	0.452	0.494	0.469	0.472	0.46	0.459	0.469	3.702	
P	Chlorobenzene		1.106	0.962	1.09	0.962	0.997	0.985	0.956	0.909	0.859	0.981	7.982	
T	1,1,1,2-Tetrachloroethane		0.349	0.363	0.388	0.342	0.362	0.369	0.37	0.373	0.374	0.366	3.731	
C	Ethylbenzene		0.552	0.491	0.592	0.513	0.544	0.546	0.545	0.549	0.554	0.543	5.148	
T	m-,p-Xylene		0.697	0.619	0.697	0.624	0.654	0.652	0.626	0.576	0.521	0.630	8.881	
T	o-Xylene		0.668	0.618	0.681	0.624	0.653	0.645	0.642	0.632	0.628	0.643	3.214	
T	Styrene		1.024	0.988	1.074	1.008	1.072	1.072	1.054	1	0.928	1.024	4.795	
P	Bromoform		0.175	0.175	0.184	0.185	0.194	0.211	0.213	0.22	0.217	0.197	9.306	
T	Isopropylbenzene		1.629	1.459	1.666	1.509	1.58	1.551	1.476	1.314	1.175	1.484	10.490	
I	1,4-Dichlorobenzene-d4	ISTD												
P	1,1,2,2-Tetrachloroethane		0.55	0.472	0.548	0.562	0.566	0.588	0.589	0.585	0.577	0.560	6.465	
S	p-Bromofluorobenzene				1.305	0.986	1	0.933	0.948	0.932	0.925	1.004	13.502	
T	1,2,3-Trichloropropane			0.143	0.182	0.158	0.162	0.17	0.172	0.173	0.173	0.167	7.322	
T	trans-1,4-Dichloro-2-Butene			0.129	0.144	0.155	0.185	0.195	0.21	0.212	0.212	0.180	18.350	0.999
T	n-Propylbenzene		3.798	3.341	3.838	3.337	3.626	3.414	3.237	2.68		3.409	10.827	
T	Bromobenzene	0.861	0.679	0.753	0.783	0.724	0.759	0.734	0.748	0.734	0.743	0.752	6.228	
T	1,3,5-Trimethylbenzene		2.67	2.465	2.666	2.417	2.557	2.429	2.406	2.131	1.963	2.411	9.681	
T	2-Chlorotoluene		2.909	2.11	2.406	2.141	2.225	2.139	2.061	1.818		2.226	14.414	
T	4-Chlorotoluene		2.909	2.212	2.457	2.145	2.345	2.185	2.143	1.818		2.277	13.838	
T	a-Methylstyrene		1.275	1.11	1.308	1.252	1.39	1.326	1.381	1.302	1.267	1.290	6.401	
T	tert-Butylbenzene		0.476	0.464	0.572	0.503	0.522	0.508	0.52	0.507	0.528	0.511	6.092	
T	1,2,4-Trimethylbenzene		2.719	2.528	2.725	2.4	2.609	2.489	2.452	2.147	1.963	2.448	10.337	
T	sec-Butylbenzene		3.081	2.696	3.207	2.776	2.974	2.85	2.755	2.378	2.162	2.764	11.895	
T	p-Isopropyltoluene		2.536	2.364	2.568	2.364	2.556	2.444	2.403	2.094	1.929	2.362	9.203	
T	1,3-Dichlorobenzene		1.604	1.281	1.548	1.376	1.453	1.399	1.407	1.304	1.277	1.406	8.162	
T	1,4-Dichlorobenzene	2.026	1.449	1.467	1.552	1.387	1.472	1.415	1.413	1.312	1.273	1.477	14.142	
T	n-Butylbenzene		2.479	1.983	2.327	2.057	2.269	2.171	2.097	1.832	1.722	2.104	11.377	
T	1,2-Dichlorobenzene	1.499	1.314	1.326	1.394	1.292	1.346	1.311	1.315	1.223	1.205	1.322	6.276	
T	1,2-Dibromo-3-Chloropropane		0.074	0.095	0.096	0.097	0.1	0.115	0.117	0.114	0.123	0.103	14.646	
T	1,2,4-Trichlorobenzene		0.887	0.922	0.967	0.867	0.922	0.898	0.88	0.821	0.882	0.894	4.568	
T	Hexachlorobutadiene		0.444	0.299	0.401	0.307	0.356	0.335	0.325	0.304	0.337	0.345	13.991	
T	Naphthalene		1.787	1.663	1.755	1.752	1.783	1.851	1.777	1.609	1.58	1.729	5.239	
T	1,2,3-Trichlorobenzene	1.019	0.92	0.754	0.809	0.78	0.813	0.807	0.791	0.746	0.793	0.823	10.146	

Wed Nov 06 14:59:19 2013

Thu Sep 19 10:28:54 2013

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Calibration Table Report
Method: A9WTR.M
Title: Appendix IX (SOP:OVL MSV01) Water 12/04/13 HPMS11
Last Calibration: Wed Dec 18 14:24:41 2013
Curve: WG455130
Calibration Files
                                    5     20     50    100    200    300    400    500             Linear  Quadratic
                              11M97410.D 11M97411.D 11M97412.D 11M97413.D 11M97414.D 11M97415.D 11M97416.D 11M97417.D
Compound                                                                              Avg    %RSD

Fluorobenzene                 ISTD
Acetonitrile                    0.036  0.028  0.027  0.029  0.029  0.030  0.029  0.029  0.030  9.836
3-Chloro-1-propene              0.478  0.497  0.515  0.502  0.505  0.493  0.454  0.439  0.485  5.450
2-Chloro-1,3-butadiene          0.458  0.502  0.525  0.523  0.533  0.520  0.480  0.464  0.501  5.923
Methacrylonitrile               0.196  0.178  0.168  0.176  0.183  0.184  0.174  0.174  0.179  4.838
Isobutyl Alcohol                       0.010  0.008  0.009  0.009  0.010  0.009  0.010  0.009  7.458
1-Butanol                              0.003  0.003  0.004  0.004  0.005  0.005  0.004  0.004 19.985  0.995
Cyclohexanone                          0.028  0.021  0.021  0.018  0.036  0.036  0.042  0.029 31.895         0.991
2-Nitropropane                  0.073  0.071  0.074  0.082  0.087  0.091  0.088  0.088  0.082  9.852
Ethyl Acetate                   0.246  0.236  0.224  0.236  0.242  0.241  0.225  0.223  0.234  3.836
Methyl methacrylate             0.235  0.219  0.223  0.243  0.251  0.251  0.237  0.236  0.237  4.857
Chlorobenzene-d5              ISTD
1,4-Dichlorobenzene-d4        ISTD

Wed Dec 18 14:50:12 2013
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                                        Response Factor Report HPMS17

  Method Path : D:\MassHunter\GCMS\1\methods\
  Method File : A9FOOWT.M
  Title     : Appendix IX (SOP:OVL MSV01) WATER 10/13/13 HPMS17
  Last Update  : Thu Oct 17 17:39:37 2013
  Response Via : Initial Calibration
  Curve:WG448462
  Calibration Files
  5   =17M000186.D  20  =17M000187.D  50  =17M000188.D  100 =17M000189.D  200 =17M000190.D  300 =17M000191.D  400 =17M00019
  500 =17M000193.D

        Compound            5     20    50    100   200   300   400   500   Avg      %RSD
  -------------------------------------------------------------------------------------------

  1) I   Fluorobenzene         ----------------ISTD--------------------                  Linear   Quadratic
  2) T   Acetonitrile            0.015 0.016 0.016 0.018 0.018 0.019 0.018 0.017    6.99
  3) T   3-Chloro-1-pro... 0.338 0.384 0.374 0.368 0.350 0.333 0.318 0.306 0.346    8.00
  4) T   2-Chloro-1,3-b... 0.284 0.344 0.339 0.340 0.330 0.319 0.309 0.299 0.320    6.81
  5) T   Methacrylonitrile 0.055 0.065 0.068 0.067 0.070 0.066 0.066 0.064 0.065    6.65
  6) T   Ethyl Acetate     0.124 0.142 0.149 0.150 0.156 0.149 0.150 0.146 0.146    6.70
  7) T   Isobutyl Alcohol        0.004 0.005 0.004 0.005 0.005 0.005 0.005 0.005    7.94
  8) T   1-Butanol                     0.002 0.002 0.002 0.003 0.003 0.003 0.002   24.53           0.996
  9) T   Methyl methacr... 0.110 0.132 0.142 0.147 0.151 0.141 0.140 0.135 0.137    9.17
 10) T   2-Nitropropane          0.039 0.048 0.051 0.056 0.055 0.056 0.055 0.051   12.15

 11)     Chlorobenzene-d5      ----------------ISTD--------------------
 12) T   Cyclohexanone                 0.004 0.004 0.005 0.005 0.006 0.006 0.005   18.06           0.993

 13) I   1,4-Dichlorobenzen... ----------------ISTD--------------------
 ----------------------------------------------------------------------------
 (#) = Out of Range

A9FOOWT.M Thu Oct 17 17:45:24 2013
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Calibration Table Report
Method: 8260WTR.M
Title: 8260B/624 SOP:OVL MSV01 WATER 11/15/13 HPMS17
Last Calibration: Sat Nov 16 17:30:32 2013
Curve: WG453012
Calibration Files
                                      0.3     0.4       1       2       5      20      50     100     200     300                       R^2
                                  17M001022.D 17M001023.D 17M001024.D 17M001025.D 17M001026.D 17M001027.D 17M001028.D 17M001029.D 17M001030.D 17M001031.D
Compound                                                                                                          Avg     %RSD    Linear  Quadratic

Fluorobenzene                     ISTD
Dichlorodifluoromethane                             0.196   0.206   0.204   0.262   0.243   0.252   0.253   0.240   0.232  11.138
Chloromethane                                       0.379   0.375   0.367   0.408   0.376   0.402   0.385   0.364   0.382   4.072
Vinyl Chloride                              0.366   0.370   0.386   0.376   0.426   0.388   0.403   0.346   0.317   0.375   8.421
1,3-Butadiene                                                       0.192   0.205   0.172   0.165   0.150           0.177  12.466
Bromomethane                                        0.202   0.205   0.203   0.228   0.216   0.235   0.235   0.228   0.219   6.525
Chloroethane                                        0.169   0.184   0.181   0.199   0.186   0.200   0.196   0.188   0.188   5.636
Trichlorofluoromethane                      0.357   0.389   0.418   0.415   0.463   0.434   0.455   0.447   0.423   0.422   7.859
Diethyl ether                                       0.171   0.188   0.185   0.193   0.182   0.200           0.192   0.187   4.932
Isoprene                                            0.351   0.392   0.380   0.410   0.387   0.407   0.393   0.390   0.389   4.666
Acrolein                                                    0.006   0.006   0.007   0.006   0.007           0.006   0.006   3.035
1,1,2-Trichloro-1,2,2-Trifluoroet                   0.241   0.250   0.248   0.274   0.256   0.265   0.264   0.250   0.256   4.292
Acetone                                                             0.062   0.052   0.046   0.051   0.045   0.045   0.050  12.654
1,1-Dichloroethene                          0.337   0.364   0.388   0.386   0.424   0.398   0.424   0.414   0.394   0.392   7.263
Tert-Butyl Alcohol                                          0.017   0.017   0.017   0.016   0.017           0.018   0.017   3.135
Dimethyl Sulfide                                    0.240   0.264   0.251   0.271   0.254   0.266   0.262   0.248   0.257   4.057
Iodomethane                                         0.306   0.349   0.352   0.387   0.364   0.382   0.375   0.355   0.359   7.141
Methyl acetate                                              0.144   0.145   0.136   0.125   0.129   0.124   0.121   0.132   7.324
Methylene Chloride                          0.275   0.273   0.286   0.282   0.307   0.288   0.310   0.311   0.302   0.293   5.121
Carbon Disulfide                                    0.758   0.818   0.804   0.885   0.850   0.905   0.916   0.877   0.852   6.422
Acrylonitrile                                       0.052   0.062   0.061   0.065   0.065   0.069           0.072   0.064   9.926
Methyl Tert Butyl Ether                             0.621   0.636   0.648   0.709   0.658   0.698   0.680   0.649   0.662   4.609
trans-1,2-Dichloroethene                    0.239   0.257   0.266   0.268   0.294   0.274   0.296   0.294   0.283   0.275   7.003
n-Hexane                                            0.266   0.286   0.275   0.309   0.296   0.305   0.307   0.289   0.292   5.400
Diisopropyl ether                                   0.737   0.814   0.797   0.820   0.760   0.833           0.753   0.788   4.732
Vinyl Acetate                                               0.341   0.333   0.360   0.321   0.329   0.320   0.299   0.329   5.773
1,1-Dichloroethane                          0.452   0.469   0.491   0.485   0.529   0.492   0.524   0.520   0.496   0.495   5.160
Ethyl-Tert-Butyl ether                              0.739   0.821   0.806   0.834   0.778   0.854           0.787   0.803   4.787
2-Butanone                                                  0.091   0.080   0.076   0.070   0.071   0.069   0.069   0.075  10.761
Propionitrile                                       0.019   0.022   0.023   0.023   0.022   0.023           0.023   0.022   7.551
2,2-Dichloropropane                         0.437   0.429   0.427   0.422   0.458   0.423   0.453   0.446   0.418   0.435   3.341
cis-1,2-Dichloroethene                      0.286   0.301   0.317   0.306   0.337   0.316   0.340   0.337   0.326   0.318   5.796
Chloroform                          0.482   0.474   0.494   0.512   0.510   0.556   0.520   0.552   0.547   0.523   0.517   5.510
1-Bromopropane                                      0.051   0.059   0.062   0.067   0.064   0.066   0.066   0.063   0.062   8.437
Bromochloromethane                          0.169   0.186   0.197   0.193   0.217   0.203   0.215   0.214   0.207   0.200   7.828
Tetrahydrofuran                                     0.044   0.045   0.045   0.046   0.043   0.046           0.043   0.045   2.618
Dibromofluoromethane                                        0.313   0.307   0.318   0.304   0.322   0.304           0.311   2.450
1,1,1-Trichloroethane                       0.409   0.443   0.452   0.457   0.502   0.474   0.513   0.517   0.501   0.474   7.754
Cyclohexane                                 0.411   0.421   0.450   0.443   0.462   0.431   0.440   0.451   0.432   0.438   3.684
1,1-Dichloropropene                         0.288   0.329   0.352   0.350   0.390   0.368   0.394   0.390   0.374   0.359   9.619
Tert-Amyl-Methyl ether                              0.660   0.731   0.726   0.759   0.713   0.794           0.757   0.734   5.770
Carbon Tetrachloride                        0.355   0.385   0.414   0.421   0.469    0.45   0.491   0.464   0.471 0.43551 10.3163
1,2-Dichloroethane-d4                                       0.339   0.309    0.31   0.295   0.304   0.284         0.30681 6.03475
1,2-Dichloroethane                          0.296   0.337   0.358    0.35   0.385   0.361   0.385   0.385   0.371 0.35864 8.06451
Benzene                                     0.999   1.029   1.066   1.057   1.157   1.081   1.163   1.156   1.097 1.08956 5.44178
Trichloroethene                              0.29   0.302   0.329   0.322   0.348   0.328   0.354   0.355   0.346 0.33045 6.96555
Methylcyclohexane                                   0.411   0.451   0.448   0.484   0.457   0.462   0.474   0.455 0.45531  4.7221
1,2-Dichloropropane                         0.245   0.261   0.273   0.269   0.297   0.274   0.293   0.289   0.279 0.27568 5.92506
1,4-Dioxane                                                 0.002   0.002   0.002   0.002   0.002                 0.00203 5.54176
Bromodichloromethane                        0.328   0.358   0.373   0.377   0.423   0.405   0.436   0.436   0.427 0.39578 9.75905
Dibromomethane                              0.147   0.157   0.164   0.167   0.181   0.172   0.184   0.181   0.176 0.16993 7.29876
2-Chloroethyl Vinyl Ether                           0.077    0.09   0.097   0.107   0.105   0.117   0.118         0.10169 14.7308
4-Methyl-2-Pentanone                                                0.065   0.073   0.069   0.072    0.07   0.072  0.0703 4.10242
cis-1,3-Dichloropropene                     0.357   0.391   0.414   0.418   0.479   0.456   0.493   0.496   0.485 0.44321  11.326
Dimethyl Disulfide                                                  0.251   0.287   0.282   0.301   0.312   0.305 0.28951 7.58771
Chlorobenzene-d5                  ISTD
Toluene-d8                                                  1.627   1.547   1.579   1.479   1.535   1.384         1.52533  5.5613
Toluene                                     1.595   1.615   1.646   1.699   1.862   1.714   1.844   1.708    1.54 1.69156 6.39356
Ethyl Methacrylate                                  0.378   0.412    0.43    0.46   0.433   0.448   0.427   0.402 0.42356 6.12205
trans-1,3-Dichloropropene                   0.436   0.486    0.52   0.541   0.612    0.58   0.617   0.588   0.557 0.54852 10.9307
1,1,2-Trichloroethane                0.25   0.301   0.289   0.319   0.321   0.356   0.329   0.345   0.326   0.312 0.31475 9.46606
2-Hexanone                                                  0.168    0.17   0.177   0.165    0.17   0.155   0.152 0.16536 5.30749
1,3-Dichloropropane                         0.474   0.511   0.531   0.551   0.598   0.551   0.577   0.549    0.52  0.5401  6.7907
Tetrachloroethene                           0.412   0.437   0.454   0.477   0.528   0.497   0.532   0.511   0.487 0.48161 8.47708
Dibromochloromethane                        0.351    0.35   0.393   0.413   0.477   0.452   0.486    0.47   0.452 0.42708 12.3394
1,2-Dibromoethane                            0.26   0.301   0.322   0.328    0.37   0.343   0.361   0.344   0.327 0.32846 10.0844
1-Chlorohexane                              0.477    0.47   0.513   0.533   0.595   0.565   0.601   0.584   0.553  0.5436 8.96118
Chlorobenzene                               1.018   1.025   1.086   1.125    1.27    1.19   1.299   1.269   1.198 1.16448  9.1437
1,1,1,2-Tetrachloroethane                   0.368   0.396   0.415   0.439   0.503   0.479   0.529   0.534   0.522 0.46496 13.3994
Ethylbenzene                                0.522   0.539   0.571   0.602   0.674   0.647   0.725   0.737   0.716 0.63699 12.8786
m-,p-Xylene                                 0.669    0.67   0.698   0.735   0.816   0.785   0.879   0.863   0.776 0.76562 10.2434
o-Xylene                                    0.665   0.661   0.707   0.742   0.819   0.768   0.844    0.84   0.814 0.76225 9.50679
Styrene                                      0.97   1.033   1.122   1.171   1.347   1.277   1.422   1.393   1.309 1.22729  13.114
Bromoform                                           0.227   0.251    0.27    0.33    0.32   0.347   0.341   0.327 0.30167 15.0773   0.999
Isopropylbenzene                            1.552   1.653   1.748   1.843    2.05   1.944   2.125   2.019   1.801 1.85955 10.2857
1,4-Dichlorobenzene-d4            ISTD
1,1,2,2-Tetrachloroethane                   0.603   0.616   0.652   0.747   0.859   0.792   0.812   0.743   0.697 0.72461 12.3154
p-Bromofluorobenzene                                                1.262   1.282   1.202   1.234    1.08           1.212 6.56156
1,2,3-Trichloropropane                      0.176   0.222    0.22   0.254   0.267   0.242   0.248   0.223   0.209   0.229  11.962
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trans-1,4-Dichloro-2-Butene			0.168	0.18	0.216	0.235	0.222	0.23	0.213	0.2	0.20803	11.3576	
n-Propylbenzene		4.135	3.992	4.245	4.71	5.196	4.85	5.141	4.463	3.841	4.50807	10.9615	
Bromobenzene	0.896	0.925	0.974	1.081	1.152	1.252	1.145	1.205	1.115	1.071	1.08167	10.8985	
1,3,5-Trimethylbenzene		3.088	2.981	3.153	3.482	3.791	3.508	3.739	3.369	3.044	3.35057	8.98897	
2-Chlorotoluene		2.846	2.706	2.746	2.978	3.212	2.918	2.954	2.623	2.528	2.83439	7.35746	
4-Chlorotoluene		2.47	2.419	2.532	2.741	3.003	2.793	3.007	2.771	2.556	2.69926	8.0959	
a-Methylstyrene				1.775	1.993	2.158	2.051	2.185	2.034	1.947	2.02034	6.80379	
tert-Butylbenzene		0.594	0.623	0.705	0.766	0.826	0.766	0.814	0.752	0.734	0.73123	10.7989	
1,2,4-Trimethylbenzene		3.043	3.052	3.189	3.521	3.826	3.569	3.808	3.411	3.073	3.38785	9.2739	
sec-Butylbenzene		3.655	3.586	3.853	4.342	4.76	4.473	4.774	4.19	3.682	4.1461	11.3588	
p-Isopropyltoluene		2.961	2.874	3.086	3.509	3.961	3.748	4.04	3.576	3.221	3.44156	12.47	
1,3-Dichlorobenzene		1.739	1.682	1.788	1.987	2.219	2.094	2.255	2.069	1.972	1.97809	10.3771	
1,4-Dichlorobenzene	1.472	1.638	1.691	1.789	1.99	2.208	2.091	2.261	2.081	1.975	1.91952	13.5783	
n-Butylbenzene		2.269	2.217	2.342	2.759	3.297	3.228	3.514	3.15	2.875	2.85011	17.0035	0.994
1,2-Dichlorobenzene	1.39	1.722	1.705	1.775	1.982	2.165	2.033	2.17	1.966	1.879	1.87872	12.7023	
1,2-Dibromo-3-Chloropropane				0.117	0.128	0.149	0.144	0.149	0.136	0.13	0.13611	8.78261	
1,2,4-Trichlorobenzene		1.023	1.042	1.132	1.305	1.562	1.53	1.657	1.573	1.53	1.37253	18.2371	0.999
Hexachlorobutadiene		0.554	0.563	0.603	0.712	0.854	0.84	0.904	0.85	0.838	0.74627	18.739	0.999
Naphthalene		1.97	2.035	2.148	2.455	2.872	2.72	2.827	2.6	2.392	2.4467	13.8102	
1,2,3-Trichlorobenzene	0.786	0.988	1.036	1.112	1.29	1.504	1.438	1.526	1.447	1.391	1.25187	20.3635	0.999

Wed Nov 20 09:47:17 2013

Microbac Laboratories Inc.
ALTERNATE SOURCE CALIBRATION REPORT

Login Number:	L13120825	Run Date:	11/05/2013	Sample ID:	WG451178-12
Instrument ID:	HPMS11	Run Time:	22:42	Method:	8260B
File ID:	11M96673	Analyst:	FJB	QC Key:	DOD4
ICal Workgroup:	WG451178	Cal ID:	HPMS11 - 05-NOV-13		

Analyte		Expected	Found	Units	RF	%D	UCL	Q
Chloroform	CCC	20.0	20.8	ug/L	0.543	3.90	20	
1,1-Dichloroethene	CCC	20.0	19.6	ug/L	0.446	1.80	20	
1,2-Dichloropropane	CCC	20.0	20.5	ug/L	0.290	2.30	20	
Ethylbenzene	CCC	20.0	20.2	ug/L	0.548	0.900	20	
Toluene	CCC	20.0	21.4	ug/L	1.49	7.20	20	
Vinyl Chloride	CCC	20.0	23.8	ug/L	0.392	18.8	20	
Bromoform	SPCC	20.0	21.7	ug/L	0.214	8.50	20	
Chlorobenzene	SPCC	20.0	21.3	ug/L	1.05	6.60	20	
Chloromethane	SPCC	20.0	23.2	ug/L	0.404	15.9	20	
1,1-Dichloroethane	SPCC	20.0	20.8	ug/L	0.540	3.80	20	
1,1,2,2-Tetrachloroethane	SPCC	20.0	20.6	ug/L	0.577	3.10	20	
Acetone		20.0	23.8	ug/L	0.0690	18.9	20	
Benzene		20.0	20.6	ug/L	1.12	3.00	20	
Bromobenzene		20.0	20.6	ug/L	0.776	3.20	20	
Bromochloromethane		20.0	21.7	ug/L	0.185	8.40	20	
Bromodichloromethane		20.0	20.2	ug/L	0.398	1.00	20	
Bromomethane		20.0	20.5	ug/L	0.145	2.60	20	
2-Butanone		20.0	21.1	ug/L	0.0892	5.70	20	
n-Butylbenzene		20.0	21.5	ug/L	2.26	7.50	20	
sec-Butylbenzene		20.0	22.2	ug/L	3.06	10.8	20	
tert-Butylbenzene		20.0	21.4	ug/L	0.548	7.20	20	
Carbon Disulfide		20.0	21.5	ug/L	0.889	7.70	20	
Carbon Tetrachloride		20.0	21.1	ug/L	0.457	5.70	20	
Dibromochloromethane		20.0	21.0	ug/L	0.355	4.90	20	
Chloroethane		20.0	21.0	ug/L	0.202	5.10	20	
2-Chlorotoluene		20.0	21.3	ug/L	2.37	6.30	20	
4-Chlorotoluene		20.0	20.8	ug/L	2.37	4.20	20	
1,2-Dibromo-3-Chloropropane		20.0	22.1	ug/L	0.114	10.5	20	
1,2-Dibromoethane		20.0	21.1	ug/L	0.272	5.60	20	
Dibromomethane		20.0	21.4	ug/L	0.166	6.90	20	
1,2-Dichlorobenzene		20.0	21.8	ug/L	1.44	8.80	20	
1,3-Dichlorobenzene		20.0	21.4	ug/L	1.50	6.90	20	
1,4-Dichlorobenzene		20.0	20.1	ug/L	1.48	0.300	20	
Dichlorodifluoromethane		20.0	30.9	ug/L	0.381	54.5	20	*
1,2-Dichloroethane		20.0	20.7	ug/L	0.391	3.30	20	
cis-1,2-Dichloroethene		20.0	20.5	ug/L	0.314	2.70	20	
trans-1,2-Dichloroethene		20.0	20.0	ug/L	0.287	0.100	20	
1,3-Dichloropropane		20.0	20.7	ug/L	0.478	3.60	20	
2,2-Dichloropropane		20.0	18.9	ug/L	0.470	5.40	20	
cis-1,3-Dichloropropene		20.0	21.3	ug/L	0.482	6.50	20	
trans-1,3-Dichloropropene		20.0	20.2	ug/L	0.505	0.800	20	
1,1-Dichloropropene		20.0	20.5	ug/L	0.406	2.50	20	

ALT - Modified 09/06/2007
Version 1.5 PDF File ID: 3288058
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Microbac Laboratories Inc.
ALTERNATE SOURCE CALIBRATION REPORT

Login Number: L13120825 Run Date: 11/05/2013 Sample ID: WG451178-12
Instrument ID: HPMS11 Run Time: 22:42 Method: 8260B
File ID: 11M96673 Analyst: FJB QC Key: DOD4
ICal Workgroup: WG451178 Cal ID: HPMS11 - 05-NOV-13

Analyte		Expected	Found	Units	RF	%D	UCL	Q
2-Hexanone		20.0	22.6	ug/L	0.179	12.8	20	
Hexachlorobutadiene		20.0	20.3	ug/L	0.351	1.60	20	
Isopropylbenzene		20.0	22.5	ug/L	1.67	12.7	20	
p-Isopropyltoluene		20.0	21.6	ug/L	2.55	7.80	20	
4-Methyl-2-Pentanone		20.0	22.4	ug/L	0.0769	11.8	20	
Methylene Chloride		20.0	19.5	ug/L	0.284	2.30	20	
Naphthalene		20.0	22.4	ug/L	1.94	12.2	20	
n-Propylbenzene		20.0	21.3	ug/L	3.64	6.70	20	
Styrene		20.0	21.6	ug/L	1.11	8.10	20	
1,1,1,2-Tetrachloroethane		20.0	20.3	ug/L	0.372	1.70	20	
Tetrachloroethene		20.0	20.4	ug/L	0.299	1.80	20	
1,2,3-Trichlorobenzene		20.0	20.9	ug/L	0.859	4.40	20	
1,2,4-Trichlorobenzene		20.0	21.0	ug/L	0.940	5.20	20	
1,1,1-Trichloroethane		20.0	21.2	ug/L	0.498	5.80	20	
1,1,2-Trichloroethane		20.0	21.0	ug/L	0.265	5.00	20	
Trichloroethene		20.0	20.5	ug/L	0.307	2.50	20	
Trichlorofluoromethane		20.0	23.2	ug/L	0.532	15.8	20	
1,2,3-Trichloropropane		20.0	20.5	ug/L	0.171	2.50	20	
1,2,4-Trimethylbenzene		20.0	21.2	ug/L	2.59	6.00	20	
1,3,5-Trimethylbenzene		20.0	21.4	ug/L	2.58	7.00	20	
o-Xylene		20.0	21.3	ug/L	0.684	6.30	20	
m-,p-Xylene		40.0	43.4	ug/L	0.682	8.40	20	

* Exceeds %D Limit

CCC Calibration Check Compounds
SPCC System Performance Check Compounds

ALT - Modified 09/06/2007
Version 1.5 PDF File ID: 3288058
Report generated 12/26/2013 16:06

Microbac Laboratories Inc.
ALTERNATE SOURCE CALIBRATION REPORT

Login Number: L13120825
Run Date: 11/15/2013
Sample ID: WG453012-12
Instrument ID: HPMS17
Run Time: 20:12
Method: 8260B
File ID: 17M001033
Analyst: ADC
QC Key: DOD4
ICal Workgroup: WG453012
Cal ID: HPMS17 - 15-NOV-13

Analyte		Expected	Found	Units	RF	%D	UCL	Q
Chloroform	CCC	50.0	49.4	ug/L	0.511	1.30	20	
1,1-Dichloroethene	CCC	50.0	46.4	ug/L	0.364	7.20	20	
1,2-Dichloropropane	CCC	50.0	47.0	ug/L	0.259	6.00	20	
Ethylbenzene	CCC	50.0	46.7	ug/L	0.595	6.70	20	
Toluene	CCC	50.0	47.0	ug/L	1.59	6.10	20	
Vinyl Chloride	CCC	50.0	49.5	ug/L	0.372	1.00	20	
Bromoform	SPCC	50.0	46.2	ug/L	0.306	7.50	20	
Chlorobenzene	SPCC	50.0	49.9	ug/L	1.16	0.300	20	
Chloromethane	SPCC	50.0	54.3	ug/L	0.415	8.60	20	
1,1-Dichloroethane	SPCC	50.0	47.9	ug/L	0.475	4.20	20	
1,1,2,2-Tetrachloroethane	SPCC	50.0	48.7	ug/L	0.706	2.60	20	
Acetone		50.0	46.6	ug/L	0.0467	6.70	20	
Benzene		50.0	47.7	ug/L	1.04	4.50	20	
Bromobenzene		50.0	45.7	ug/L	0.988	8.70	20	
Bromochloromethane		50.0	49.3	ug/L	0.197	1.30	20	
Bromodichloromethane		50.0	48.3	ug/L	0.382	3.50	20	
Bromomethane		50.0	50.6	ug/L	0.222	1.20	20	
2-Butanone		50.0	46.9	ug/L	0.0705	6.20	20	
n-Butylbenzene		50.0	47.2	ug/L	2.91	5.50	20	
sec-Butylbenzene		50.0	48.2	ug/L	3.99	3.60	20	
tert-Butylbenzene		50.0	46.5	ug/L	0.681	6.90	20	
Carbon Disulfide		50.0	42.0	ug/L	0.716	15.9	20	
Carbon Tetrachloride		50.0	50.5	ug/L	0.440	0.900	20	
Dibromochloromethane		50.0	49.7	ug/L	0.424	0.700	20	
Chloroethane		50.0	49.1	ug/L	0.185	1.80	20	
2-Chlorotoluene		50.0	46.2	ug/L	2.62	7.70	20	
4-Chlorotoluene		50.0	46.2	ug/L	2.49	7.60	20	
1,2-Dibromo-3-Chloropropane		50.0	47.7	ug/L	0.130	4.50	20	
1,2-Dibromoethane		50.0	47.2	ug/L	0.310	5.60	20	
Dibromomethane		50.0	49.4	ug/L	0.168	1.20	20	
1,2-Dichlorobenzene		50.0	51.5	ug/L	1.93	2.90	20	
1,3-Dichlorobenzene		50.0	48.9	ug/L	1.94	2.10	20	
1,4-Dichlorobenzene		50.0	48.8	ug/L	1.87	2.30	20	
Dichlorodifluoromethane		50.0	69.5	ug/L	0.322	38.9	20	*
1,2-Dichloroethane		50.0	47.4	ug/L	0.340	5.30	20	
cis-1,2-Dichloroethene		50.0	47.8	ug/L	0.304	4.50	20	
trans-1,2-Dichloroethene		50.0	47.4	ug/L	0.260	5.20	20	
1,3-Dichloropropane		50.0	46.3	ug/L	0.500	7.40	20	
2,2-Dichloropropane		50.0	44.3	ug/L	0.385	11.4	20	
cis-1,3-Dichloropropene		50.0	49.9	ug/L	0.442	0.300	20	
trans-1,3-Dichloropropene		50.0	45.5	ug/L	0.499	9.10	20	
1,1-Dichloropropene		50.0	48.6	ug/L	0.349	2.80	20	

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Microbac Laboratories Inc.
ALTERNATE SOURCE CALIBRATION REPORT

Login Number: L13120825
Run Date: 11/15/2013
Sample ID: WG453012-12
Instrument ID: HPMS17
Run Time: 20:12
Method: 8260B
File ID: 17M001033
Analyst: ADC
QC Key: DOD4
ICal Workgroup: WG453012
Cal ID: HPMS17 - 15-NOV-13

Analyte		Expected	Found	Units	RF	%D	UCL	Q
2-Hexanone		50.0	50.2	ug/L	0.166	0.400	20	
Hexachlorobutadiene		50.0	45.1	ug/L	0.764	9.80	20	
Isopropylbenzene		50.0	50.5	ug/L	1.88	1.00	20	
p-Isopropyltoluene		50.0	47.8	ug/L	3.29	4.30	20	
4-Methyl-2-Pentanone		50.0	50.5	ug/L	0.0710	0.900	20	
Methylene Chloride		50.0	46.5	ug/L	0.273	6.90	20	
Naphthalene		50.0	50.6	ug/L	2.48	1.30	20	
n-Propylbenzene		50.0	45.7	ug/L	4.12	8.60	20	
Styrene		50.0	49.6	ug/L	1.22	0.800	20	
1,1,1,2-Tetrachloroethane		50.0	46.6	ug/L	0.433	6.80	20	
Tetrachloroethene		50.0	48.4	ug/L	0.467	3.10	20	
1,2,3-Trichlorobenzene		50.0	47.6	ug/L	1.36	4.90	20	
1,2,4-Trichlorobenzene		50.0	46.1	ug/L	1.43	7.80	20	
1,1,1-Trichloroethane		50.0	49.2	ug/L	0.466	1.60	20	
1,1,2-Trichloroethane		50.0	47.6	ug/L	0.300	4.80	20	
Trichloroethene		50.0	46.0	ug/L	0.304	8.10	20	
Trichlorofluoromethane		50.0	55.0	ug/L	0.464	10.0	20	
1,2,3-Trichloropropane		50.0	44.9	ug/L	0.206	10.2	20	
1,2,4-Trimethylbenzene		50.0	45.7	ug/L	3.10	8.60	20	
1,3,5-Trimethylbenzene		50.0	45.5	ug/L	3.05	8.90	20	
o-Xylene		50.0	48.4	ug/L	0.737	3.30	20	
m-,p-Xylene		100	96.5	ug/L	0.738	3.50	20	

* Exceeds %D Limit

CCC Calibration Check Compounds
SPCC System Performance Check Compounds

ALT - Modified 09/06/2007
Version 1.5 PDF File ID: 3288058
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Microbac Laboratories Inc.
CONTINUING CALIBRATION VERIFICATION (CCV)

Login Number:	L13120825	Run Date:	12/22/2013	Sample ID:	WG457313-02
Instrument ID:	HPMS17	Run Time:	17:32	Method:	8260B
File ID:	17M001841	Analyst:	ADC	QC Key:	DOD4
Workgroup (AAB#):	WG457314	Cal ID:	HPMS17 - 15-NOV-13		
Matrix:	WATER				

Analyte		Expected	Found	UNITS	RF	%D	UCL	Q
Chloroform	CCC	50.0	53.7	ug/L	0.556	7.45	20	
1,1-Dichloroethene	CCC	50.0	55.0	ug/L	0.431	9.98	20	
1,2-Dichloropropane	CCC	50.0	53.7	ug/L	0.296	7.49	20	
Ethylbenzene	CCC	50.0	51.9	ug/L	0.661	3.79	20	
Toluene	CCC	50.0	51.3	ug/L	1.74	2.61	20	
Vinyl Chloride	CCC	50.0	56.0	ug/L	0.420	12.0	20	
Bromoform	SPCC	50.0	48.3	ug/L	0.320	3.40	20	
Chlorobenzene	SPCC	50.0	51.6	ug/L	1.20	3.26	20	
Chloromethane	SPCC	50.0	54.7	ug/L	0.418	9.41	20	
1,1-Dichloroethane	SPCC	50.0	54.1	ug/L	0.536	8.20	20	
1,1,2,2-Tetrachloroethane	SPCC	50.0	52.5	ug/L	0.761	5.03	20	
Xylenes		150	155	ug/L	0.788	3.67	20	
Acetone		50.0	47.0	ug/L	0.0471	5.92	20	
Benzene		50.0	53.4	ug/L	1.16	6.77	20	
Bromobenzene		50.0	49.0	ug/L	1.06	2.04	20	
Bromochloromethane		50.0	52.7	ug/L	0.211	5.41	20	
Bromodichloromethane		50.0	54.2	ug/L	0.429	8.39	20	
Bromomethane		50.0	44.8	ug/L	0.196	10.4	20	
2-Butanone		50.0	48.2	ug/L	0.0726	3.50	20	
n-Butylbenzene		50.0	51.9	ug/L	3.20	3.87	20	
sec-Butylbenzene		50.0	51.7	ug/L	4.29	3.38	20	
tert-Butylbenzene		50.0	48.9	ug/L	0.715	2.23	20	
Carbon Disulfide		50.0	50.6	ug/L	0.862	1.20	20	
Carbon Tetrachloride		50.0	54.8	ug/L	0.477	9.53	20	
Dibromochloromethane		50.0	52.4	ug/L	0.447	4.76	20	
Chloroethane		50.0	53.2	ug/L	0.200	6.46	20	
2-Chlorotoluene		50.0	48.8	ug/L	2.77	2.40	20	
4-Chlorotoluene		50.0	49.0	ug/L	2.64	2.07	20	
1,2-Dibromo-3-Chloropropane		50.0	46.6	ug/L	0.127	6.70	20	
1,2-Dibromoethane		50.0	50.2	ug/L	0.330	0.424	20	
Dibromomethane		50.0	52.6	ug/L	0.179	5.11	20	
1,2-Dichlorobenzene		50.0	50.6	ug/L	1.90	1.10	20	
1,3-Dichlorobenzene		50.0	50.8	ug/L	2.01	1.54	20	
1,4-Dichlorobenzene		50.0	52.1	ug/L	2.00	4.30	20	
Dichlorodifluoromethane		50.0	49.9	ug/L	0.231	0.293	20	
1,2-Dichloroethane		50.0	53.2	ug/L	0.382	6.47	20	
cis-1,2-Dichloroethene		50.0	53.4	ug/L	0.340	6.80	20	
trans-1,2-Dichloroethene		50.0	54.4	ug/L	0.299	8.76	20	
1,3-Dichloropropane		50.0	51.1	ug/L	0.552	2.19	20	
2,2-Dichloropropane		50.0	52.6	ug/L	0.457	5.18	20	
cis-1,3-Dichloropropene		50.0	54.7	ug/L	0.485	9.46	20	
trans-1,3-Dichloropropene		50.0	53.0	ug/L	0.581	5.99	20	

CCV - Modified 03/05/2008
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Microbac Laboratories Inc.
CONTINUING CALIBRATION VERIFICATION (CCV)

Login Number: L13120825
Instrument ID: HPMS17
File ID: 17M001841
Workgroup (AAB#): WG457314
Matrix: WATER

Run Date: 12/22/2013
Run Time: 17:32
Analyst: ADC
Cal ID: HPMS17 - 15-NOV-13

Sample ID: WG457313-02
Method: 8260B
QC Key: DOD4

Analyte		Expected	Found	UNITS	RF	%D	UCL	Q
1,1-Dichloropropene		50.0	56.5	ug/L	0.406	13.0	20	
2-Hexanone		50.0	48.7	ug/L	0.161	2.58	20	
Hexachlorobutadiene		50.0	50.4	ug/L	0.855	0.808	20	
Isopropylbenzene		50.0	53.1	ug/L	1.97	6.16	20	
p-Isopropyltoluene		50.0	52.6	ug/L	3.62	5.25	20	
4-Methyl-2-Pentanone		50.0	51.2	ug/L	0.0720	2.47	20	
Methylene Chloride		50.0	53.0	ug/L	0.310	6.01	20	
Naphthalene		50.0	51.8	ug/L	2.53	3.53	20	
n-Propylbenzene		50.0	51.0	ug/L	4.60	1.93	20	
Styrene		50.0	52.6	ug/L	1.29	5.16	20	
1,1,1,2-Tetrachloroethane		50.0	51.1	ug/L	0.476	2.26	20	
Tetrachloroethene		50.0	54.1	ug/L	0.521	8.12	20	
1,2,3-Trichlorobenzene		50.0	48.5	ug/L	1.39	3.10	20	
1,2,4-Trichlorobenzene		50.0	49.0	ug/L	1.53	1.93	20	
1,1,1-Trichloroethane		50.0	52.8	ug/L	0.501	5.64	20	
1,1,2-Trichloroethane		50.0	51.5	ug/L	0.324	3.04	20	
Trichloroethene		50.0	51.9	ug/L	0.343	3.79	20	
Trichlorofluoromethane		50.0	53.7	ug/L	0.454	7.42	20	
1,2,3-Trichloropropane		50.0	47.4	ug/L	0.217	5.22	20	
1,2,4-Trimethylbenzene		50.0	50.2	ug/L	3.40	0.335	20	
1,3,5-Trimethylbenzene		50.0	48.8	ug/L	3.27	2.31	20	
o-Xylene		50.0	50.8	ug/L	0.775	1.63	20	
m-,p-Xylene		100	105	ug/L	0.802	4.69	20	

* Exceeds %D Criteria

CCC Calibration Check Compounds
SPCC System Performance Check Compounds

CCV - Modified 03/05/2008
PDF File ID: 3288060
Report generated 12/26/2013 16:06

Microbac Laboratories Inc.
CONTINUING CALIBRATION VERIFICATION (CCV)

Login Number: L13120825
Run Date: 12/23/2013
Sample ID: WG457422-02
Instrument ID: HPMS11
Run Time: 15:55
Method: 8260B
File ID: 11M97806
Analyst: FJB
QC Key: DOD4
Workgroup (AAB#): WG457423
Cal ID: HPMS11 - 05-NOV-13
Matrix: WATER

Analyte		Expected	Found	UNITS	RF	%D	UCL	Q
Chloroform	CCC	50.0	49.9	ug/L	0.522	0.191	20	
1,1-Dichloroethene	CCC	50.0	53.5	ug/L	0.485	6.99	20	
1,2-Dichloropropane	CCC	50.0	53.8	ug/L	0.306	7.66	20	
Ethylbenzene	CCC	50.0	50.9	ug/L	0.552	1.73	20	
Toluene	CCC	50.0	51.8	ug/L	1.44	3.59	20	
Vinyl Chloride	CCC	50.0	58.8	ug/L	0.388	17.6	20	
Bromoform	SPCC	50.0	53.0	ug/L	0.209	6.01	20	
Chlorobenzene	SPCC	50.0	51.3	ug/L	1.01	2.67	20	
Chloromethane	SPCC	50.0	59.3	ug/L	0.413	18.6	20	
1,1-Dichloroethane	SPCC	50.0	53.0	ug/L	0.552	5.97	20	
1,1,2,2-Tetrachloroethane	SPCC	50.0	54.1	ug/L	0.605	8.12	20	
Xylenes		150	153	ug/L	0.646	1.82	20	
Acetone		50.0	63.7	ug/L	0.0739	27.3	20	*
Benzene		50.0	49.0	ug/L	1.07	1.91	20	
Bromobenzene		50.0	50.6	ug/L	0.760	1.14	20	
Bromochloromethane		50.0	53.2	ug/L	0.181	6.48	20	
Bromodichloromethane		50.0	51.1	ug/L	0.403	2.23	20	
Bromomethane		50.0	50.9	ug/L	0.144	1.75	20	
2-Butanone		50.0	52.8	ug/L	0.0891	5.55	20	
n-Butylbenzene		50.0	53.5	ug/L	2.25	6.97	20	
sec-Butylbenzene		50.0	53.1	ug/L	2.94	6.19	20	
tert-Butylbenzene		50.0	51.6	ug/L	0.528	3.28	20	
Carbon Disulfide		50.0	50.5	ug/L	0.834	1.04	20	
Carbon Tetrachloride		50.0	48.9	ug/L	0.424	2.12	20	
Dibromochloromethane		50.0	53.4	ug/L	0.361	6.78	20	
Chloroethane		50.0	55.7	ug/L	0.214	11.3	20	
2-Chlorotoluene		50.0	54.5	ug/L	2.43	9.04	20	
4-Chlorotoluene		50.0	44.7	ug/L	2.03	10.7	20	
1,2-Dibromo-3-Chloropropane		50.0	51.1	ug/L	0.106	2.27	20	
1,2-Dibromoethane		50.0	55.8	ug/L	0.288	11.6	20	
Dibromomethane		50.0	52.9	ug/L	0.164	5.70	20	
1,2-Dichlorobenzene		50.0	51.0	ug/L	1.35	2.05	20	
1,3-Dichlorobenzene		50.0	50.6	ug/L	1.42	1.28	20	
1,4-Dichlorobenzene		50.0	48.9	ug/L	1.44	2.19	20	
Dichlorodifluoromethane		50.0	54.1	ug/L	0.267	8.18	20	
1,2-Dichloroethane		50.0	54.8	ug/L	0.414	9.55	20	
cis-1,2-Dichloroethene		50.0	50.2	ug/L	0.307	0.449	20	
trans-1,2-Dichloroethene		50.0	48.6	ug/L	0.278	2.89	20	
1,3-Dichloropropane		50.0	55.4	ug/L	0.511	10.7	20	
2,2-Dichloropropane		50.0	44.1	ug/L	0.439	11.8	20	
cis-1,3-Dichloropropene		50.0	51.6	ug/L	0.467	3.12	20	
trans-1,3-Dichloropropene		50.0	55.0	ug/L	0.551	9.96	20	

CCV - Modified 03/05/2008
PDF File ID: 3288060
Report generated 12/26/2013 16:06

Microbac Laboratories Inc.
CONTINUING CALIBRATION VERIFICATION (CCV)

Login Number: L13120825
Run Date: 12/23/2013
Sample ID: WG457422-02
Instrument ID: HPMS11
Run Time: 15:55
Method: 8260B
File ID: 11M97806
Analyst: FJB
QC Key: DOD4
Workgroup (AAB#): WG457423
Cal ID: HPMS11 - 05-NOV-13
Matrix: WATER

Analyte		Expected	Found	UNITS	RF	%D	UCL	Q
1,1-Dichloropropene		50.0	51.0	ug/L	0.404	2.05	20	
2-Hexanone		50.0	53.7	ug/L	0.170	7.45	20	
Hexachlorobutadiene		50.0	44.0	ug/L	0.304	11.9	20	
Isopropylbenzene		50.0	52.1	ug/L	1.55	4.20	20	
p-Isopropyltoluene		50.0	52.9	ug/L	2.50	5.81	20	
4-Methyl-2-Pentanone		50.0	50.2	ug/L	0.0691	0.454	20	
Methylene Chloride		50.0	49.1	ug/L	0.285	1.77	20	
Naphthalene		50.0	46.8	ug/L	1.62	6.45	20	
n-Propylbenzene		50.0	51.0	ug/L	3.48	2.01	20	
Styrene		50.0	51.7	ug/L	1.06	3.37	20	
1,1,1,2-Tetrachloroethane		50.0	52.1	ug/L	0.381	4.21	20	
Tetrachloroethene		50.0	47.3	ug/L	0.278	5.47	20	
1,2,3-Trichlorobenzene		50.0	44.5	ug/L	0.733	11.0	20	
1,2,4-Trichlorobenzene		50.0	46.8	ug/L	0.836	6.45	20	
1,1,1-Trichloroethane		50.0	50.1	ug/L	0.472	0.240	20	
1,1,2-Trichloroethane		50.0	55.2	ug/L	0.278	10.4	20	
Trichloroethene		50.0	48.5	ug/L	0.290	3.03	20	
Trichlorofluoromethane		50.0	50.1	ug/L	0.460	0.139	20	
1,2,3-Trichloropropane		50.0	53.4	ug/L	0.178	6.70	20	
1,2,4-Trimethylbenzene		50.0	52.7	ug/L	2.58	5.44	20	
1,3,5-Trimethylbenzene		50.0	52.2	ug/L	2.52	4.49	20	
o-Xylene		50.0	50.2	ug/L	0.646	0.343	20	
m-,p-Xylene		100	103	ug/L	0.646	2.55	20	

* Exceeds %D Criteria

CCC Calibration Check Compounds
SPCC System Performance Check Compounds

CCV - Modified 03/05/2008
PDF File ID: 3288060
Report generated 12/26/2013 16:06

Microbac Laboratories Inc.

INTERNAL STANDARD AREA SUMMARY
(COMPARED TO MIDPOINT OF ICAL)

Login Number: L13120825
Instrument ID: HPMS17
Workgroup (AAB#): WG457314

ICAL CCV Number: WG453012-08
CAL ID: HPMS17 - 15-NOV-13
Matrix: WATER

Sample Number	Dilution	Tag	IS-1	IS-2	IS-3
WG453012-08	NA	NA	292066	624501	911225
Upper Limit	NA	NA	584132	1249002	1822450
Lower Limit	NA	NA	146033	312251	455613
L13120825-01	1.00	01	171240	369040	527542
L13120825-02	1.00	01	179625	400760	581573
WG457314-01	1.00	01	198208	429397	612254
WG457314-02	1.00	01	200281	411202	575701

IS-1 - 1,4-Dichlorobenzene-d4
IS-2 - Chlorobenzene-d5
IS-3 - Fluorobenzene

Underline = Response outside limits

INTERNAL_STD_ICAL - Modified 03/06/2008
PDF File ID: 3288061
Report generated 12/26/2013 16:06

Microbac Laboratories Inc.

INTERNAL STANDARD AREA SUMMARY
(COMPARED TO MIDPOINT OF ICAL)

Login Number: L13120825
Instrument ID: HPMS11
Workgroup (AAB#): WG457423

ICAL CCV Number: WG451178-08
CAL ID: HPMS11 - 05-NOV-13
Matrix: WATER

Sample Number	Dilution	Tag	IS-1	IS-2	IS-3
WG451178-08	NA	NA	381974	702242	886698
Upper Limit	NA	NA	763948	1404484	1773396
Lower Limit	NA	NA	190987	351121	443349
L13120825-01	5.00	DL01	449598	900685	1186716
WG457423-01	1.00	01	459528	920524	1200790
WG457423-02	1.00	01	492148	943538	1225148
WG457423-03	1.00	01	502280	958814	1259386

IS-1 - 1,4-Dichlorobenzene-d4
IS-2 - Chlorobenzene-d5
IS-3 - Fluorobenzene

Underline = Response outside limits

INTERNAL_STD_ICAL - Modified 03/06/2008
PDF File ID: 3288061
Report generated 12/26/2013 16:06

Microbac Laboratories Inc.
INTERNAL STANDARD RETENTION TIME SUMMARY
(COMPARED TO MIDPOINT OF ICAL)

Login Number: L13120825
Instrument ID: HPMS11
Workgroup (AAB#): WG457423

ICAL CCV Number: WG451178-08
CAL ID: HPMS11 - 05-NOV-13
Matrix: WATER

Sample Number	Dilution	Tag	IS-1	IS-2	IS-3
WG451178-08	NA	NA	17.07	14.26	10.63
Upper Limit	NA	NA	17.57	14.76	11.13
Lower Limit	NA	NA	16.57	13.76	10.13
L13120825-01	5.00	DL01	17.07	14.26	10.62
WG457423-01	1.00	01	17.07	14.26	10.62
WG457423-02	1.00	01	17.07	14.26	10.62
WG457423-03	1.00	01	17.07	14.26	10.62

IS-1 - 1,4-Dichlorobenzene-d4
IS-2 - Chlorobenzene-d5
IS-3 - Fluorobenzene

Underline = Response outside limits

INTERNAL_STD_RT_ICAL - Modified 03/06/2008
PDF File ID: 3288063
Report generated: 12/26/2013 16:06

Microbac Laboratories Inc.
INTERNAL STANDARD RETENTION TIME SUMMARY
(COMPARED TO MIDPOINT OF ICAL)

Login Number: L13120825
Instrument ID: HPMS17
Workgroup (AAB#): WG457314

ICAL CCV Number: WG453012-08
CAL ID: HPMS17 - 15-NOV-13
Matrix: WATER

Sample Number	Dilution	Tag	IS-1	IS-2	IS-3
WG453012-08	NA	NA	16.971	13.996	10.192
Upper Limit	NA	NA	17.471	14.496	10.692
Lower Limit	NA	NA	16.471	13.496	9.692
L13120825-01	1.00	01	16.971	13.996	10.182
L13120825-02	1.00	01	16.971	13.996	10.182
WG457314-01	1.00	01	16.971	13.996	10.181
WG457314-02	1.00	01	16.971	13.996	10.181

IS-1 - 1,4-Dichlorobenzene-d4
IS-2 - Chlorobenzene-d5
IS-3 - Fluorobenzene

Underline = Response outside limits

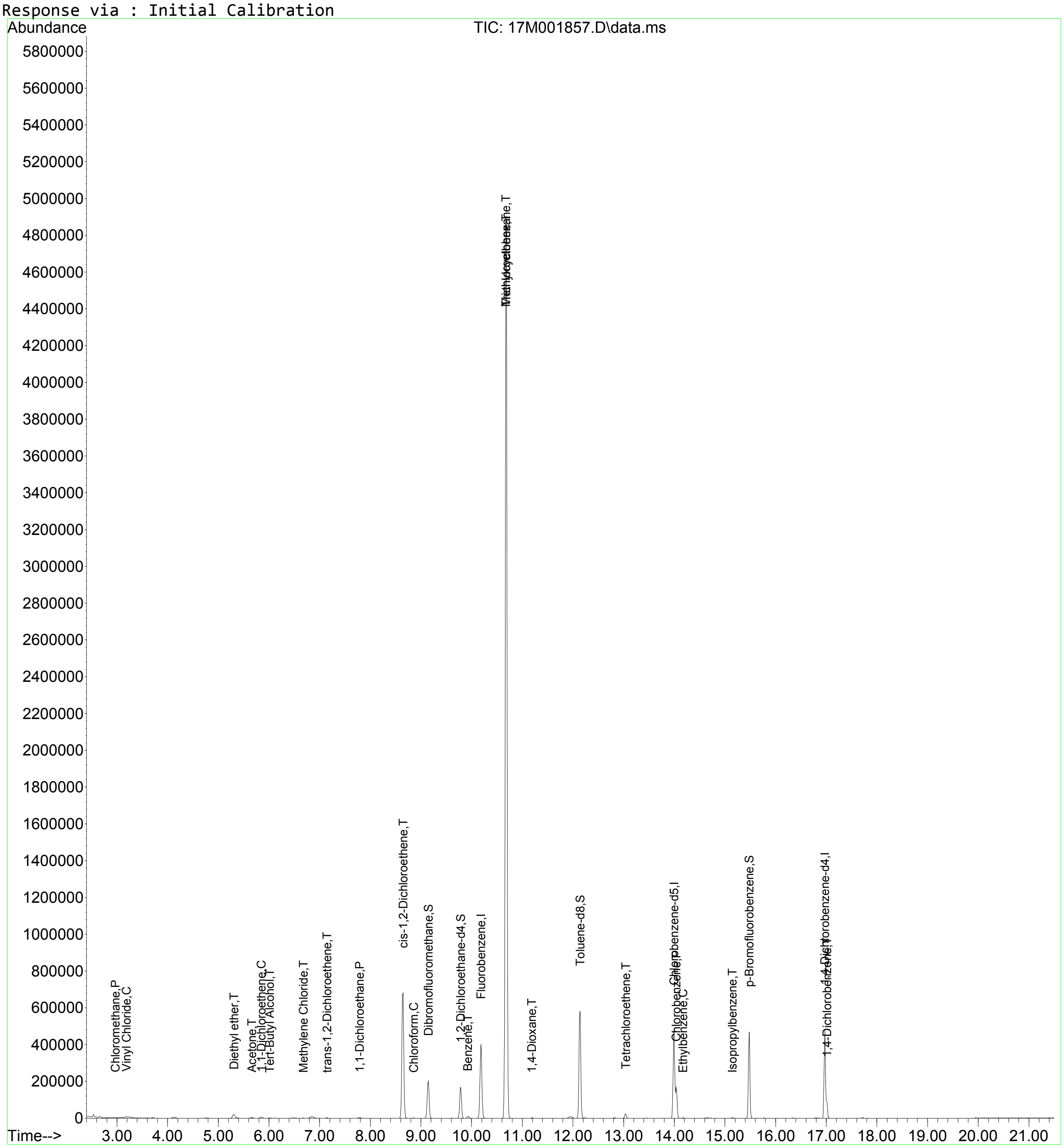
INTERNAL_STD_RT_ICAL - Modified 03/06/2008
PDF File ID: 3288063
Report generated: 12/26/2013 16:06

2.1.1.3 Sample Data

```
                           Quantitation Report    (Not Reviewed)

Data Path : D:\MassHunter\GCMS\1\data\122213\
Data File : 17M001857.D
Acq On    : 23 Dec 2013  02:05
Operator  : ADC
Sample    : L13120825-01 A 826-LOW
Misc      : 1,1
ALS Vial  : 17   Sample Multiplier: 1

Quant Time: Dec 23 10:01:15 2013
Quant Method : D:\MassHunter\GCMS\1\methods\8260WTR.M
Quant Title  : 8260B/624 SOP:OVL MSV01 WATER 11/15/13 HPMS17
QLast Update : Sat Nov 16 17:30:32 2013
Response via : Initial Calibration

        Compound                   R.T. QIon  Response  Conc Units Dev(Min)
 --------------------------------------------------------------------------
 Internal Standards
   1) Fluorobenzene              10.182   96   527542    25.00000 ug/L    -0.0105
  56) Chlorobenzene-d5           13.996  117   369040    25.00000 ug/L     0.0000
  76) 1,4-Dichlorobenzene-d4     16.971  152   171240    25.00000 ug/L     0.0000

 System Monitoring Compounds
  37) Dibromofluoromethane        9.145  111   169235    25.7605 ug/L    0.0000
   Spiked Amount     25.000   Range  86 - 118    Recovery   =  103.042%
  43) 1,2-Dichloroethane-d4       9.788   65   155159    23.9654 ug/L    0.0000
   Spiked Amount     25.000   Range  80 - 120    Recovery   =   95.862%
  57) Toluene-d8                 12.141   98   557415    24.7560 ug/L    0.0000
   Spiked Amount     25.000   Range  88 - 110    Recovery   =   99.024%
  78) p-Bromofluorobenzene       15.478   95   189195    22.7898 ug/L    0.0000
   Spiked Amount     25.000   Range  86 - 115    Recovery   =   91.159%

 Target Compounds                                                   Qvalue
   3) Chloromethane               2.967   50     1701     0.2109 ug/L #    59
   4) Vinyl Chloride              3.185   62     6912     0.8726 ug/L #    76
   9) Diethyl ether               5.310   59    23531     5.9593 ug/L      85
  13) Acetone                     5.662   43     7869     7.4493 ug/L     100
  14) 1,1-Dichloroethene          5.849   61     7343     0.8876 ug/L      97
  15) Tert-Butyl Alcohol          6.015   59     2516     6.9812 ug/L #    60
  19) Methylene Chloride          6.678   84      761     0.1232 ug/L      82
  23) trans-1,2-Dichloroethene    7.144   96     1599     0.2760 ug/L      87
  27) 1,1-Dichloroethane          7.787   63     7656     0.7326 ug/L      86
  32) cis-1,2-Dichloroethene      8.647   96   444173    66.0902 ug/L      83
  33) Chloroform                  8.855   83     1556     0.1426 ug/L #    71
  45) Benzene                     9.922   78    14225     0.6187 ug/L      95
  46) Trichloroethene            10.679  130  2160645   309.8542 ug/L      96
  47) Methylcyclohexane          10.679   83    23666     2.4632 ug/L #     1
  49) 1,4-Dioxane                11.187   88     2193    51.1305 ug/L      92
  64) Tetrachloroethene          13.042  166    10937     1.5384 ug/L      94
  68) Chlorobenzene              14.037  112   125801     7.3184 ug/L      85
  70) Ethylbenzene               14.172  106     1162     0.1236 ug/L      59
  75) Isopropylbenzene           15.147  105     4335     0.1579 ug/L      82
  92) 1,4-Dichlorobenzene        17.012  146    47830     3.6378 ug/L      96
 --------------------------------------------------------------------------

 (#) = qualifier out of range (m) = manual integration (+) = signals summed
```

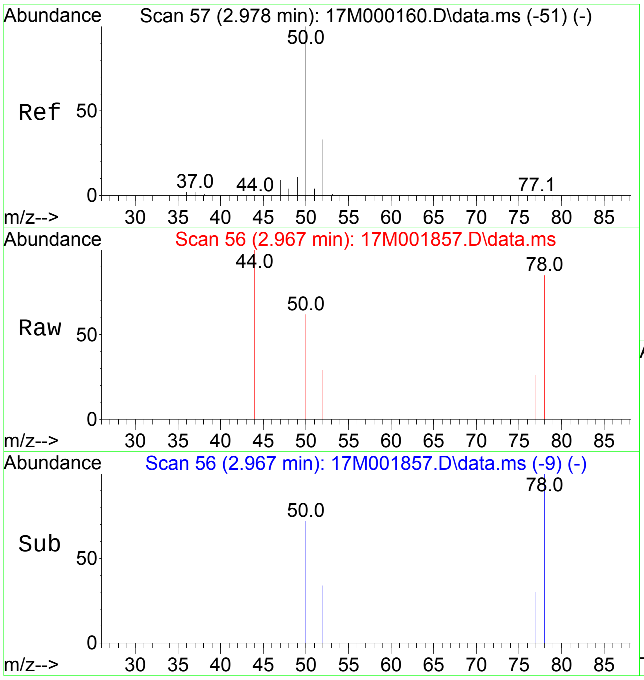
Quantitation Report   (Not Reviewed)

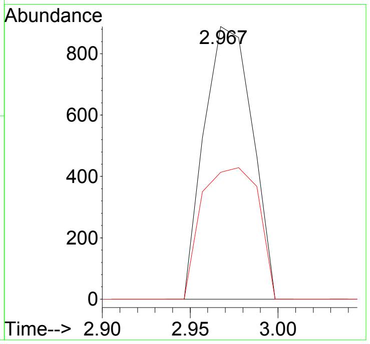
```
Data Path : D:\MassHunter\GCMS\1\data\122213\
Data File : 17M001857.D
Acq On    : 23 Dec 2013  02:05
Operator  : ADC
Sample    : L13120825-01 A 826-LOW
Misc      : 1,1
ALS Vial  : 17   Sample Multiplier: 1

Quant Time: Dec 23 10:01:15 2013
Quant Method : D:\MassHunter\GCMS\1\methods\8260WTR.M
Quant Title  : 8260B/624 SOP:OVL MSV01 WATER 11/15/13 HPMS17
QLast Update : Sat Nov 16 17:30:32 2013
Response via : Initial Calibration
```



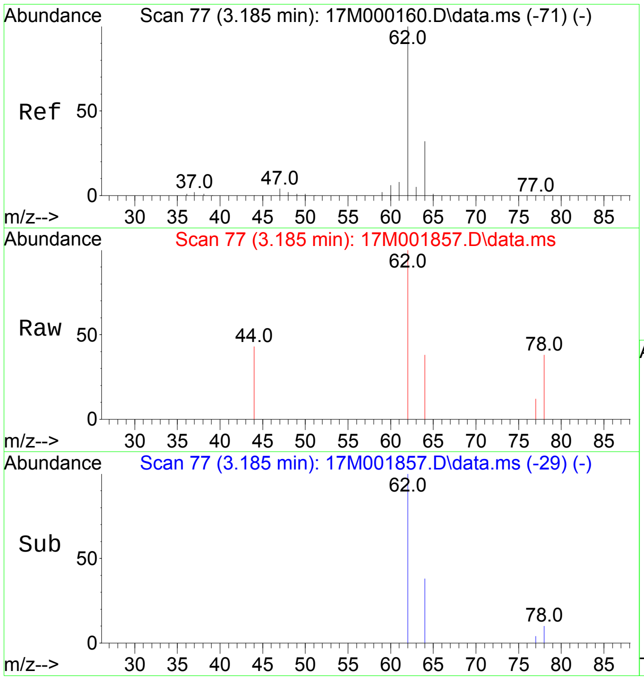
8260WTR.M Mon Dec 23 10:01:16 2013   Page: 2

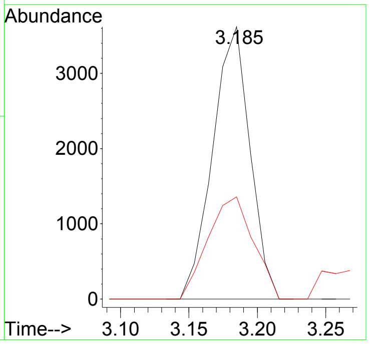
```
#3
Chloromethane
Concen:     0.2109 ug/L
RT:    2.967 min  Scan# 56
Delta R.T.   -0.011 min
Lab File:    17M001857.D
Acq: 23 Dec 2013  02:05

Tgt Ion: 50 Resp:     1701
Ion   Ratio  Lower   Upper
 50   100
 52    57.0   20.1    46.9#
```

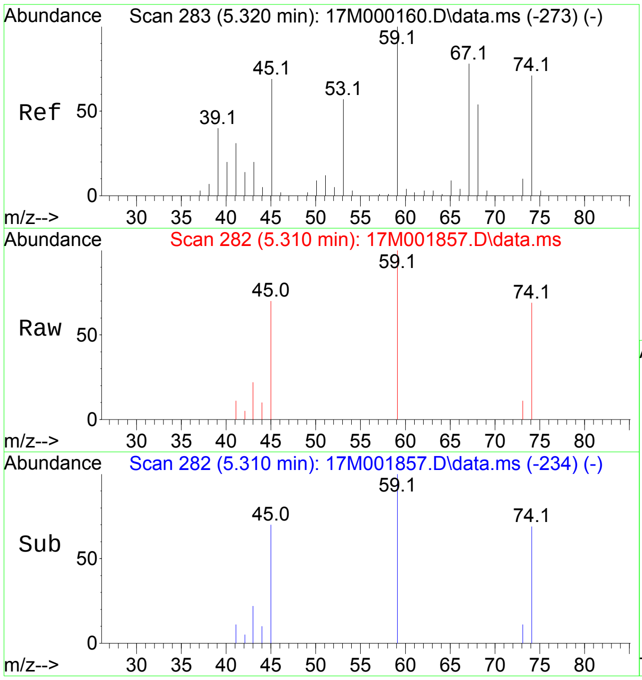




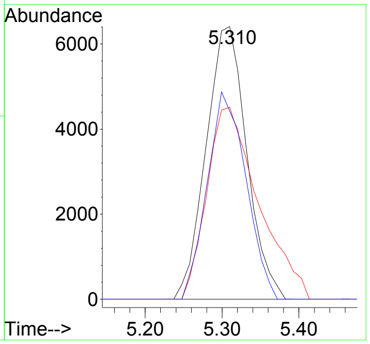
```
#4
Vinyl Chloride
Concen:     0.8726 ug/L
RT:    3.185 min  Scan# 77
Delta R.T.   -0.000 min
Lab File:    17M001857.D
Acq: 23 Dec 2013  02:05

Tgt Ion: 62 Resp:     6912
Ion   Ratio  Lower   Upper
 62   100
 64    45.7   19.5    45.5#
```

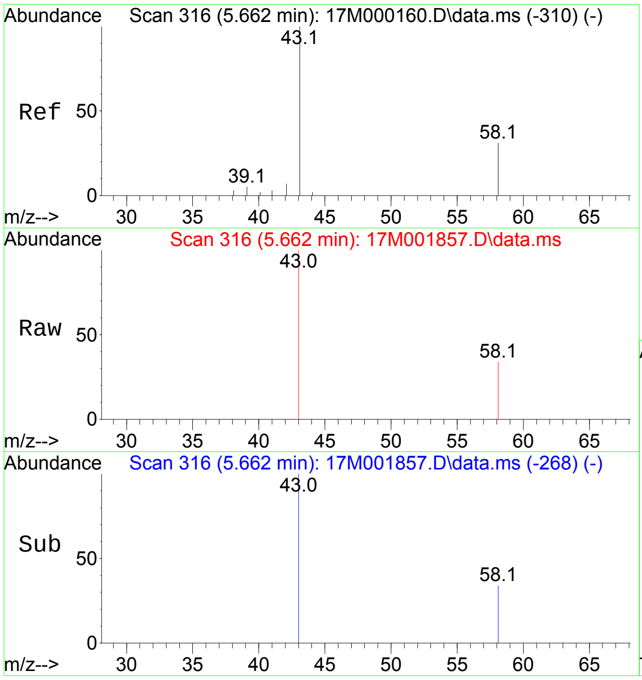




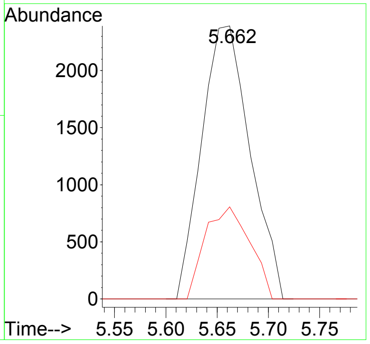


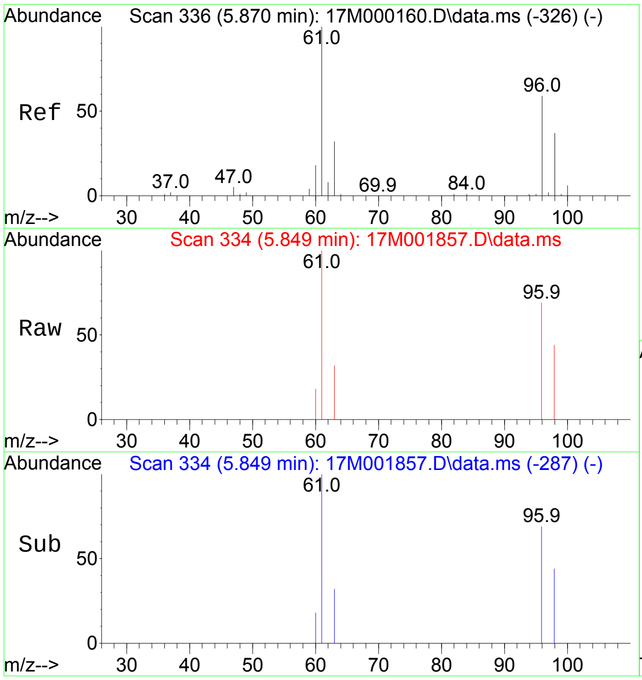
```
#9
Diethyl ether
Concen:    5.9593 ug/L
RT:    5.310 min  Scan# 282
Delta R.T.   -0.000 min
Lab File:    17M001857.D
Acq: 23 Dec 2013  02:05

Tgt Ion: 59 Resp:   23531
Ion   Ratio  Lower  Upper
 59   100
 45    89.3   40.7   95.1
 74    72.4   46.3  107.9
```



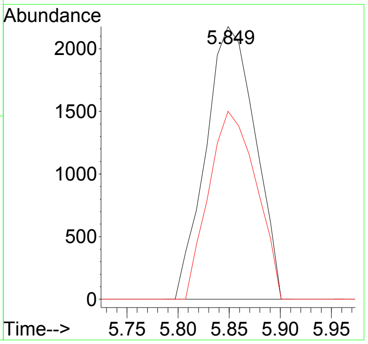


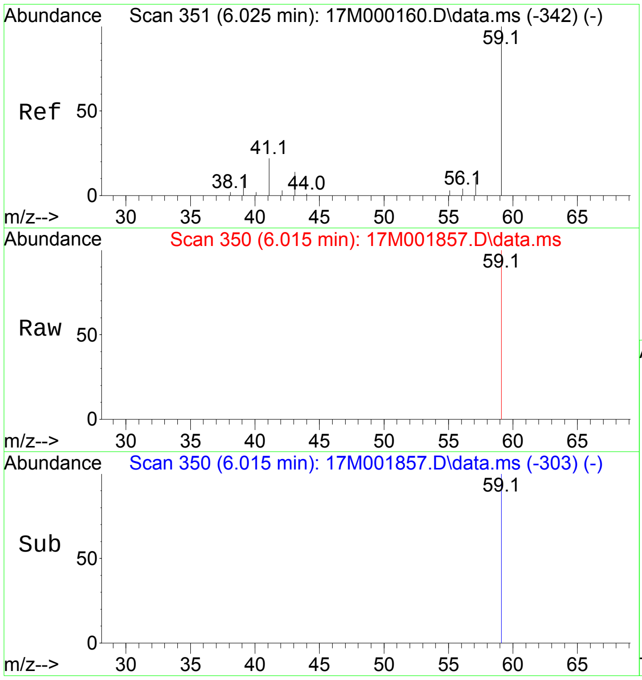
```
#13
Acetone
Concen:    7.4493 ug/L
RT:    5.662 min  Scan# 316
Delta R.T.   0.000 min
Lab File:    17M001857.D
Acq: 23 Dec 2013  02:05

Tgt Ion: 43 Resp:    7869
Ion   Ratio  Lower  Upper
 43   100
 58    31.2   18.8   43.8
```



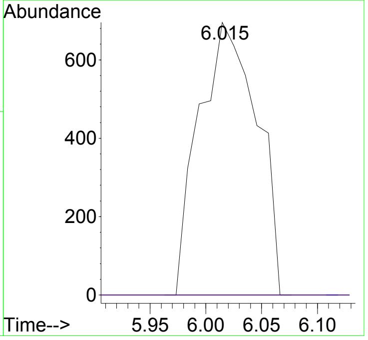


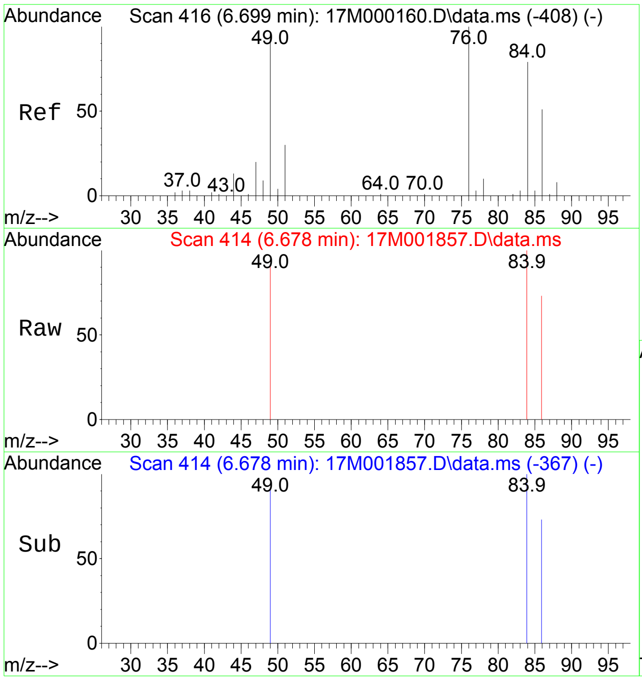
```
#14
1,1-Dichloroethene
Concen:    0.8876 ug/L
RT:    5.849 min  Scan# 334
Delta R.T.  -0.010 min
Lab File:   17M001857.D
Acq: 23 Dec 2013  02:05

Tgt Ion: 61 Resp:    7343
Ion  Ratio  Lower  Upper
 61  100
 96   66.1   38.3   89.3
```



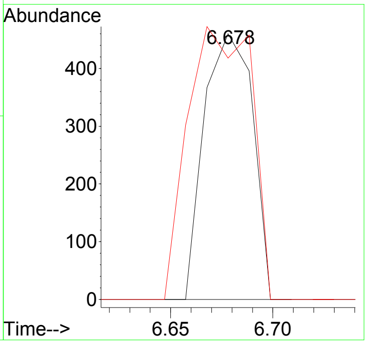


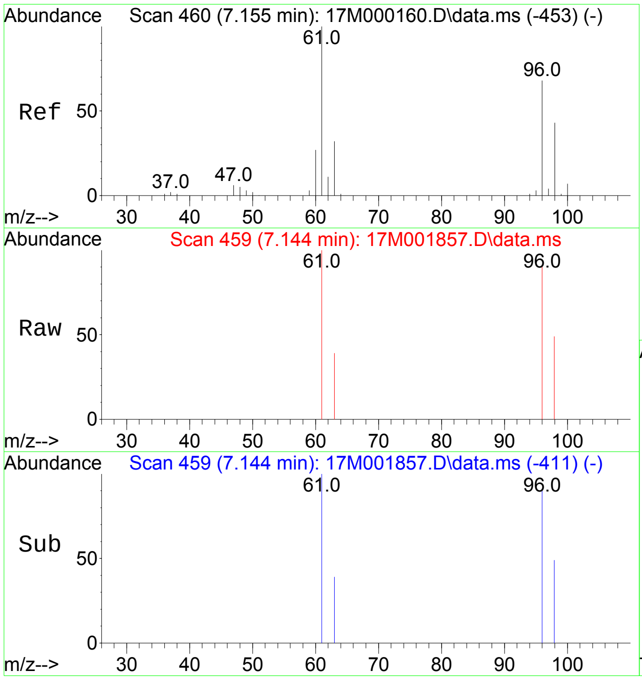
```
#15
Tert-Butyl Alcohol
Concen:    6.9812 ug/L
RT:    6.015 min  Scan# 350
Delta R.T.  -0.010 min
Lab File:   17M001857.D
Acq: 23 Dec 2013  02:05

Tgt Ion: 59 Resp:    2516
Ion  Ratio  Lower  Upper
 59  100
 41    0.0   12.8   29.8#
 57    0.0    6.4   15.0#
```



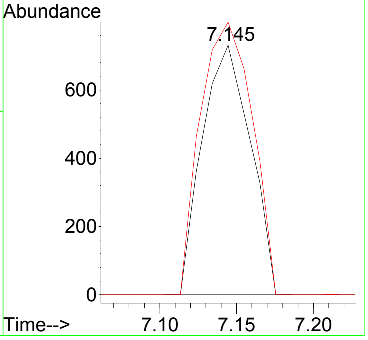


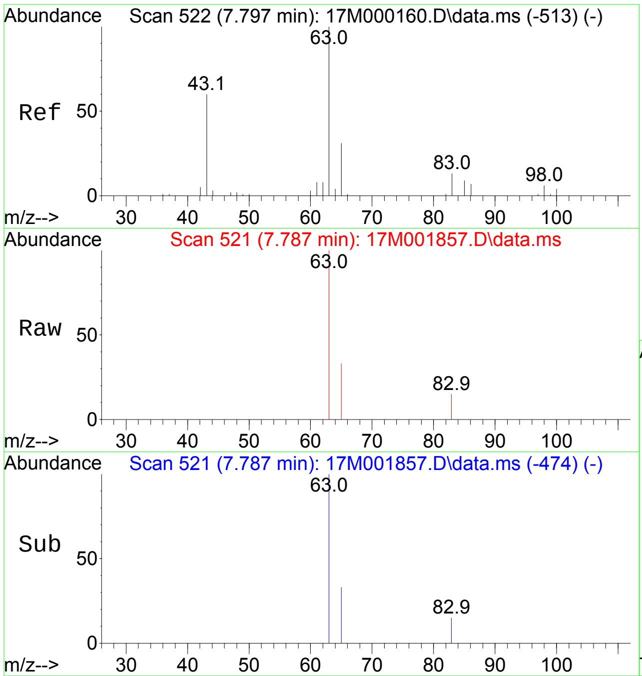
```
#19
Methylene Chloride
Concen:    0.1232 ug/L
RT:    6.678 min  Scan# 414
Delta R.T.  -0.010 min
Lab File:   17M001857.D
Acq: 23 Dec 2013  02:05

Tgt Ion: 84 Resp:      761
Ion  Ratio  Lower  Upper
 84  100
 49  135.0   69.4  162.0
```



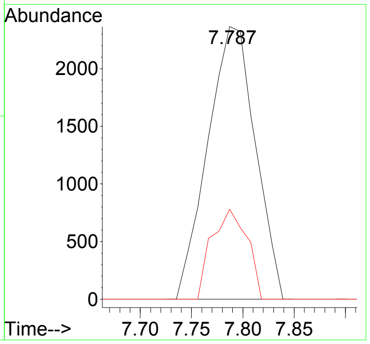


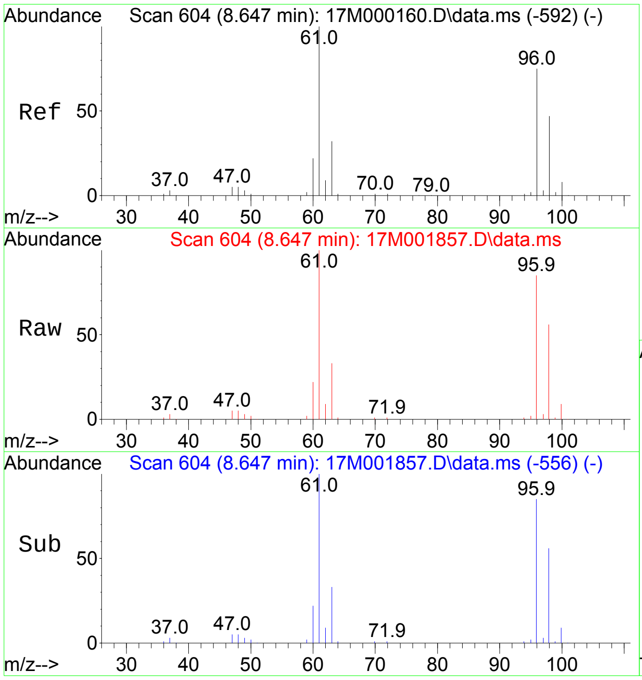
```
#23
trans-1,2-Dichloroethene
Concen:    0.2760 ug/L
RT:    7.144 min  Scan# 459
Delta R.T.  0.000 min
Lab File:   17M001857.D
Acq: 23 Dec 2013  02:05

Tgt Ion: 96 Resp:     1599
Ion  Ratio  Lower  Upper
 96  100
 61  117.9   80.0  186.8
```



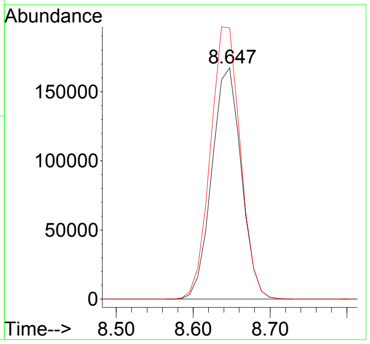


```
#27
1,1-Dichloroethane
Concen:    0.7326 ug/L
RT:    7.787 min  Scan# 521
Delta R.T.  -0.010 min
Lab File:   17M001857.D
Acq: 23 Dec 2013  02:05

Tgt Ion: 63 Resp:    7656
Ion  Ratio  Lower  Upper
 63  100
 65   24.5   19.3   44.9
```

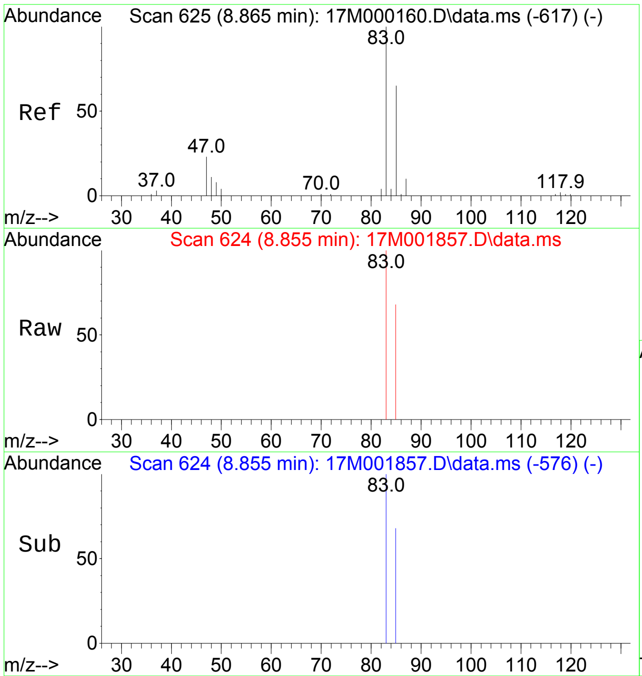


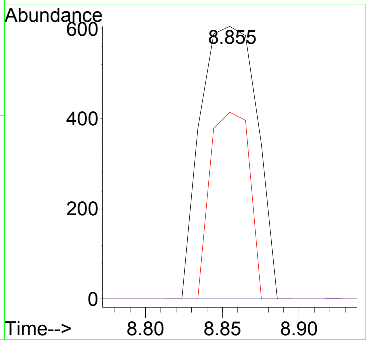


```
#32
cis-1,2-Dichloroethene
Concen:   66.0902 ug/L
RT:    8.647 min  Scan# 604
Delta R.T.  0.000 min
Lab File:   17M001857.D
Acq: 23 Dec 2013  02:05

Tgt Ion: 96 Resp:  444173
Ion  Ratio  Lower  Upper
 96  100
 61  119.7   83.9  195.9
```

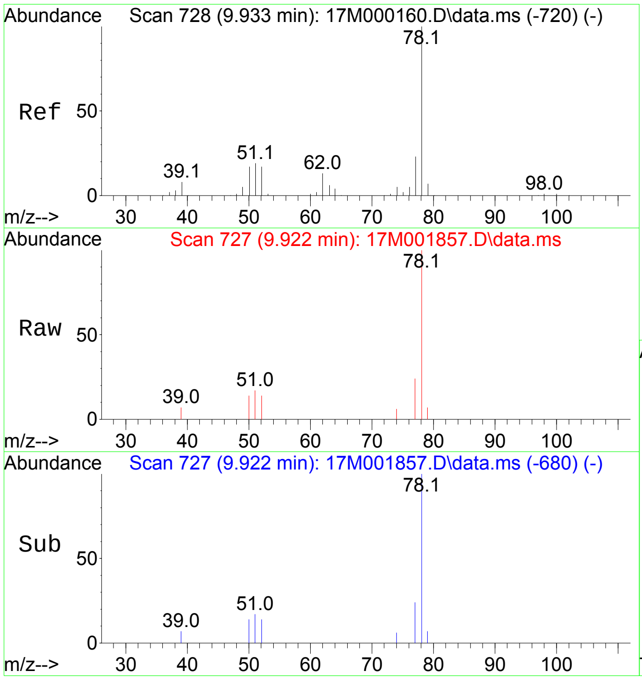


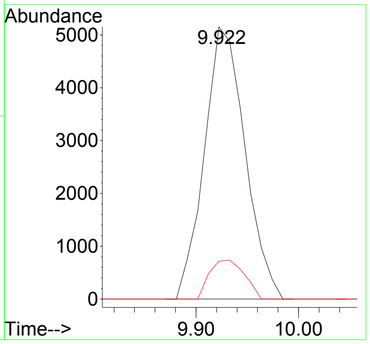
```
#33
Chloroform
Concen:    0.1426 ug/L
RT:   8.855 min  Scan# 624
Delta R.T.  -0.000 min
Lab File:   17M001857.D
Acq: 23 Dec 2013  02:05

Tgt Ion: 83 Resp:    1556
Ion  Ratio  Lower  Upper
 83  100
 85   47.6   39.2   91.6
 47    0.0   14.3   33.5#
```



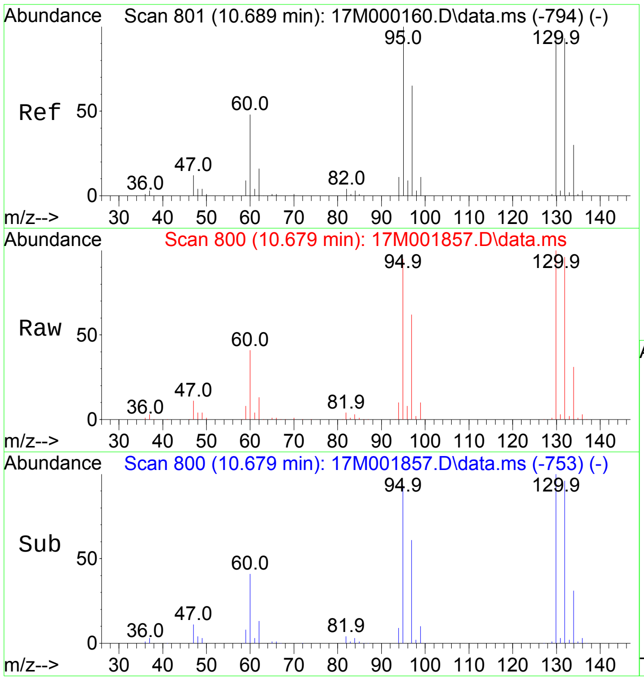


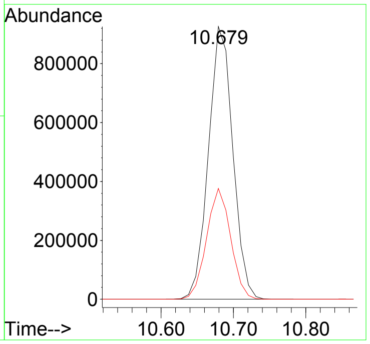
```
#45
Benzene
Concen:    0.6187 ug/L
RT:   9.922 min  Scan# 727
Delta R.T.  -0.011 min
Lab File:   17M001857.D
Acq: 23 Dec 2013  02:05

Tgt Ion: 78 Resp:   14225
Ion  Ratio  Lower  Upper
 78  100
 52   12.3    8.7   20.3
```



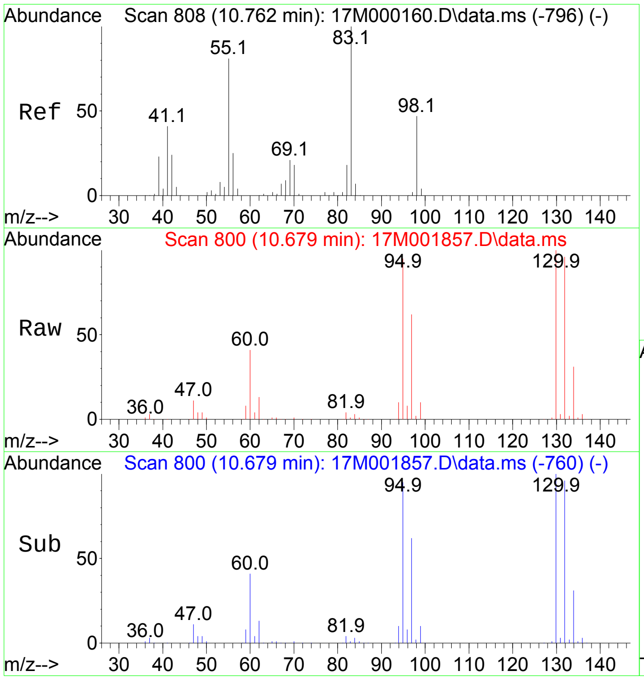


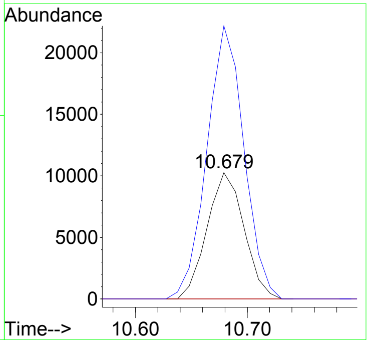
```
#46
Trichloroethene
Concen:  309.8542 ug/L
RT:  10.679 min  Scan# 800
Delta R.T.  -0.010 min
Lab File:   17M001857.D
Acq: 23 Dec 2013  02:05

Tgt Ion:130 Resp: 2160645
Ion  Ratio  Lower  Upper
130  100
 60   40.3   25.6   59.6
```

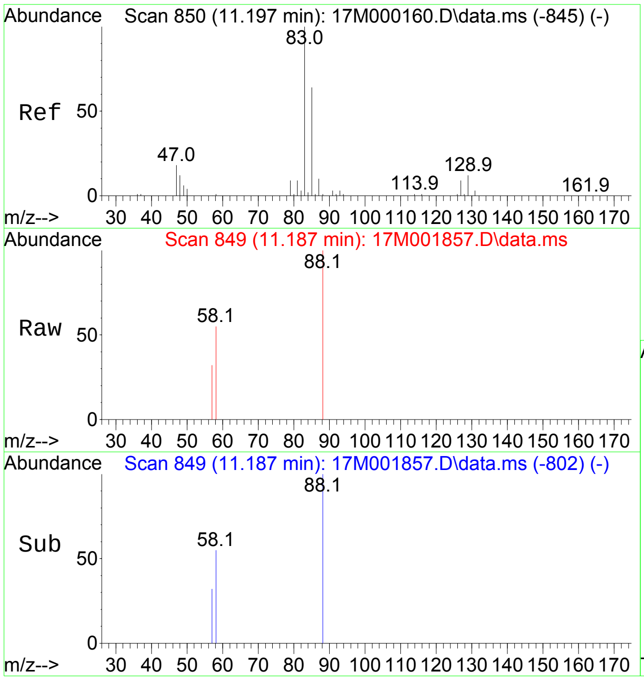




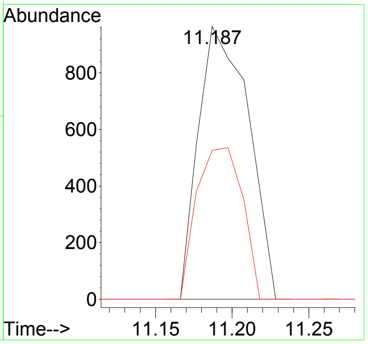
```
#47
Methylcyclohexane
Concen:    2.4632 ug/L
RT:  10.679 min  Scan# 800
Delta R.T.  -0.083 min
Lab File:   17M001857.D
Acq: 23 Dec 2013  02:05

Tgt Ion: 83 Resp:   23666
Ion  Ratio  Lower  Upper
 83  100
 55    0.0   42.8   99.8#
 98  216.6   29.4   68.6#
```

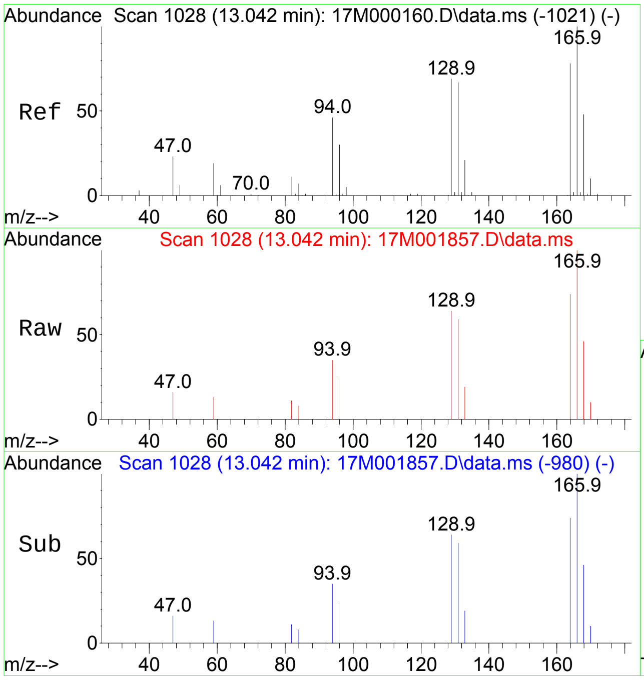




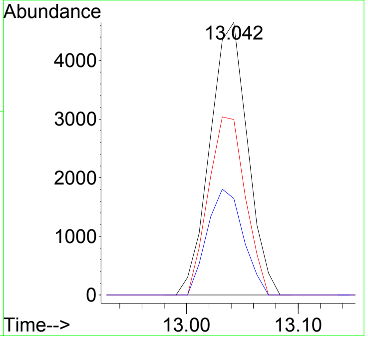


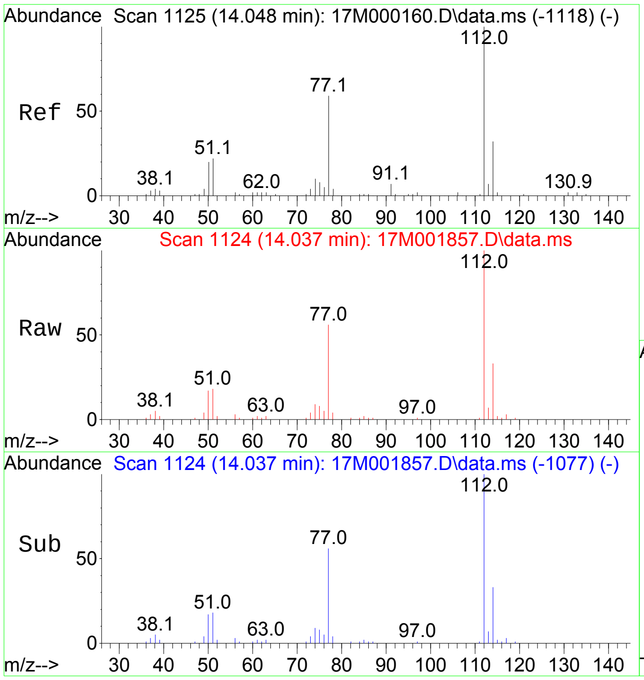
```
#49
1,4-Dioxane
Concen:   51.1305 ug/L
RT:  11.187 min  Scan# 849
Delta R.T.  -0.010 min
Lab File:   17M001857.D
Acq: 23 Dec 2013  02:05

Tgt Ion: 88 Resp:    2193
Ion  Ratio  Lower  Upper
 88  100
 58   50.8   34.1   79.5
```



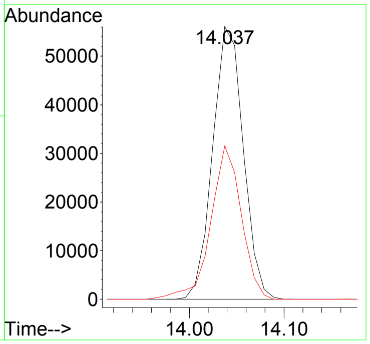


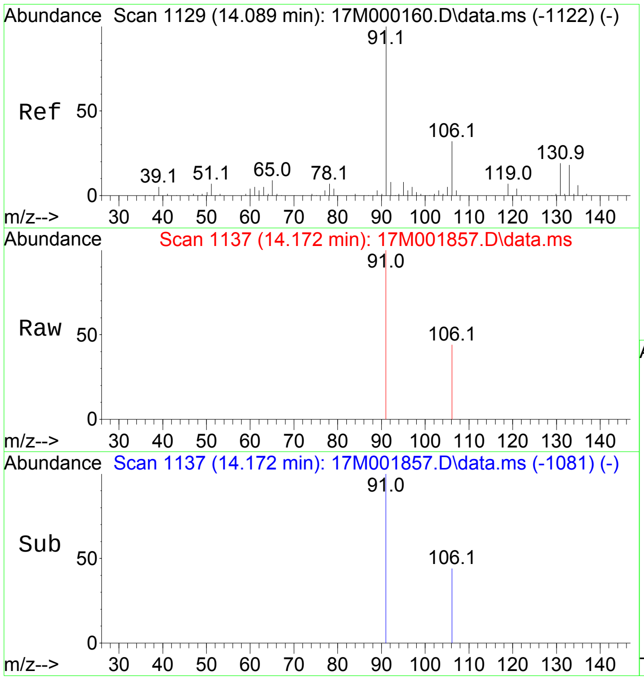
```
#64
Tetrachloroethene
Concen:    1.5384 ug/L
RT:  13.042 min  Scan# 1028
Delta R.T.   0.000 min
Lab File:   17M001857.D
Acq: 23 Dec 2013  02:05

Tgt Ion:166 Resp:   10937
Ion  Ratio  Lower  Upper
166  100
129   63.9   40.9   95.3
 94   37.2   24.6   57.4
```



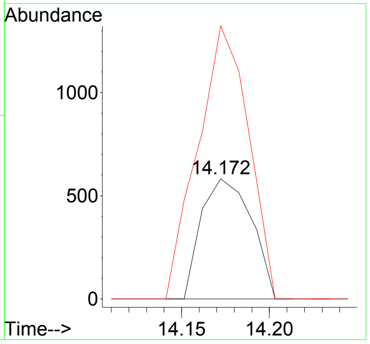


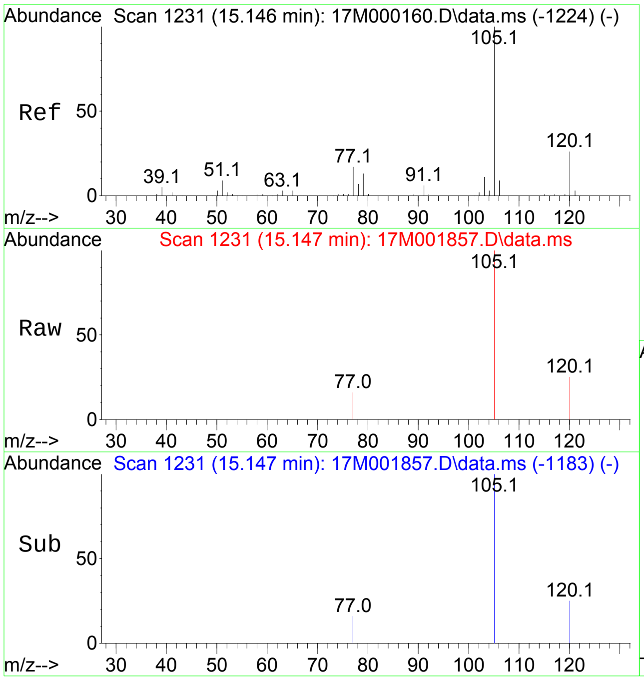
```
#68
Chlorobenzene
Concen:    7.3184 ug/L
RT:  14.037 min  Scan# 1124
Delta R.T.  -0.011 min
Lab File:   17M001857.D
Acq: 23 Dec 2013  02:05

Tgt Ion:112 Resp:  125801
Ion  Ratio  Lower  Upper
112  100
 77   56.2   41.2   96.0
```



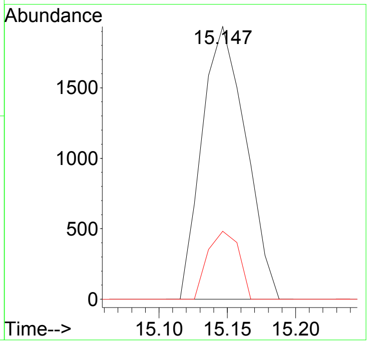


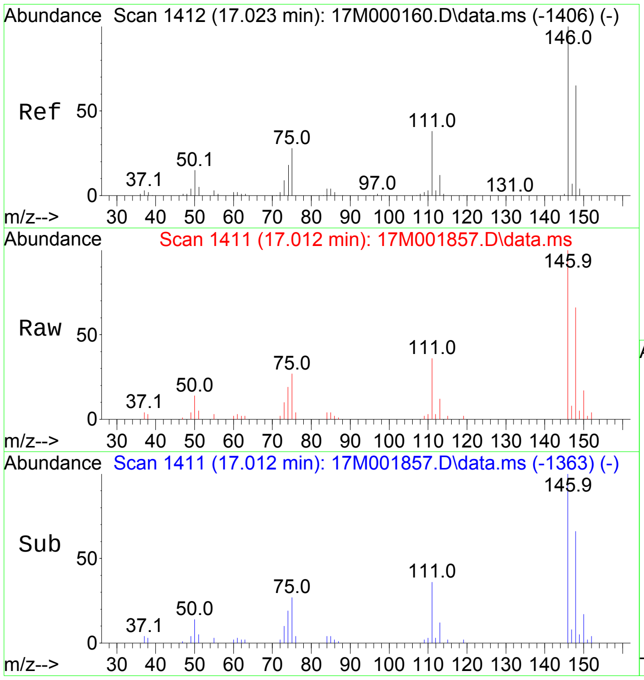
```
#70
Ethylbenzene
Concen:    0.1236 ug/L
RT:  14.172 min  Scan# 1137
Delta R.T.   0.083 min
Lab File:   17M001857.D
Acq: 23 Dec 2013  02:05

Tgt Ion:106 Resp:    1162
Ion  Ratio  Lower  Upper
106  100
 91  229.5  186.6  435.4
```



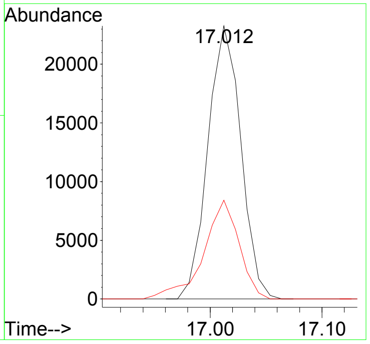


```
#75
Isopropylbenzene
Concen:    0.1579 ug/L
RT:  15.147 min  Scan# 1231
Delta R.T.   0.001 min
Lab File:    17M001857.D
Acq: 23 Dec 2013  02:05

Tgt Ion:105 Resp:    4335
Ion  Ratio  Lower  Upper
105  100
120   17.8   16.3   38.1
```





```
#92
1,4-Dichlorobenzene
Concen:    3.6378 ug/L
RT:  17.012 min  Scan# 1411
Delta R.T.   0.000 min
Lab File:    17M001857.D
Acq: 23 Dec 2013  02:05

Tgt Ion:146 Resp:   47830
Ion  Ratio  Lower  Upper
146  100
111   38.9   21.9   51.1
```

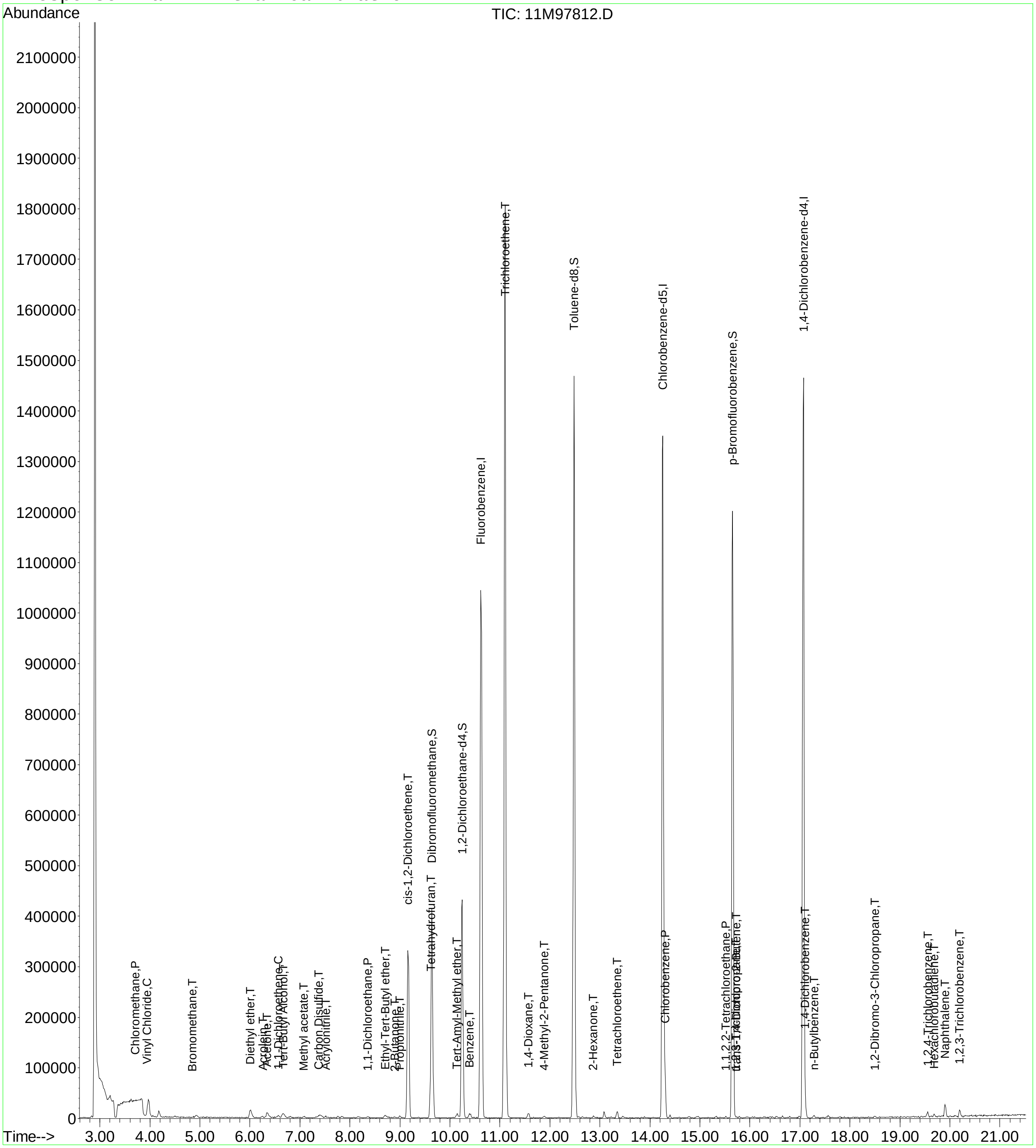


```
                          Quantitation Report    (Not Reviewed)

Data File : C:\MSDCHEM\1\DATA\122313\11M97812.D          Vial: 8
Acq On    : 23 Dec 2013  19:04                       Operator: FJB
Sample    : L13120825-01 5X B 826-LOW D1              Inst    : hpms11
Misc      : 1,5                                      Multiplr: 1.00
MS Integration Params: rteint.p
Quant Time: Dec 24 08:24:32 2013          Quant Results File: 8260_WT.RES

Quant Method : C:\MSDCHEM\1\METHODS\8260_WT.M (RTE Integrator)
Title        : 8260B/624 (SOP: OVL MSV01) Water 11/05/13 HPMS11
Last Update  : Mon Dec 16 17:06:06 2013
Response via : Initial Calibration
DataAcq Meth : 8260_WT

 Internal Standards                 R.T. QIon  Response  Conc Units Dev(Min)
 ------------------------------------------------------------------------
   1) Fluorobenzene               10.62   96  1186716    25.00 ug/L   -0.01
  56) Chlorobenzene-d5            14.26  117   900685    25.00 ug/L    0.00
  76) 1,4-Dichlorobenzene-d4      17.07  152   449598    25.00 ug/L    0.00

 System Monitoring Compounds
  37) Dibromofluoromethane         9.64  111   330270    23.0063 ug/L  0.00
   Spiked Amount     25.000   Range  86 - 118    Recovery   =   92.04%
  43) 1,2-Dichloroethane-d4       10.25   65   394383    24.3256 ug/L  0.00
   Spiked Amount     25.000   Range  80 - 120    Recovery   =   97.32%
  57) Toluene-d8                  12.48   98  1209704    26.7431 ug/L  0.00
   Spiked Amount     25.000   Range  88 - 110    Recovery   =  106.96%
  78) p-Bromofluorobenzene        15.65   95   520351    28.8184 ug/L  0.00
   Spiked Amount     25.000   Range  86 - 115    Recovery   =  115.28%#

 Target Compounds                                                  Qvalue
   3) Chloromethane                3.70   50     5040     0.3050 ug/L #  51
   4) Vinyl Chloride               3.94   62     2859     0.1826 ug/L #  42
   5) 1,3-Butadiene                3.97   54      676    Below Cal  #   1
   6) Bromomethane                 4.85   94     1195     0.1779 ug/L    87
   9) Diethyl ether                6.01   59    13763     1.5048 ug/L    77
  11) Acrolein                     6.26   56     2158    13.0845 ug/L    65
  13) Acetone                      6.34   43    21516     7.8048 ug/L #  66
  14) 1,1-Dichloroethene           6.57   61     4154     0.1929 ug/L    82
  15) Tert-Butyl Alcohol           6.67   59    19369    22.6151 ug/L    94
  18) Methyl acetate               7.07   43     4237     0.5304 ug/L #  81
  20) Carbon Disulfide             7.37   76     4908     0.1252 ug/L #  30
  21) Acrylonitrile                7.52   53     1277     0.3796 ug/L    88
  27) 1,1-Dichloroethane           8.35   63     3832     0.1551 ug/L #  84
  28) Ethyl-Tert-Butyl ether       8.71   59     6901     0.1744 ug/L    89
  29) 2-Butanone                   8.89   43     3883     0.9692 ug/L #  74
  30) Propionitrile                9.00   54     5344     4.7886 ug/L    87
  32) cis-1,2-Dichloroethene       9.16   96   174586    12.0324 ug/L    90
  36) Tetrahydrofuran              9.62   42     8104     3.4076 ug/L    97
  42) Tert-Amyl-Methyl ether      10.13   73     9529     0.2924 ug/L #  99
  45) Benzene                     10.39   78    12165     0.2349 ug/L   100
  46) Trichloroethene             11.11  130   737758    51.8942 ug/L    99
  49) 1,4-Dioxane                 11.57   88     7061    80.1888 ug/L    80
  53) 4-Methyl-2-Pentanone        11.88   58      890     0.2728 ug/L #  36
  62) 2-Hexanone                  12.86   43     3876     0.6789 ug/L #  77
  64) Tetrachloroethene           13.34  164     2992     0.2828 ug/L    81
  68) Chlorobenzene               14.30  112    53984     1.5280 ug/L    99
  77) 1,1,2,2-Tetrachloroethane   15.52   83     1996     0.1983 ug/L    79
  79) 1,2,3-Trichloropropane      15.72  110      466     0.1556 ug/L #  57
  80) trans-1,4-Dichloro-2-Buten  15.73   53      247     0.7059 ug/L #   1
  92) 1,4-Dichlorobenzene         17.10  146    22497     0.8472 ug/L    95
  93) n-Butylbenzene              17.28   91     4956     0.1310 ug/L #  65
  95) 1,2-Dibromo-3-Chloropropan  18.50   75      548     0.2945 ug/L    75
  96) 1,2,4-Trichlorobenzene      19.55  180     4036     0.2510 ug/L    85
  97) Hexachlorobutadiene         19.69  225     1620     0.2608 ug/L    84
  98) Naphthalene                 19.90  128    23188     0.7459 ug/L #  96
  99) 1,2,3-Trichlorobenzene      20.19  180     4523     0.3055 ug/L    95



 ------------------------------------------------------------------------
 (#) = qualifier out of range (m) = manual integration
 11M97812.D  8260_WT.M      Tue Dec 24 08:24:33 2013                        Page 1
```

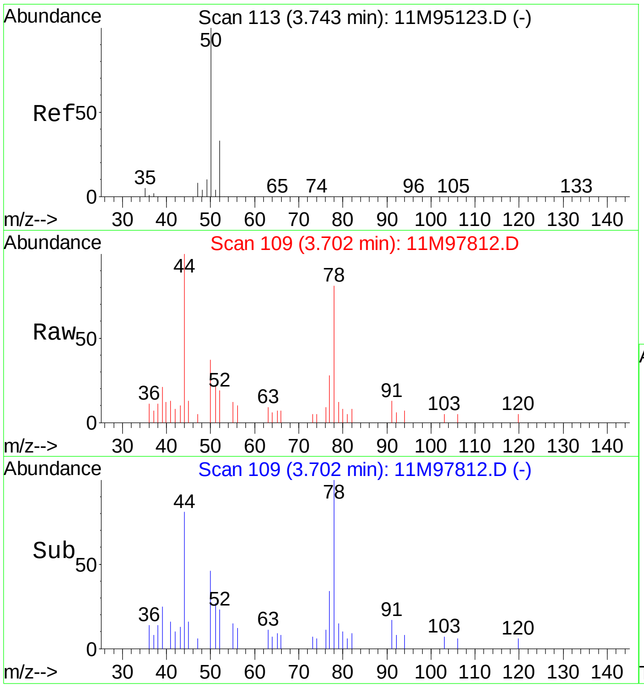
Quantitation Report   (Not Reviewed)

00192911

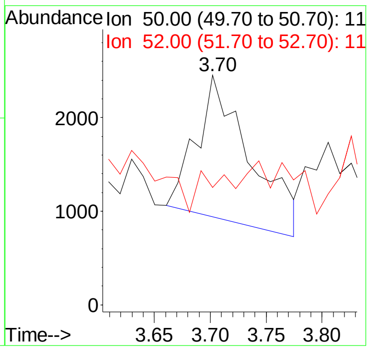
```
Data File : C:\MSDCHEM\1\DATA\122313\11M97812.D         Vial: 8
Acq On    : 23 Dec 2013  19:04                        Operator: FJB
Sample    : L13120825-01 5X B 826-LOW D1              Inst    : hpms11
Misc      : 1,5                                       Multiplr: 1.00
MS Integration Params: rteint.p
Quant Time: Dec 24  8:24 2013             Quant Results File: 8260_WT.RES

Method       : C:\MSDCHEM\1\METHODS\8260_WT.M (RTE Integrator)
Title        : 8260B/624 (SOP: OVL MSV01) Water 11/05/13 HPMS11
Last Update  : Mon Dec 16 17:06:06 2013
Response via : Initial Calibration
```

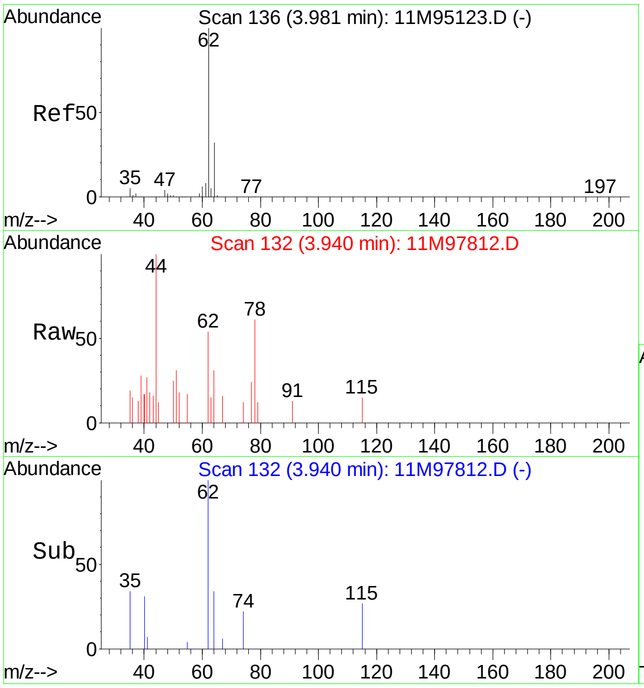


11M97812.D 8260_WT.M   Tue Dec 24 08:24:34 2013   Page 2

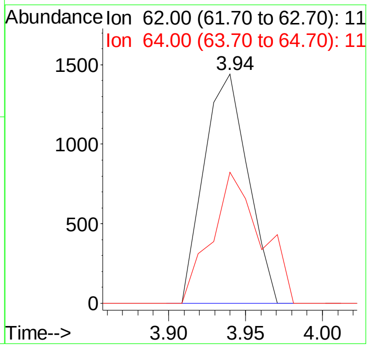


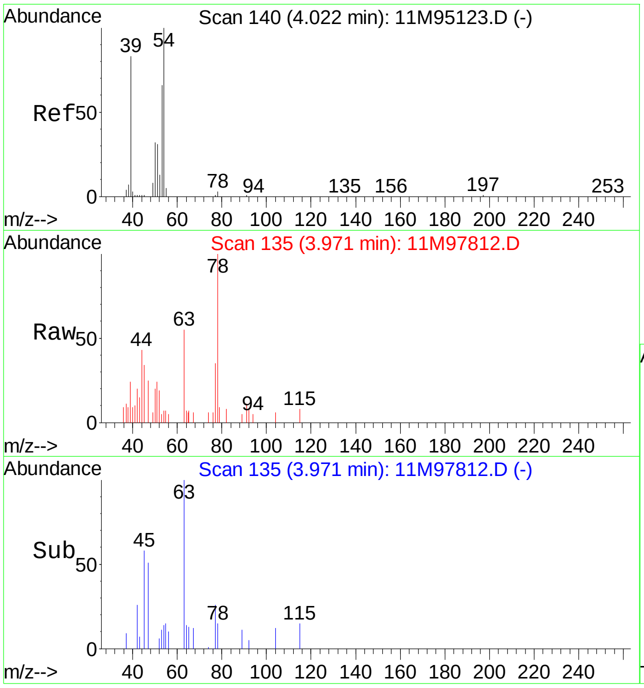
```
#3
Chloromethane
Concen:     0.31 ug/L
RT: 3.70 min   Scan# 109
Delta R.T.    0.00 min
Lab File:    11M97812.D
Acq: 23 Dec 2013  19:04

Tgt Ion: 50 Resp:     5040
Ion   Ratio   Lower   Upper
 50   100
 52    62.0    20.3    47.3#
```



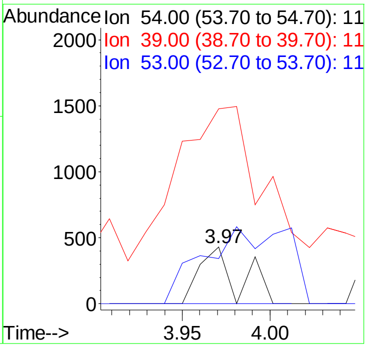


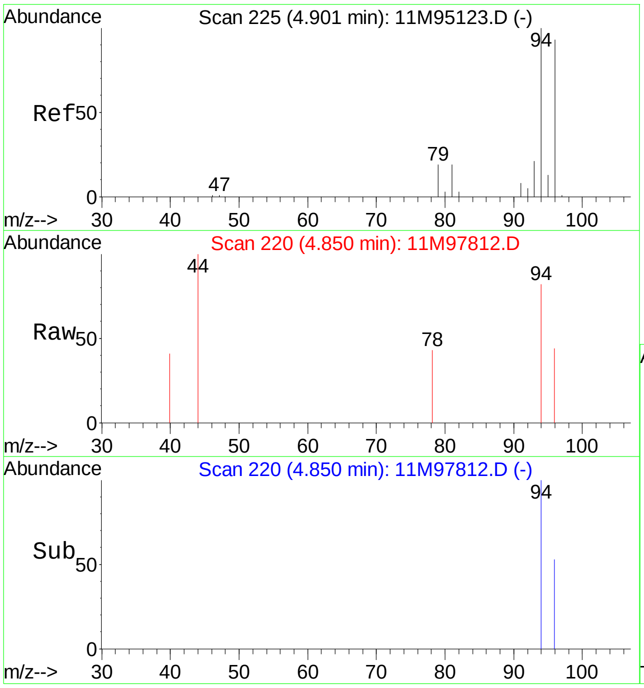
```
#4
Vinyl Chloride
Concen:     0.18 ug/L
RT: 3.94 min   Scan# 132
Delta R.T.    0.00 min
Lab File:    11M97812.D
Acq: 23 Dec 2013  19:04

Tgt Ion: 62 Resp:     2859
Ion   Ratio   Lower   Upper
 62   100
 64    64.0    19.0    44.4#
```



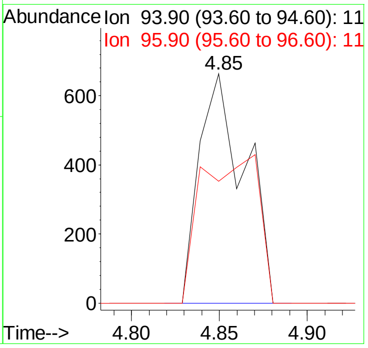


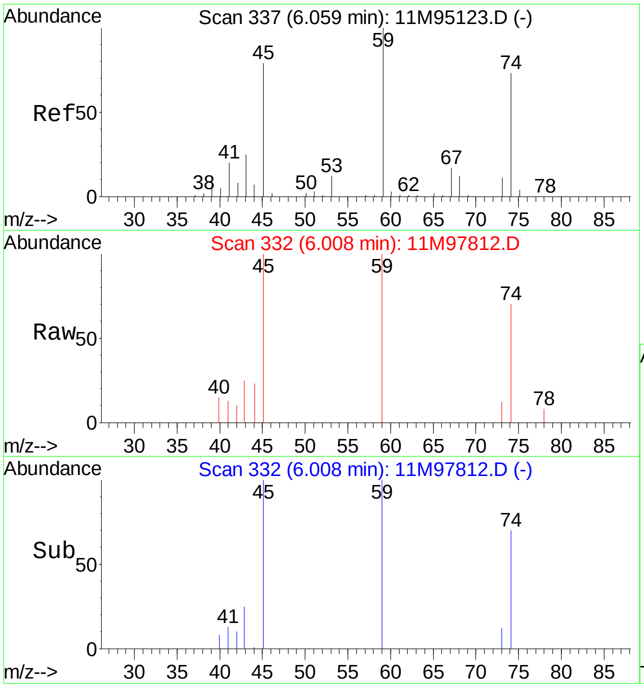
```
#5
1,3-Butadiene
Concen:   Below Cal
RT: 3.97 min  Scan# 135
Delta R.T.   -0.01 min
Lab File:   11M97812.D
Acq: 23 Dec 2013  19:04

Tgt Ion: 54 Resp:     676
Ion  Ratio   Lower   Upper
 54  100
 39  566.6   58.4  136.2#
 53  285.4   42.0   98.0#
```



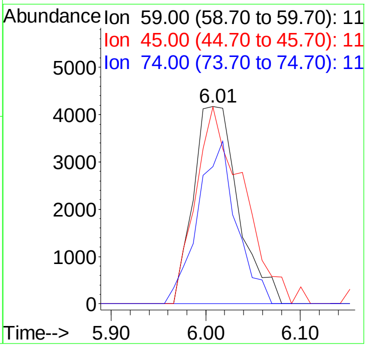


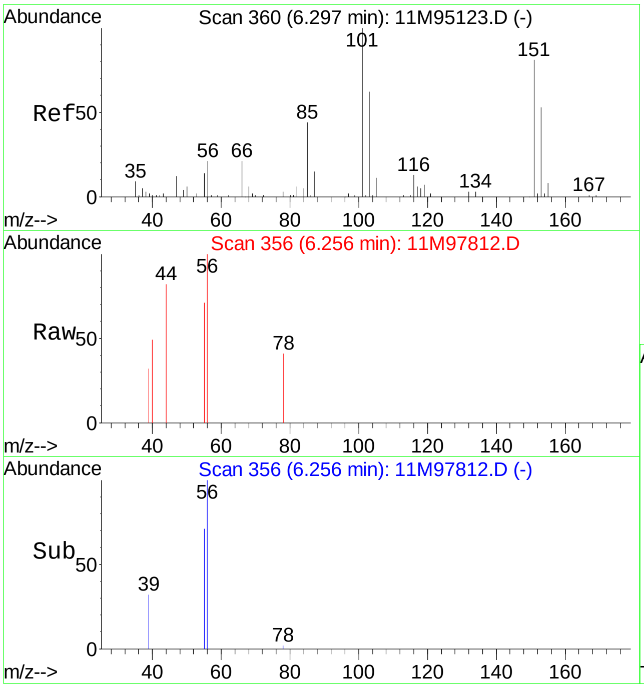
```
#6
Bromomethane
Concen:     0.18 ug/L
RT: 4.85 min  Scan# 220
Delta R.T.   0.00 min
Lab File:   11M97812.D
Acq: 23 Dec 2013  19:04

Tgt Ion: 94 Resp:    1195
Ion  Ratio   Lower   Upper
 94  100
 96   81.4   56.6   132.0
```



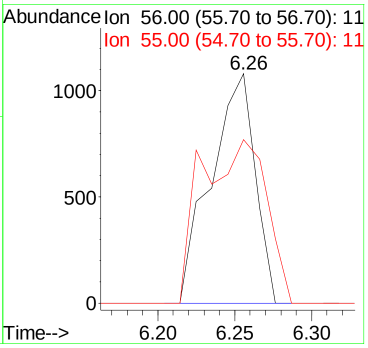


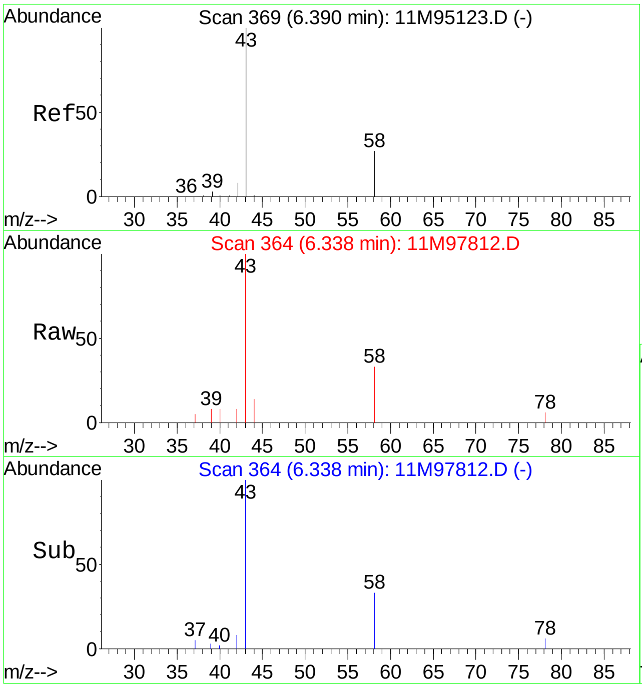
```
#9
Diethyl ether
Concen:    1.50 ug/L
RT: 6.01 min  Scan# 332
Delta R.T.   0.00 min
Lab File:   11M97812.D
Acq: 23 Dec 2013  19:04

Tgt Ion: 59 Resp:   13763
Ion  Ratio  Lower  Upper
 59  100
 45  106.6   47.9  111.7
 74   71.0   36.2   84.6
```



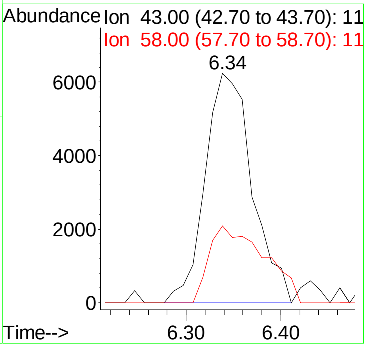


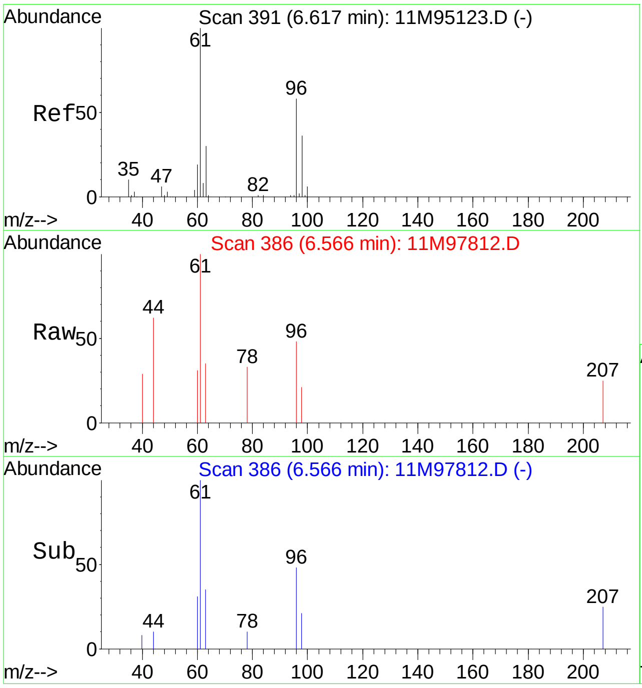
```
#11
Acrolein
Concen:   13.08 ug/L
RT: 6.26 min  Scan# 356
Delta R.T.   0.01 min
Lab File:   11M97812.D
Acq: 23 Dec 2013  19:04

Tgt Ion: 56 Resp:    2158
Ion  Ratio  Lower  Upper
 56  100
 55  104.5   44.8  104.6
```



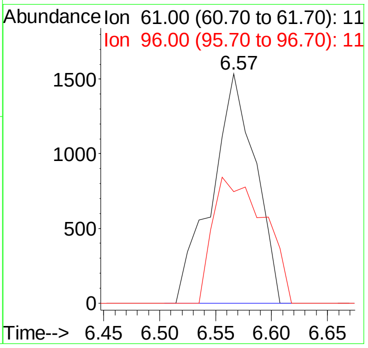


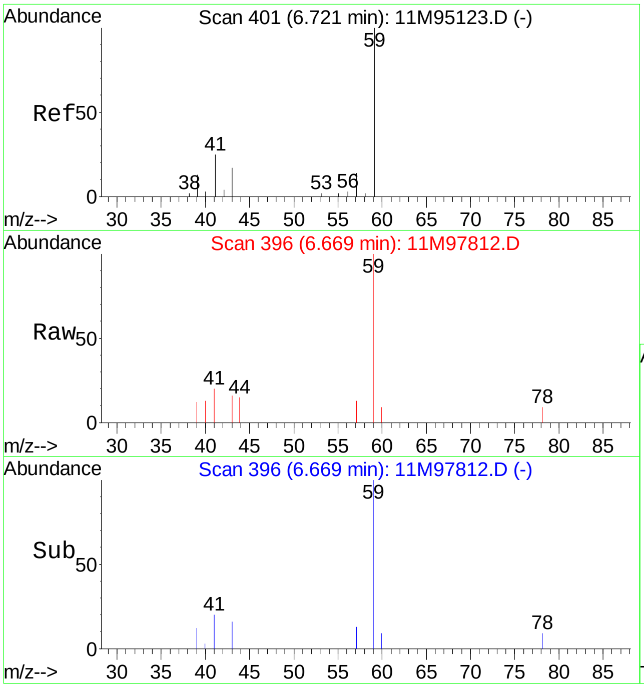
```
#13
Acetone
Concen:    7.80 ug/L
RT: 6.34 min  Scan# 364
Delta R.T.   -0.01 min
Lab File:   11M97812.D
Acq: 23 Dec 2013  19:04

Tgt Ion: 43 Resp:   21516
Ion  Ratio  Lower  Upper
 43  100
 58   39.4   13.9   32.3#
```



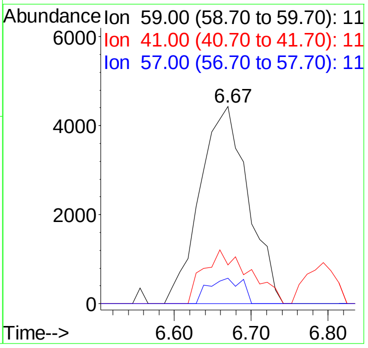


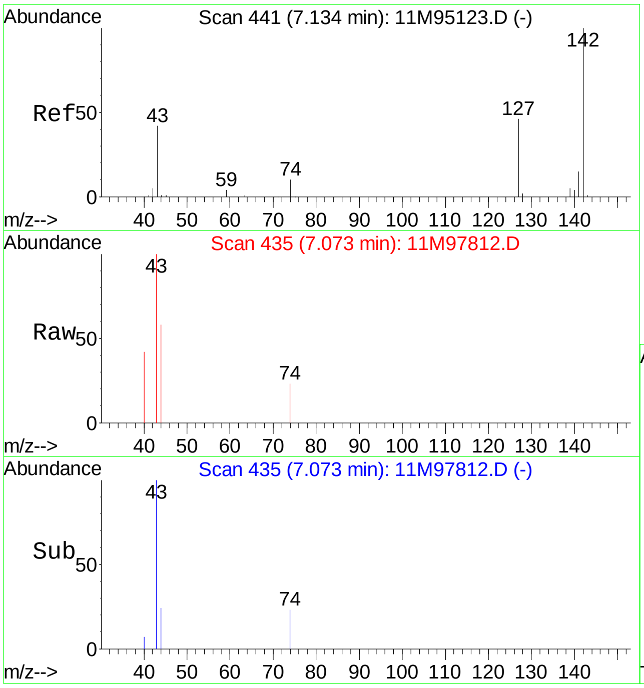
```
#14
1,1-Dichloroethene
Concen:    0.19 ug/L
RT: 6.57 min  Scan# 386
Delta R.T.   0.00 min
Lab File:   11M97812.D
Acq: 23 Dec 2013  19:04

Tgt Ion: 61 Resp:    4154
Ion  Ratio  Lower  Upper
 61  100
 96   65.3   31.4   73.4
```



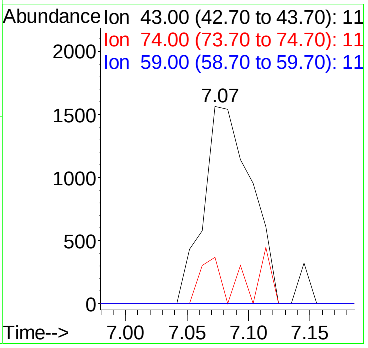


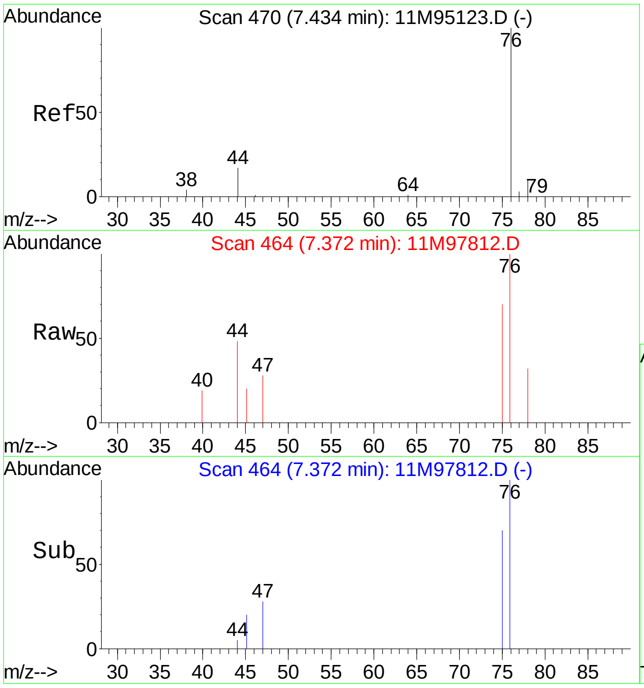
```
#15
Tert-Butyl Alcohol
Concen:    22.62 ug/L
RT: 6.67 min   Scan# 396
Delta R.T.    0.00 min
Lab File:    11M97812.D
Acq: 23 Dec 2013  19:04

Tgt Ion: 59 Resp:    19369
Ion   Ratio   Lower   Upper
 59   100
 41    26.2    14.0    32.6
 57     9.1     7.2    16.8
```



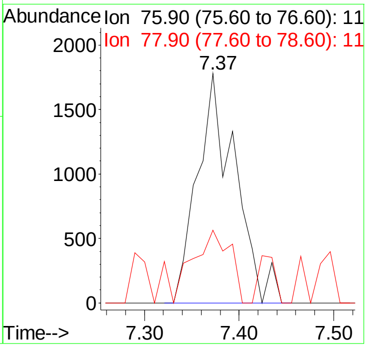


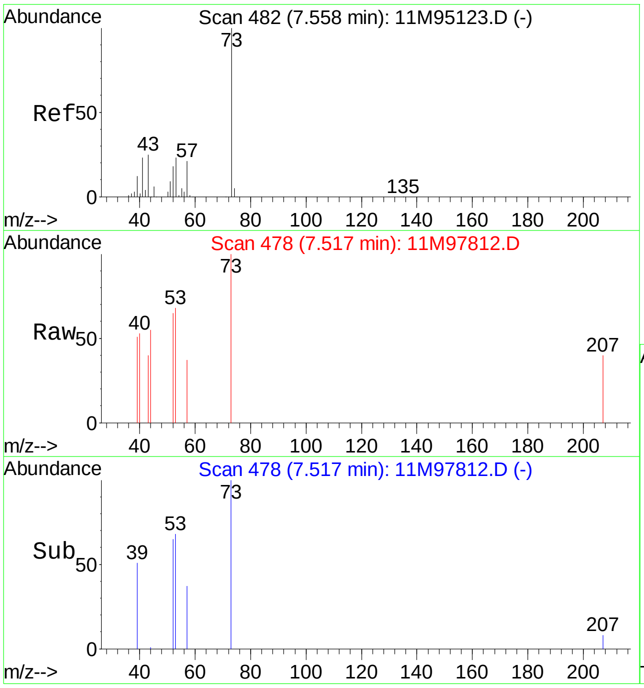
```
#18
Methyl acetate
Concen:     0.53 ug/L
RT: 7.07 min   Scan# 435
Delta R.T.   -0.01 min
Lab File:    11M97812.D
Acq: 23 Dec 2013  19:04

Tgt Ion: 43 Resp:     4237
Ion   Ratio   Lower   Upper
 43   100
 74     9.8    10.1    23.5#
 59     0.0     5.5    12.7#
```



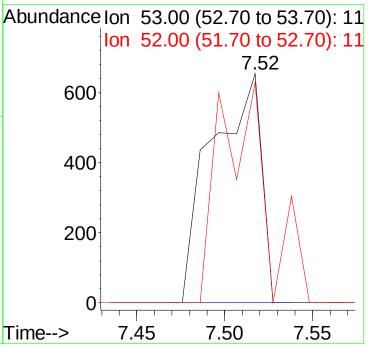


```
#20
Carbon Disulfide
Concen:    0.13 ug/L
RT: 7.37 min  Scan# 464
Delta R.T.   -0.01 min
Lab File:   11M97812.D
Acq: 23 Dec 2013  19:04

Tgt Ion: 76 Resp:    4908
Ion  Ratio  Lower  Upper
 76  100
 78   35.0    5.6   13.2#
```

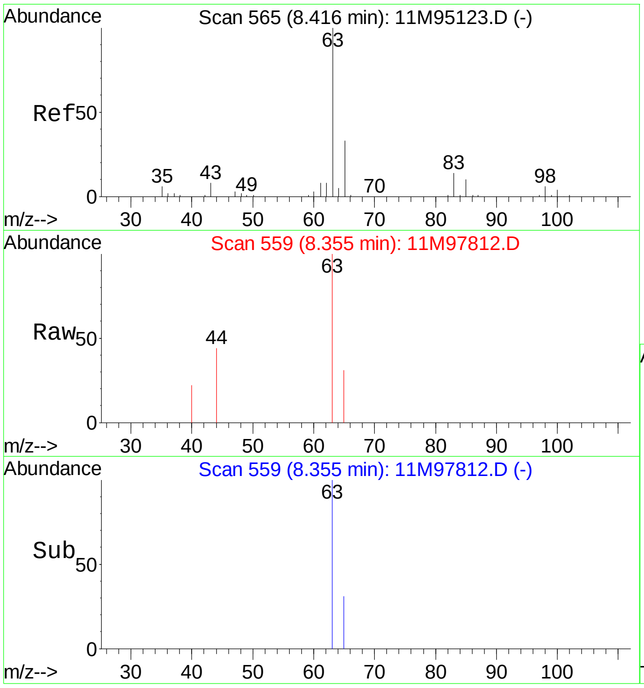


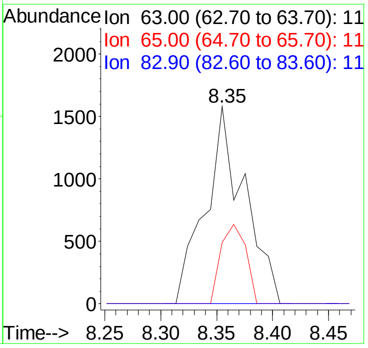


```
#21
Acrylonitrile
Concen:    0.38 ug/L
RT: 7.52 min  Scan# 478
Delta R.T.   0.02 min
Lab File:   11M97812.D
Acq: 23 Dec 2013  19:04

Tgt Ion: 53 Resp:    1277
Ion  Ratio  Lower  Upper
 53  100
 52   91.5   48.4  112.8
```

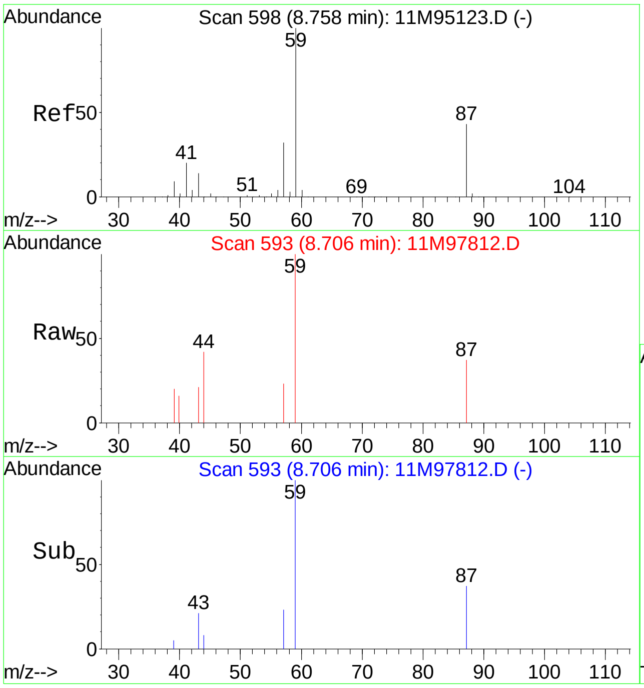


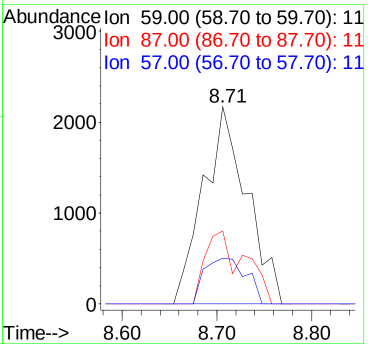
```
#27
1,1-Dichloroethane
Concen:    0.16 ug/L
RT: 8.35 min   Scan# 559
Delta R.T.   -0.01 min
Lab File:   11M97812.D
Acq: 23 Dec 2013  19:04

Tgt Ion: 63 Resp:     3832
Ion   Ratio   Lower   Upper
 63   100
 65    26.0    18.2    42.4
 83     0.0     8.0    18.6#
```



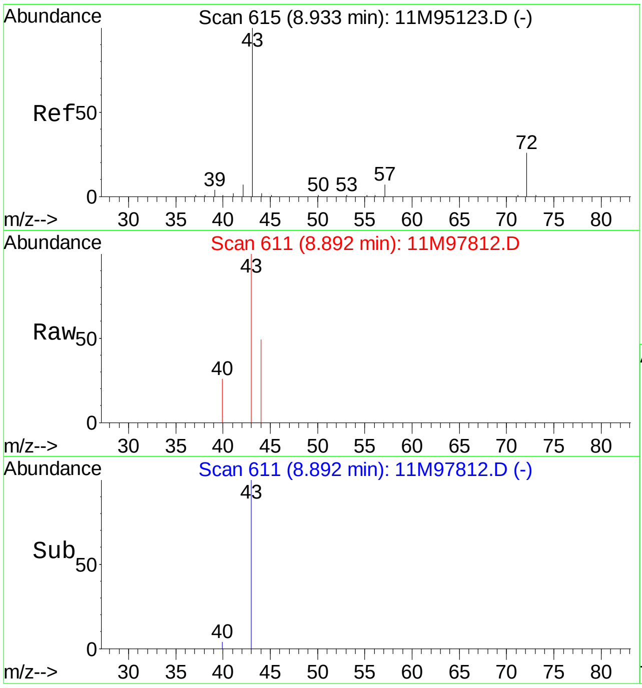


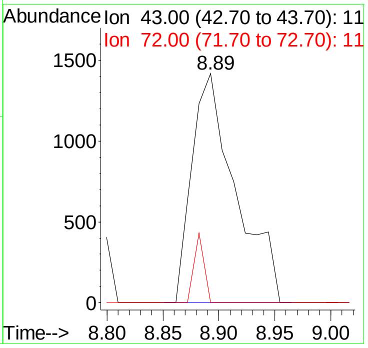
```
#28
Ethyl-Tert-Butyl ether
Concen:    0.17 ug/L
RT: 8.71 min   Scan# 593
Delta R.T.    0.00 min
Lab File:   11M97812.D
Acq: 23 Dec 2013  19:04

Tgt Ion: 59 Resp:     6901
Ion   Ratio   Lower   Upper
 59   100
 87    33.3    22.9    53.5
 57    22.3    18.3    42.7
```



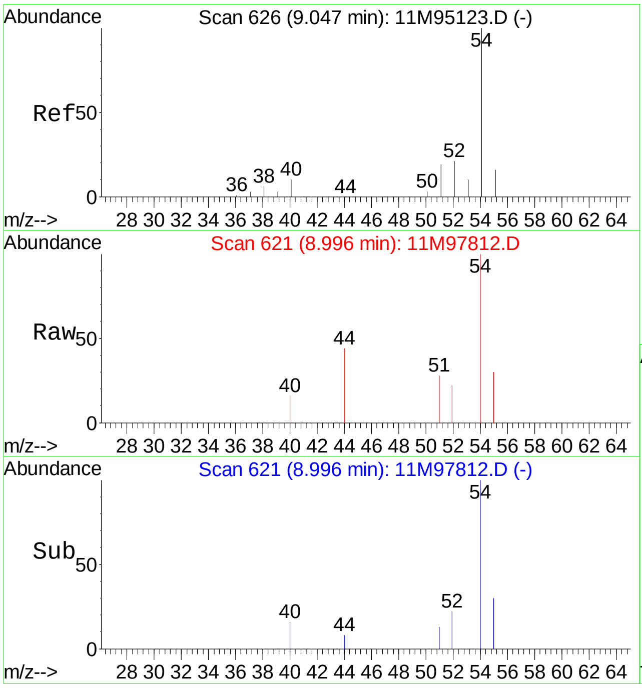


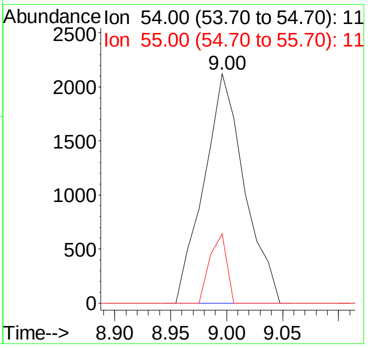
```
#29
2-Butanone
Concen:     0.97 ug/L
RT: 8.89 min   Scan# 611
Delta R.T.    0.00 min
Lab File:    11M97812.D
Acq: 23 Dec 2013  19:04

Tgt Ion: 43 Resp:     3883
Ion  Ratio   Lower   Upper
 43  100
 72    6.9    11.0    25.8#
```

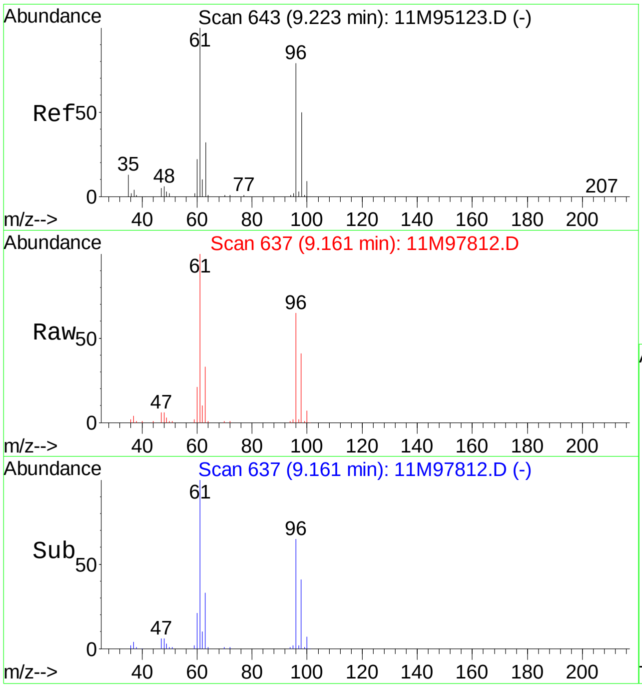




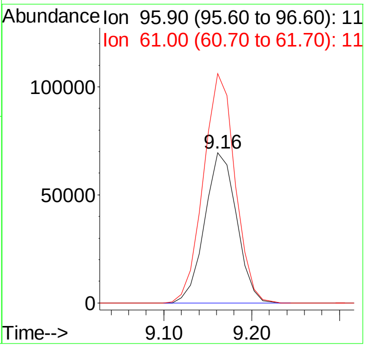
```
#30
Propionitrile
Concen:     4.79 ug/L
RT: 9.00 min   Scan# 621
Delta R.T.    0.00 min
Lab File:    11M97812.D
Acq: 23 Dec 2013  19:04

Tgt Ion: 54 Resp:     5344
Ion  Ratio   Lower   Upper
 54  100
 55   12.7    11.1    25.9
```

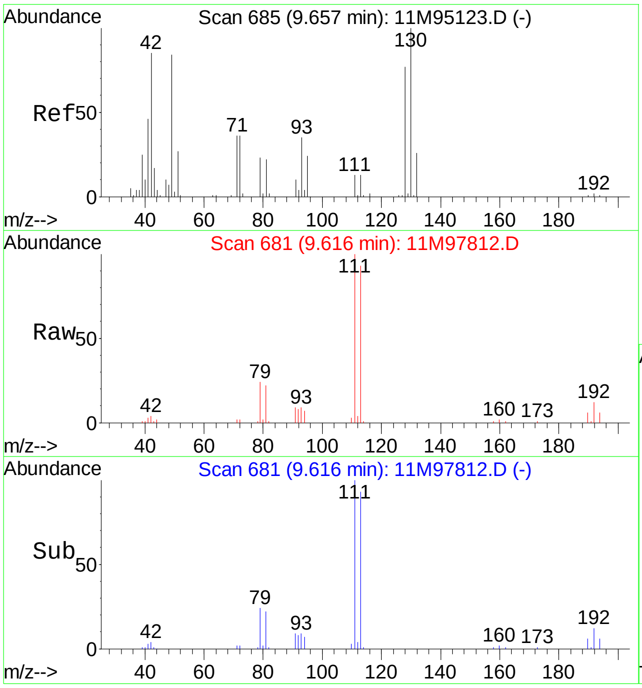




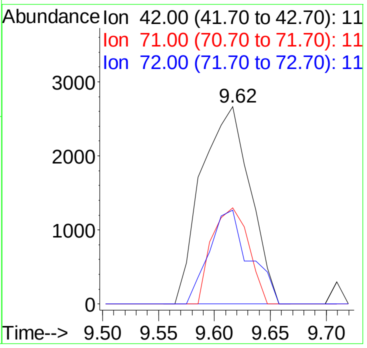


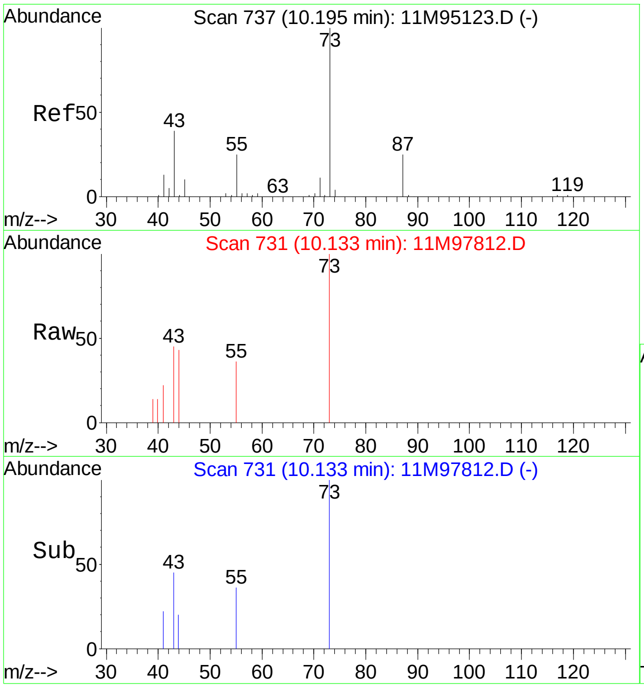
```
#32
cis-1,2-Dichloroethene
Concen:    12.03 ug/L
RT: 9.16 min   Scan# 637
Delta R.T.    -0.01 min
Lab File:    11M97812.D
Acq: 23 Dec 2013  19:04

Tgt Ion: 96 Resp:   174586
Ion  Ratio   Lower   Upper
 96  100
 61  152.3    99.2   231.4
```



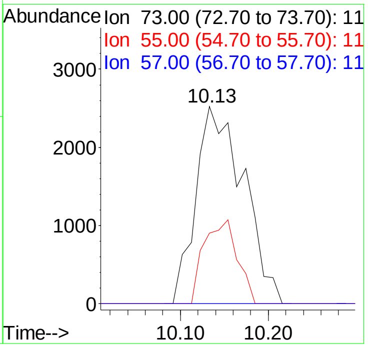


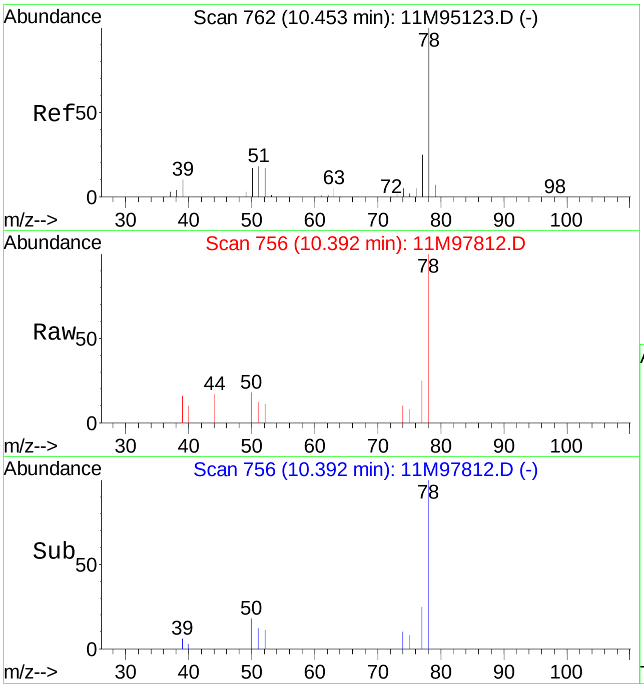
```
#36
Tetrahydrofuran
Concen:     3.41 ug/L
RT: 9.62 min   Scan# 681
Delta R.T.    0.01 min
Lab File:    11M97812.D
Acq: 23 Dec 2013  19:04

Tgt Ion: 42 Resp:     8104
Ion  Ratio   Lower   Upper
 42  100
 71   36.6    21.3    49.7
 72   39.2    22.3    51.9
```



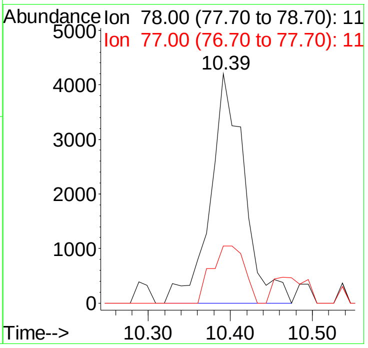


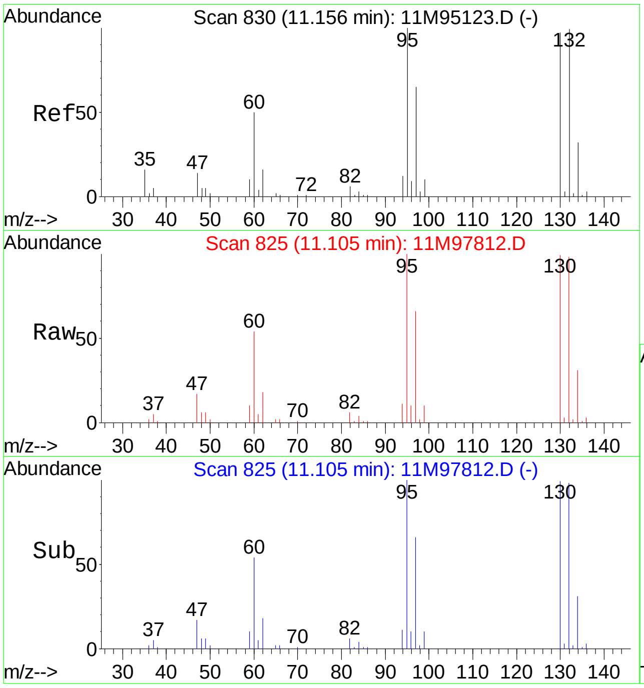
```
#42
Tert-Amyl-Methyl ether
Concen:     0.29 ug/L
RT: 10.13 min   Scan# 731
Delta R.T.    -0.02 min
Lab File:   11M97812.D
Acq: 23 Dec 2013  19:04

Tgt Ion: 73 Resp:     9529
Ion   Ratio  Lower   Upper
 73   100
 55    29.7   17.6    41.2
 57     0.0    1.4     3.4#
```



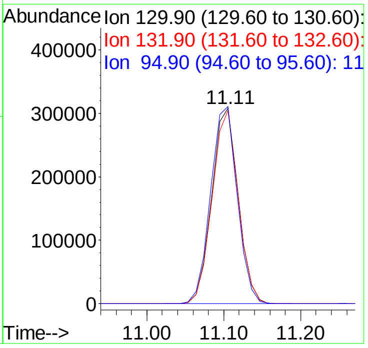


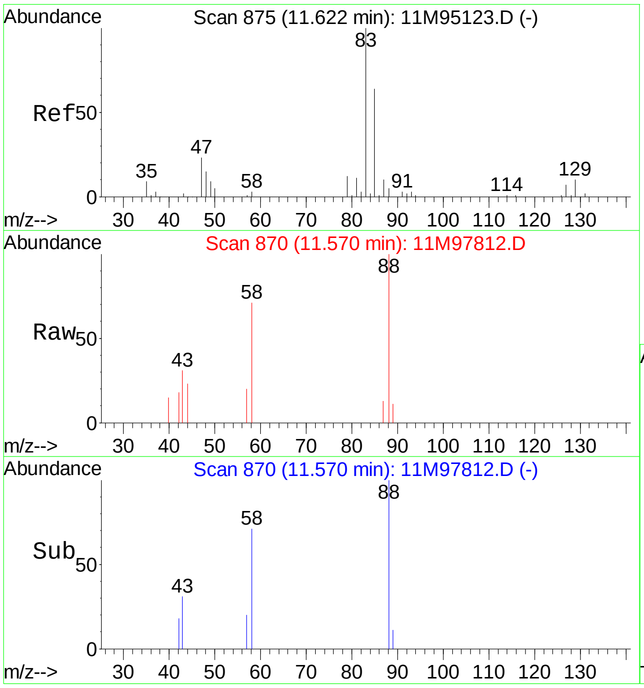
```
#45
Benzene
Concen:     0.23 ug/L
RT: 10.39 min   Scan# 756
Delta R.T.    -0.01 min
Lab File:   11M97812.D
Acq: 23 Dec 2013  19:04

Tgt Ion: 78 Resp:    12165
Ion   Ratio  Lower   Upper
 78   100
 77    24.1   14.5    33.9
```



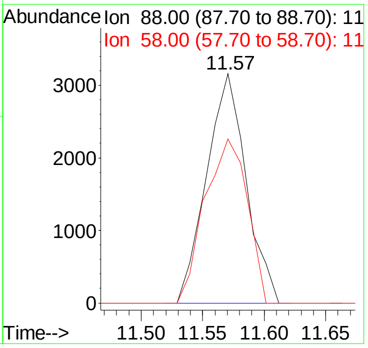


```
#46
Trichloroethene
Concen:   51.89 ug/L
RT: 11.11 min  Scan# 825
Delta R.T.   0.00 min
Lab File:   11M97812.D
Acq: 23 Dec 2013  19:04

Tgt Ion:130 Resp:  737758
Ion  Ratio  Lower  Upper
130  100
132   97.0   57.9  135.1
 95  101.4   60.4  140.8
```

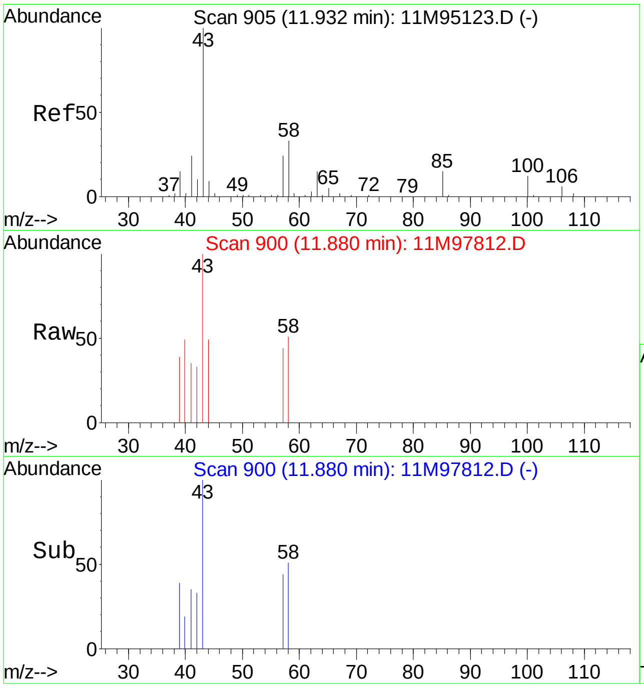


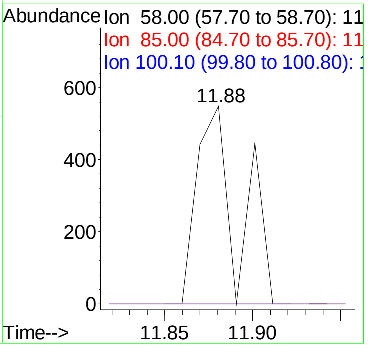


```
#49
1,4-Dioxane
Concen:   80.19 ug/L
RT: 11.57 min  Scan# 870
Delta R.T.  -0.01 min
Lab File:   11M97812.D
Acq: 23 Dec 2013  19:04

Tgt Ion: 88 Resp:    7061
Ion  Ratio  Lower  Upper
 88  100
 58   76.7   36.8   85.8
```

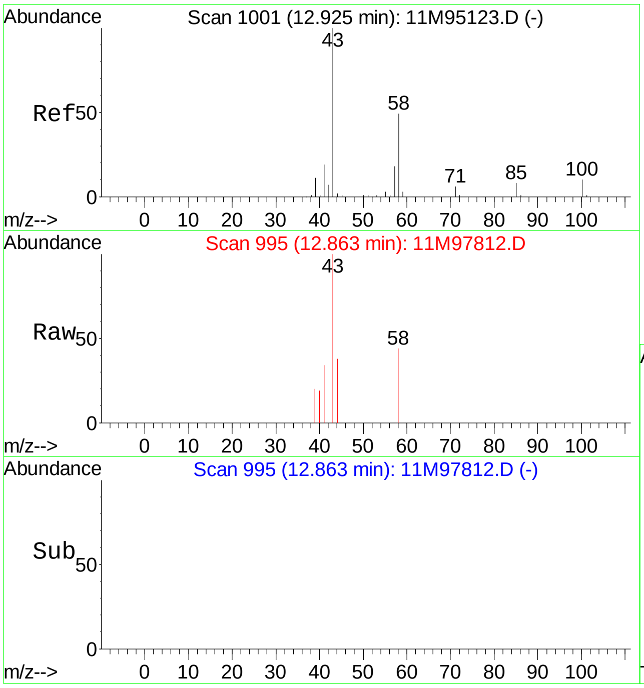


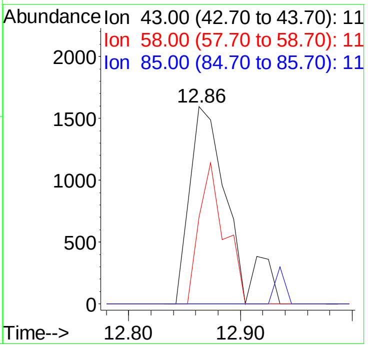
```
#53
4-Methyl-2-Pentanone
Concen:    0.27 ug/L
RT: 11.88 min  Scan# 900
Delta R.T.   -0.01 min
Lab File:   11M97812.D
Acq: 23 Dec 2013  19:04

Tgt Ion: 58 Resp:     890
Ion  Ratio  Lower   Upper
 58  100
 85    0.0   26.0    60.6#
100    0.0   21.3    49.7#
```

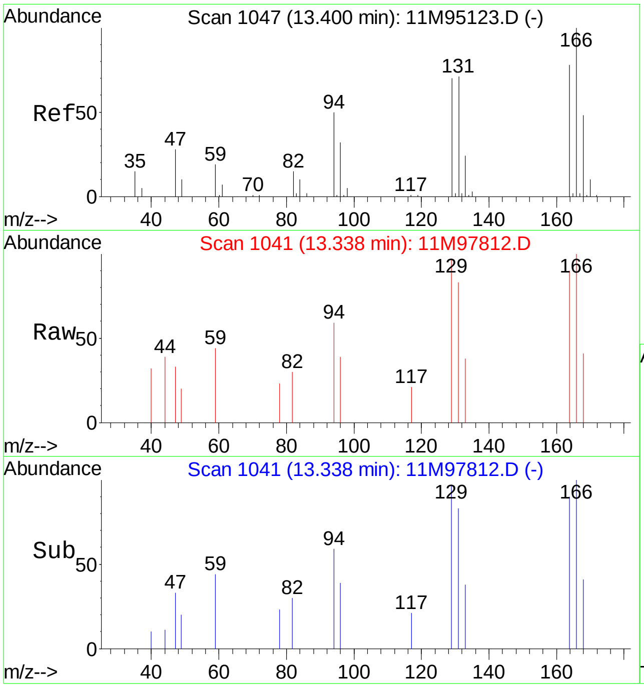




```
#62
2-Hexanone
Concen:    0.68 ug/L
RT: 12.86 min  Scan# 995
Delta R.T.   -0.01 min
Lab File:   11M97812.D
Acq: 23 Dec 2013  19:04

Tgt Ion: 43 Resp:    3876
Ion  Ratio  Lower   Upper
 43  100
 58   46.7   39.0    91.0
 85    4.8    7.8    18.2#
```

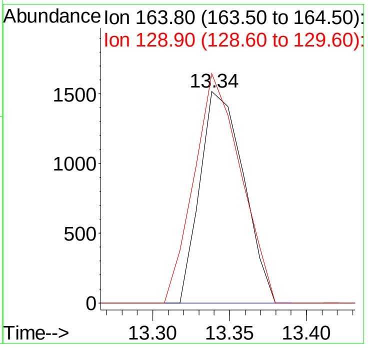


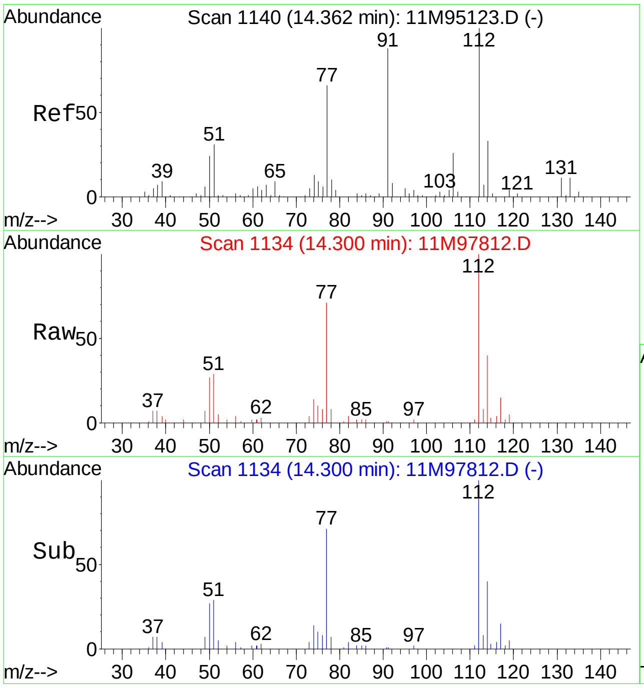




#64
Tetrachloroethene
Concen: 0.28 ug/L
RT: 13.34 min   Scan# 1041
Delta R.T.   -0.01 min
Lab File: 11M97812.D
Acq: 23 Dec 2013   19:04

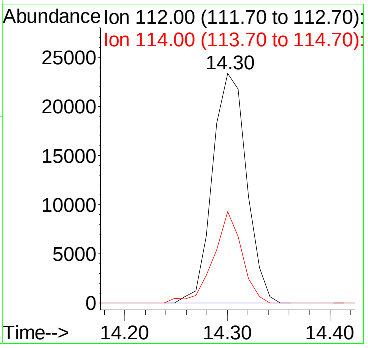
Tgt Ion:164	Resp:		2992
Ion	Ratio	Lower	Upper
164	100		
129	116.3	58.4	136.2

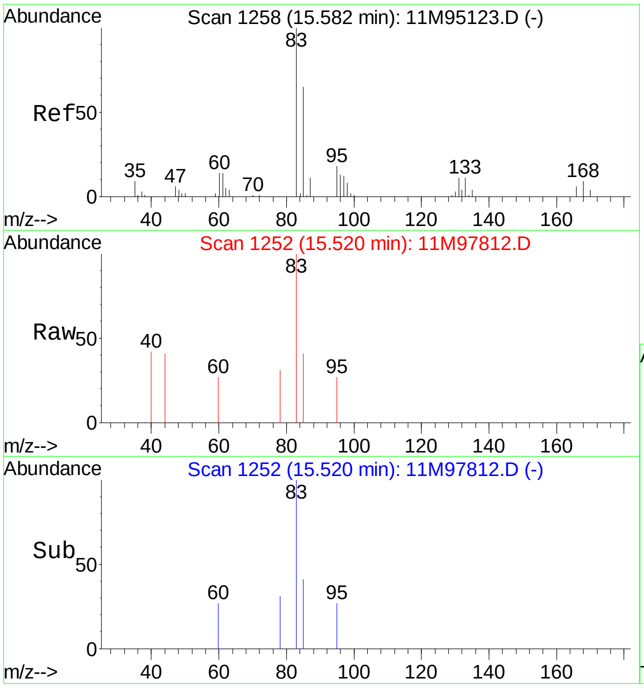




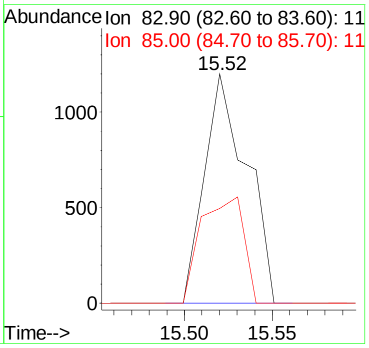
#68
Chlorobenzene
Concen: 1.53 ug/L
RT: 14.30 min   Scan# 1134
Delta R.T.   -0.01 min
Lab File: 11M97812.D
Acq: 23 Dec 2013   19:04

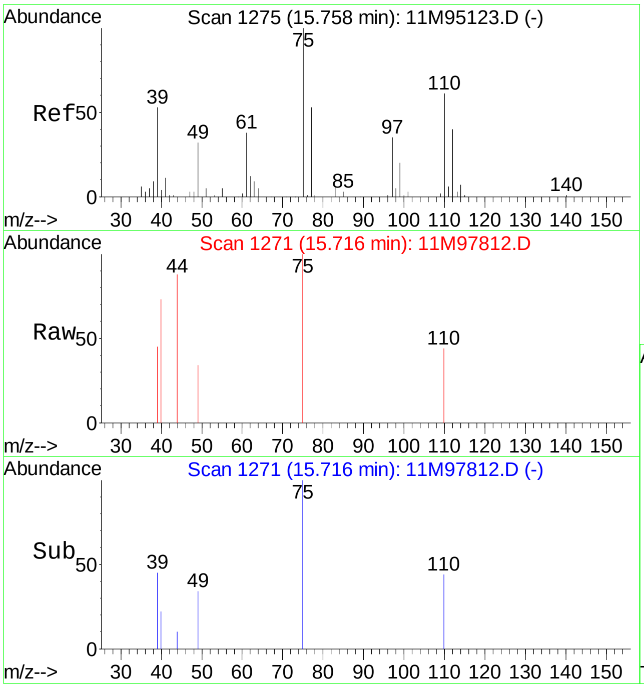
Tgt Ion:112	Resp:		53984
Ion	Ratio	Lower	Upper
112	100		
114	33.2	19.7	45.9



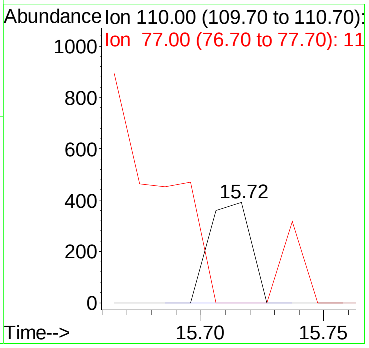


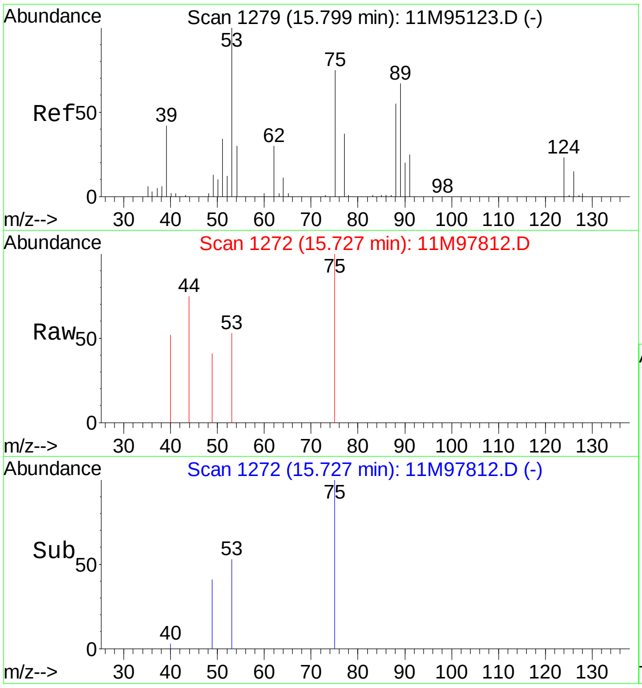
```
#77
1,1,2,2-Tetrachloroethane
Concen:    0.20 ug/L
RT: 15.52 min  Scan# 1252
Delta R.T.   -0.01 min
Lab File:   11M97812.D
Acq: 23 Dec 2013  19:04

Tgt Ion: 83 Resp:     1996
Ion  Ratio  Lower   Upper
 83  100
 85   46.8   37.9    88.3
```



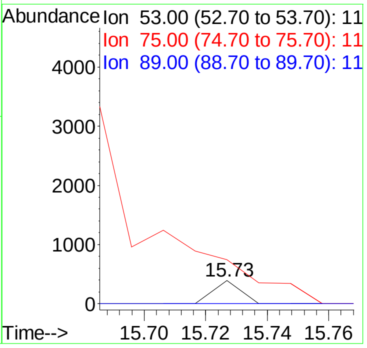


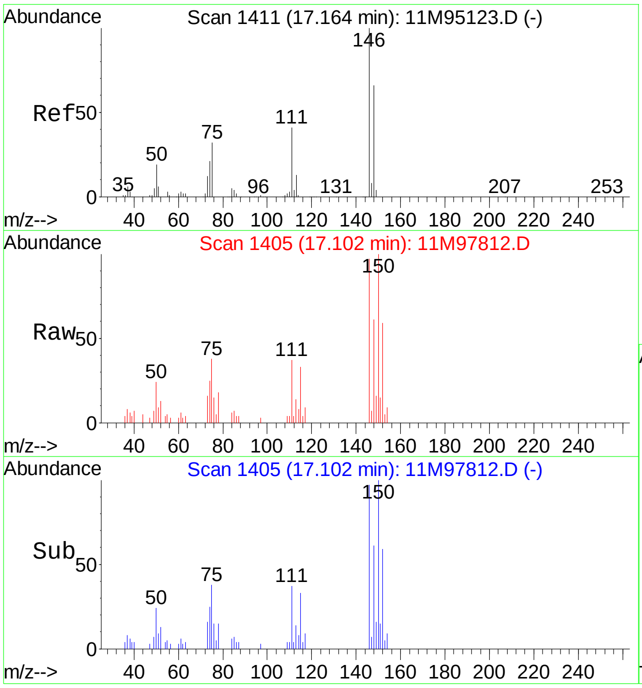
```
#79
1,2,3-Trichloropropane
Concen:    0.16 ug/L
RT: 15.72 min  Scan# 1271
Delta R.T.    0.01 min
Lab File:   11M97812.D
Acq: 23 Dec 2013  19:04

Tgt Ion:110 Resp:      466
Ion  Ratio  Lower   Upper
110  100
 77   42.3   47.9   111.9#
```



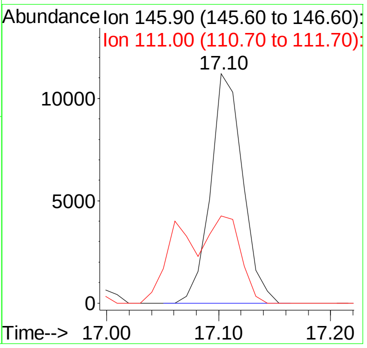


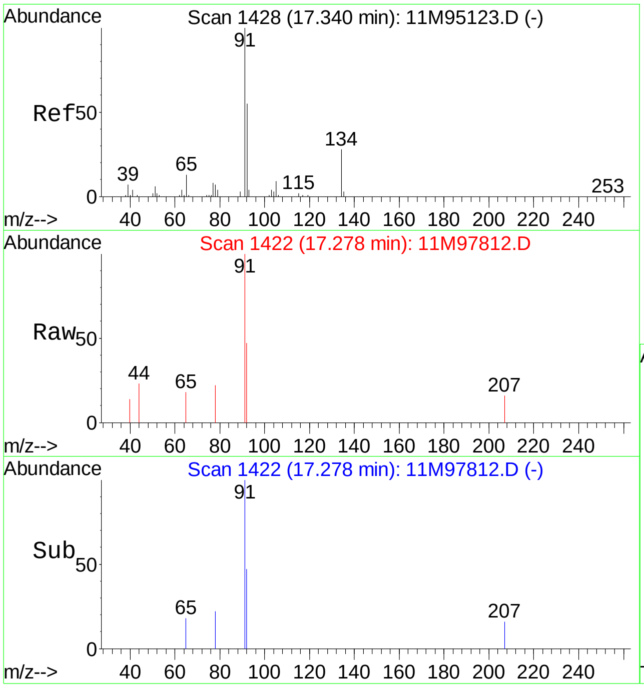
```
#80
trans-1,4-Dichloro-2-Butene
Concen:    0.71 ug/L
RT: 15.73 min  Scan# 1272
Delta R.T.   -0.02 min
Lab File:   11M97812.D
Acq: 23 Dec 2013  19:04

Tgt Ion: 53 Resp:      247
Ion  Ratio   Lower   Upper
 53  100
 75  112490.7    90.5  211.3#
 89    0.0    33.7    78.5#
```



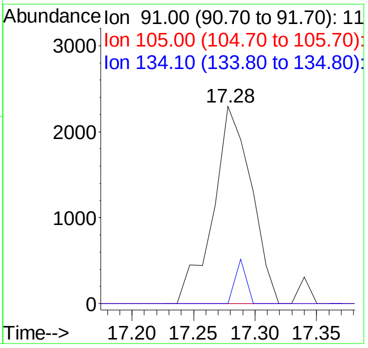


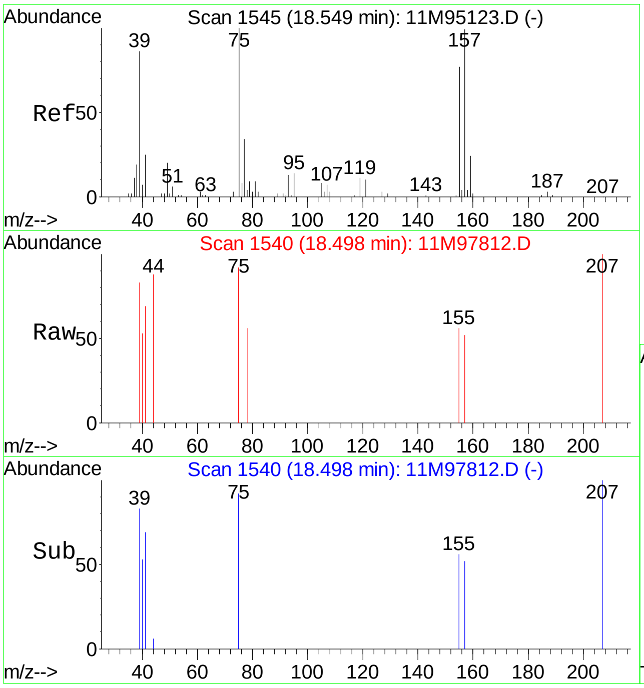
```
#92
1,4-Dichlorobenzene
Concen:    0.85 ug/L
RT: 17.10 min  Scan# 1405
Delta R.T.   -0.01 min
Lab File:   11M97812.D
Acq: 23 Dec 2013  19:04

Tgt Ion:146 Resp:    22497
Ion  Ratio   Lower   Upper
146  100
111   38.1    24.5    57.3
```



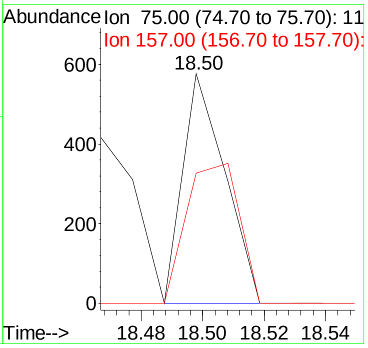


```
#93
n-Butylbenzene
Concen:     0.13 ug/L
RT: 17.28 min   Scan# 1422
Delta R.T.    -0.01 min
Lab File:    11M97812.D
Acq: 23 Dec 2013  19:04

Tgt Ion: 91 Resp:     4956
Ion  Ratio  Lower   Upper
 91  100
105    0.0    5.5   12.7#
134    6.5   15.8   36.8#
```



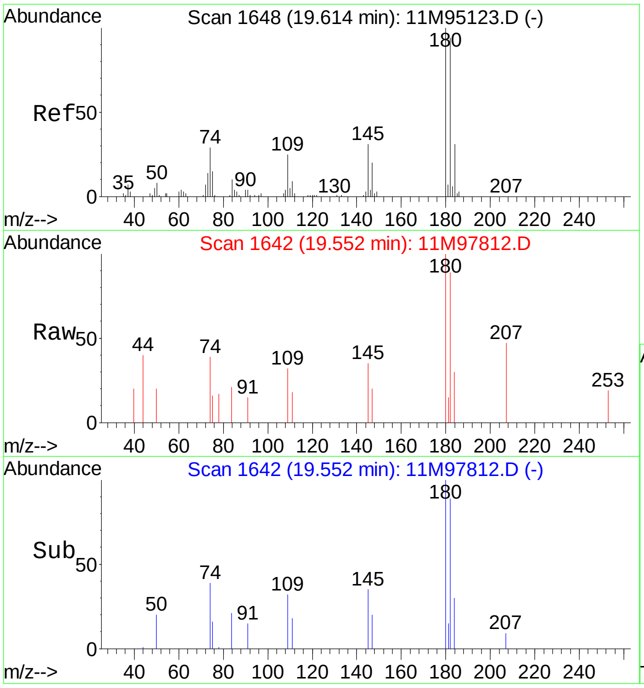


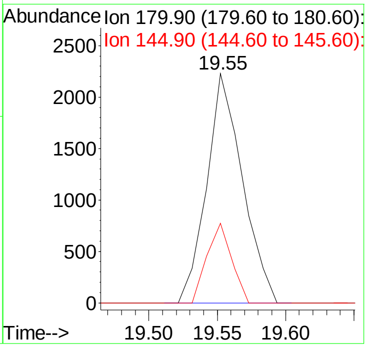
```
#95
1,2-Dibromo-3-Chloropropane
Concen:     0.29 ug/L
RT: 18.50 min   Scan# 1540
Delta R.T.    0.00 min
Lab File:    11M97812.D
Acq: 23 Dec 2013  19:04

Tgt Ion: 75 Resp:      548
Ion  Ratio  Lower   Upper
 75  100
157   76.6   61.0   142.4
```



#96
1,2,4-Trichlorobenzene
Concen: 0.25 ug/L
RT: 19.55 min Scan# 1642
Delta R.T.   -0.01 min
Lab File: 11M97812.D
Acq: 23 Dec 2013 19:04

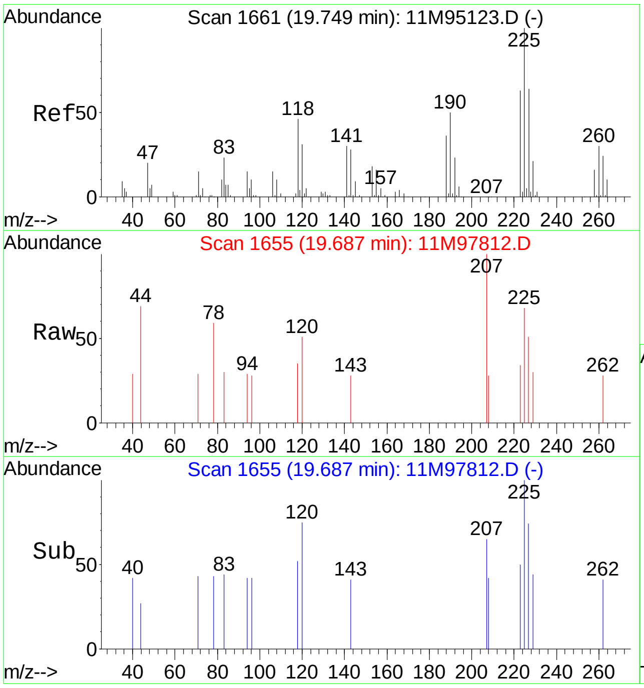
```
Tgt Ion:180 Resp:    4036
Ion  Ratio  Lower  Upper
180  100
145   23.9   19.3   44.9
```

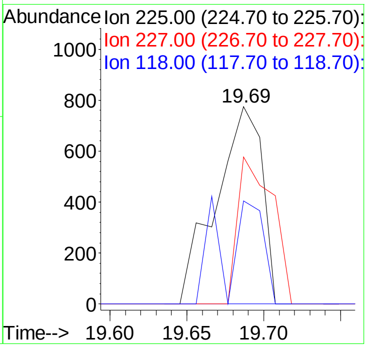


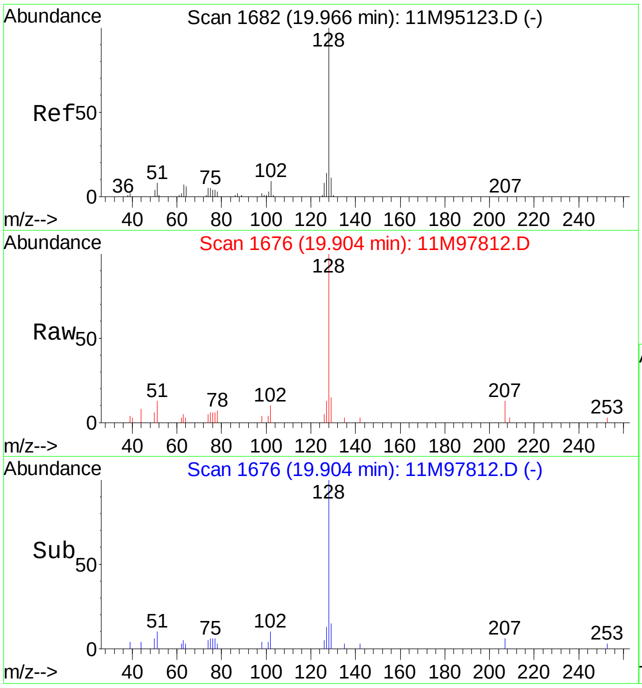


#97
Hexachlorobutadiene
Concen: 0.26 ug/L
RT: 19.69 min Scan# 1655
Delta R.T.   -0.01 min
Lab File: 11M97812.D
Acq: 23 Dec 2013 19:04

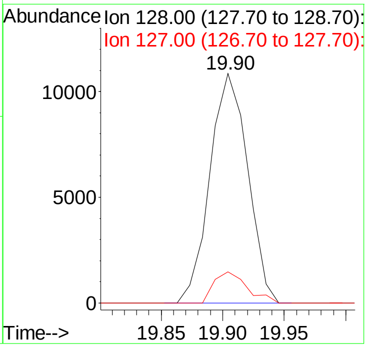
```
Tgt Ion:225 Resp:    1620
Ion  Ratio  Lower  Upper
225  100
227   56.2   38.2   89.0
118   29.4   27.9   65.1
```

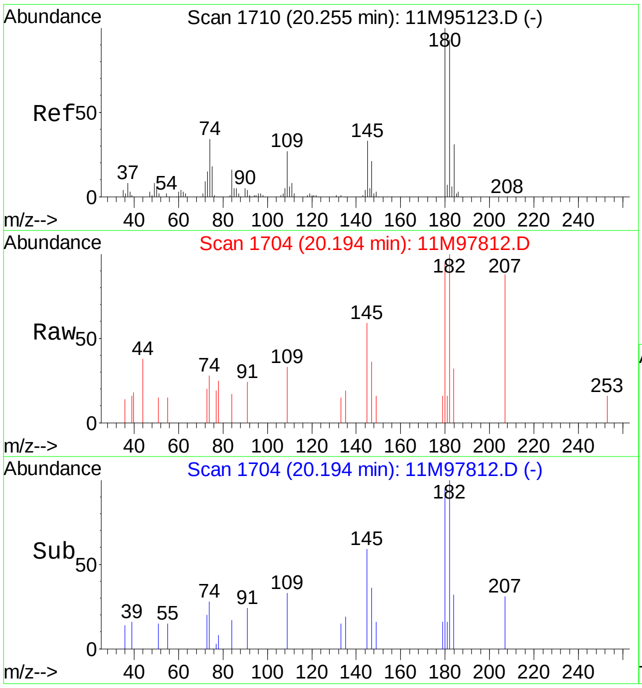




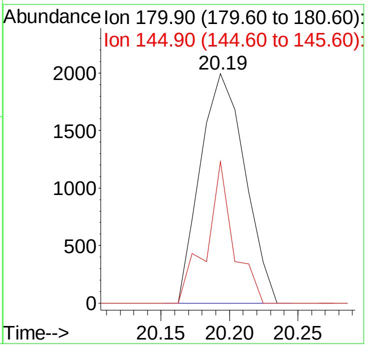


```
#98
Naphthalene
Concen:    0.75 ug/L
RT: 19.90 min  Scan# 1676
Delta R.T.   -0.01 min
Lab File:   11M97812.D
Acq: 23 Dec 2013  19:04

Tgt Ion:128 Resp:   23188
Ion  Ratio  Lower  Upper
128  100
127   11.8   12.2   15.0#
```



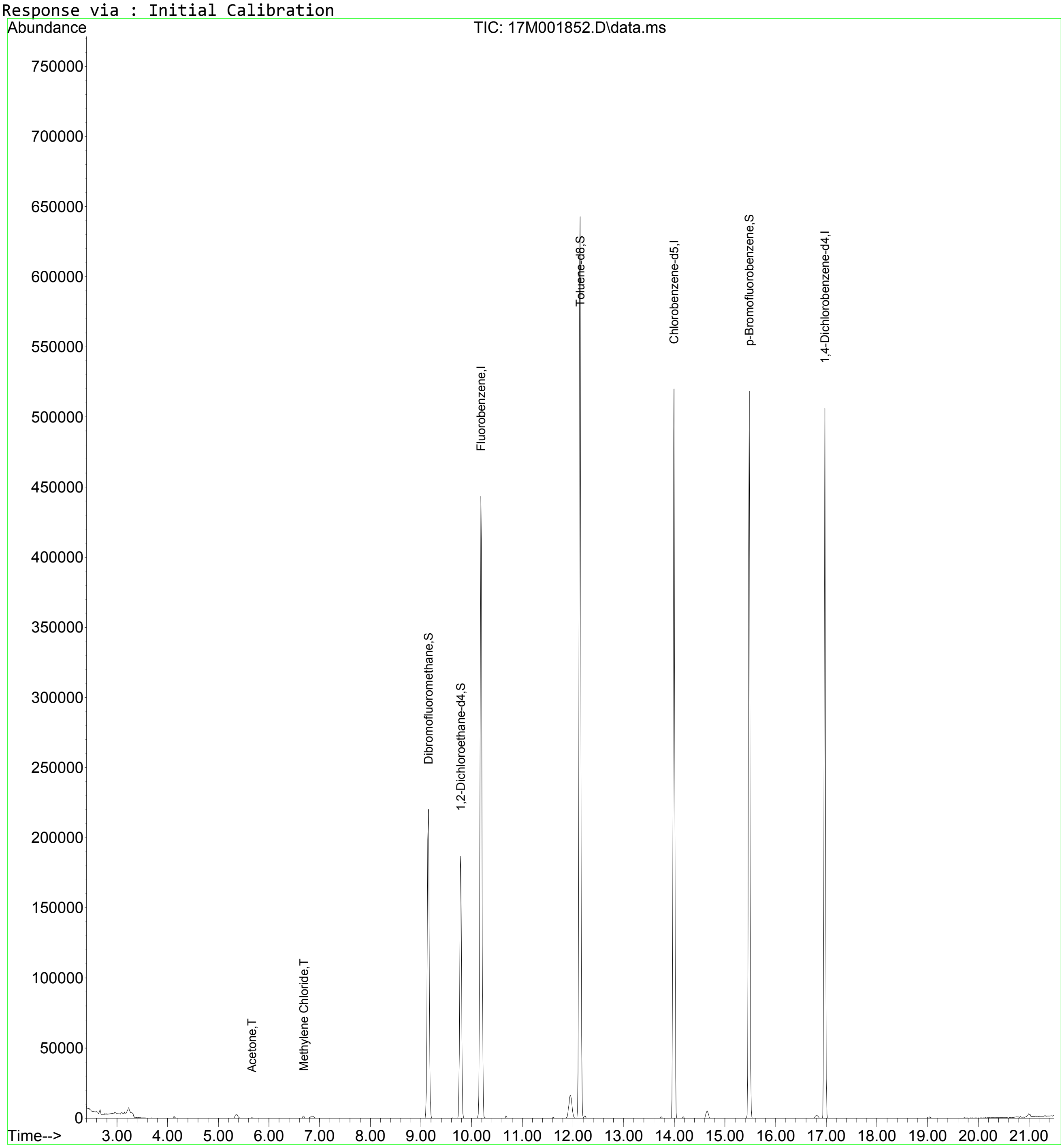


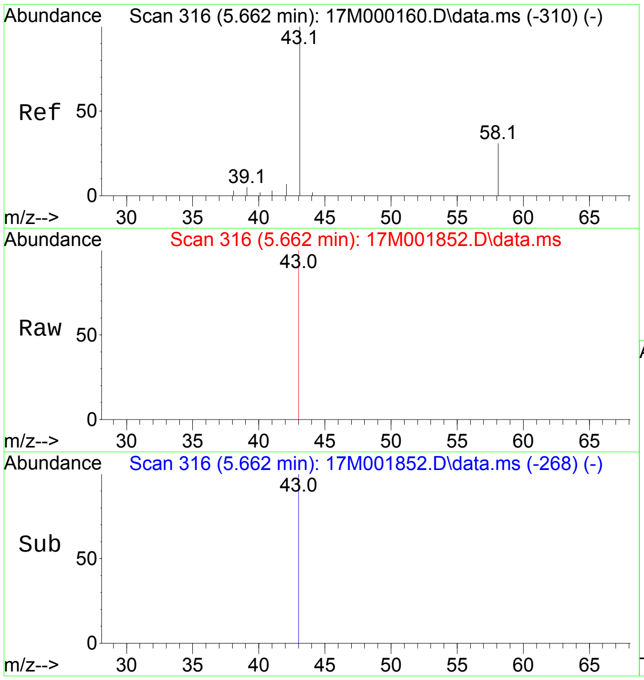
```
#99
1,2,3-Trichlorobenzene
Concen:    0.31 ug/L
RT: 20.19 min  Scan# 1704
Delta R.T.   -0.01 min
Lab File:   11M97812.D
Acq: 23 Dec 2013  19:04

Tgt Ion:180 Resp:    4523
Ion  Ratio  Lower  Upper
180  100
145   37.3   20.6   48.2
```



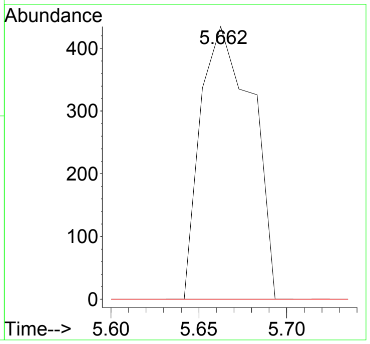
```
                         Quantitation Report    (Not Reviewed)

Data Path : D:\MassHunter\GCMS\1\data\122213\
Data File : 17M001852.D
Acq On    : 22 Dec 2013  23:35
Operator  : ADC
Sample    : L13120825-02 A 826-LOW
Misc      : 1,1
ALS Vial  : 12   Sample Multiplier: 1

Quant Time: Dec 23 10:00:59 2013
Quant Method : D:\MassHunter\GCMS\1\methods\8260WTR.M
Quant Title  : 8260B/624 SOP:OVL MSV01 WATER 11/15/13 HPMS17
QLast Update : Sat Nov 16 17:30:32 2013
Response via : Initial Calibration

        Compound                   R.T. QIon  Response  Conc Units Dev(Min)
 ---------------------------------------------------------------------------
 Internal Standards
   1) Fluorobenzene              10.182   96   581573    25.00000 ug/L    -0.0104
  56) Chlorobenzene-d5           13.996  117   400760    25.00000 ug/L     0.0000
  76) 1,4-Dichlorobenzene-d4     16.971  152   179625    25.00000 ug/L     0.0000

 System Monitoring Compounds
  37) Dibromofluoromethane        9.145  111   182968    25.2635 ug/L    0.0000
   Spiked Amount     25.000   Range  86 - 118    Recovery   =  101.054%
  43) 1,2-Dichloroethane-d4       9.788   65   171325    24.0039 ug/L    0.0000
   Spiked Amount     25.000   Range  80 - 120    Recovery   =   96.016%
  57) Toluene-d8                 12.141   98   614734    25.1408 ug/L    0.0000
   Spiked Amount     25.000   Range  88 - 110    Recovery   =  100.563%
  78) p-Bromofluorobenzene       15.478   95   207361    23.8120 ug/L    0.0000
   Spiked Amount     25.000   Range  86 - 115    Recovery   =   95.248%

 Target Compounds                                                  Qvalue
  13) Acetone                     5.662   43      891     0.7651 ug/L #    43
  19) Methylene Chloride          6.689   84     1105     0.1622 ug/L      99
 ---------------------------------------------------------------------------

 (#) = qualifier out of range (m) = manual integration (+) = signals summed
```

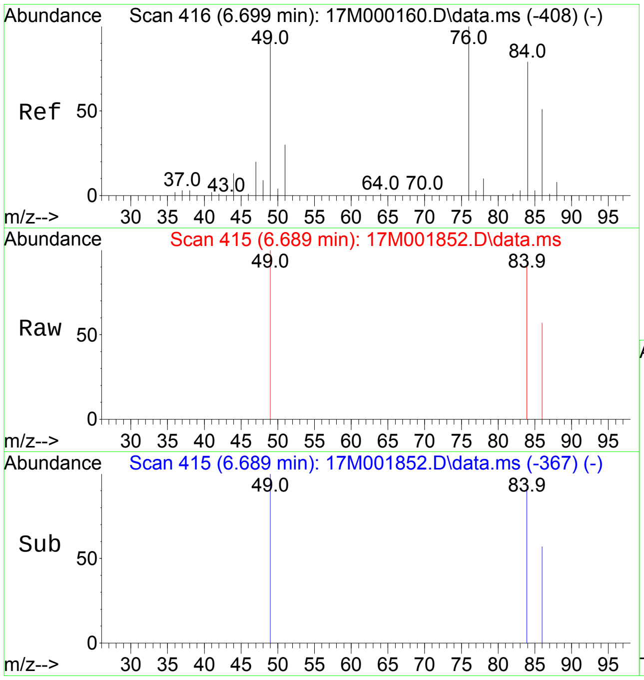
```
                         Quantitation Report    (Not Reviewed)

Data Path : D:\MassHunter\GCMS\1\data\122213\
Data File : 17M001852.D
Acq On    : 22 Dec 2013  23:35
Operator  : ADC
Sample    : L13120825-02 A 826-LOW
Misc      : 1,1
ALS Vial  : 12   Sample Multiplier: 1

Quant Time: Dec 23 10:00:59 2013
Quant Method : D:\MassHunter\GCMS\1\methods\8260WTR.M
Quant Title  : 8260B/624 SOP:OVL MSV01 WATER 11/15/13 HPMS17
QLast Update : Sat Nov 16 17:30:32 2013
Response via : Initial Calibration
```



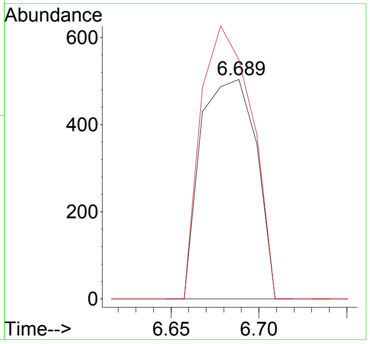


```
#13
Acetone
Concen:     0.7651 ug/L
RT:    5.662 min  Scan# 316
Delta R.T.   0.000 min
Lab File:    17M001852.D
Acq: 22 Dec 2013  23:35

Tgt Ion: 43 Resp:      891
Ion   Ratio  Lower   Upper
 43   100
 58     0.0    18.8    43.8#
```





```
#19
Methylene Chloride
Concen:     0.1622 ug/L
RT:    6.689 min  Scan# 415
Delta R.T.   0.001 min
Lab File:    17M001852.D
Acq: 22 Dec 2013  23:35

Tgt Ion: 84 Resp:     1105
Ion   Ratio  Lower   Upper
 84   100
 49   114.8    69.4   162.0
```

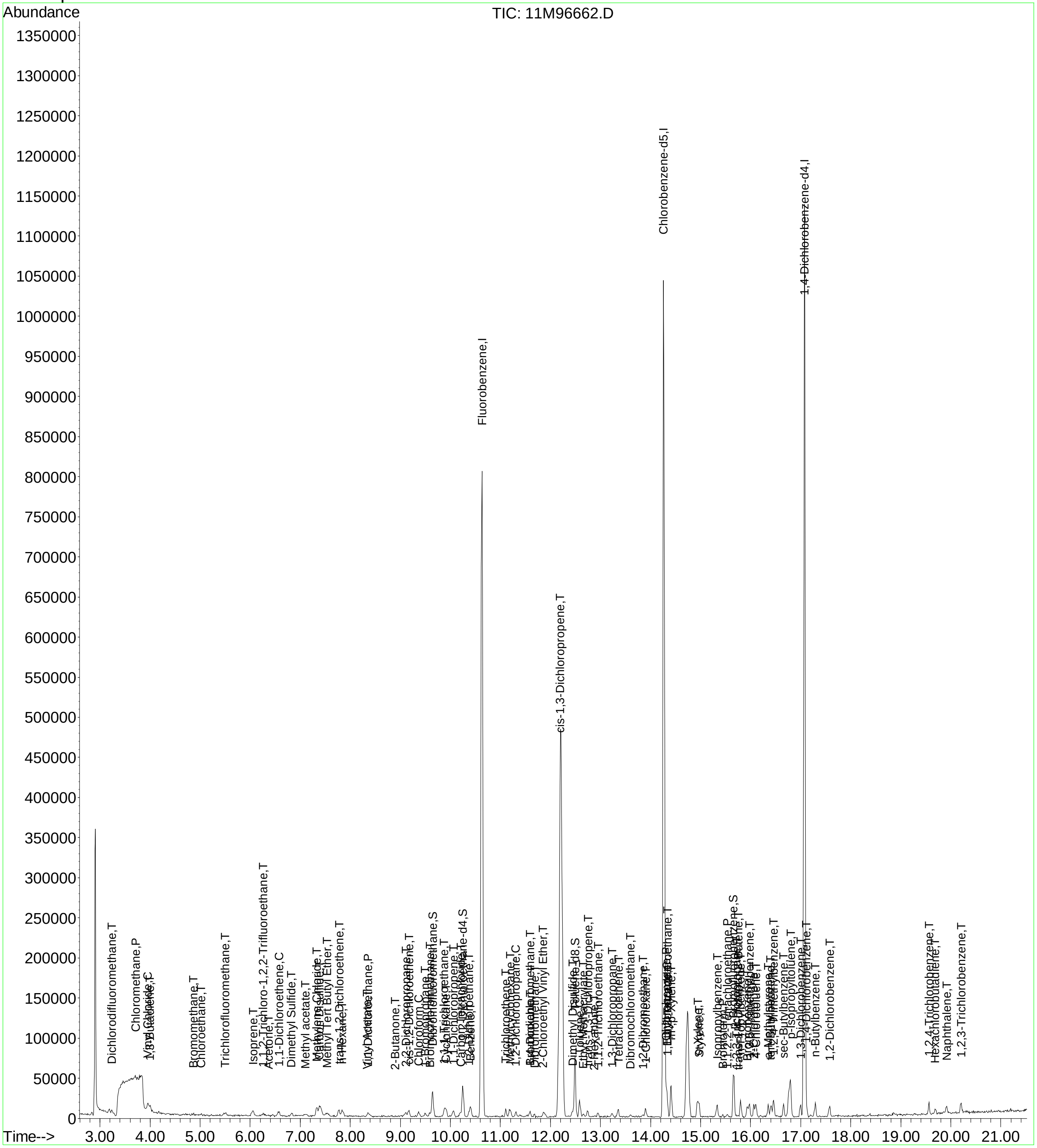


2.1.1.4 Standards Data

```
                          Quantitation Report    (Not Reviewed)

Data File : C:\MSDchem\1\data\110513\11M96662.D          Vial: 2
Acq On    :  5 Nov 2013  16:30                       Operator: FJB
Sample    : WG451178-02 0.3ug/L STD 8260             Inst    : hpms11
Misc      : 1,1 STD61183                             Multiplr: 1.00
MS Integration Params: rteint.p
Quant Time: Nov 05 16:52:30 2013          Quant Results File: 8260_WT.RES

Quant Method : C:\MSDCHEM\1\METHODS\8260_WT.M (RTE Integrator)
Title        : 8260B/624 (SOP: OVL MSV01) Water 11/05/13 HPMS11
Last Update  : Wed Oct 23 10:24:39 2013
Response via : Initial Calibration
DataAcq Meth : 8260_WT

 Internal Standards                  R.T. QIon  Response  Conc Units Dev(Min)
-------------------------------------------------------------------------
   1) Fluorobenzene                 10.63   96   933145    25.00 ug/L    0.00
  56) Chlorobenzene-d5              14.26  117   709314    25.00 ug/L   -0.01
  76) 1,4-Dichlorobenzene-d4        17.07  152   369417    25.00 ug/L   -0.01

 System Monitoring Compounds
  37) Dibromofluoromethane           9.65  111    25894     2.7055 ug/L  0.00
   Spiked Amount     25.000   Range  86 - 118    Recovery   =   10.84%#
  43) 1,2-Dichloroethane-d4         10.25   65    33809     3.8581 ug/L  0.00
   Spiked Amount     25.000   Range  80 - 120    Recovery   =   15.44%#
  57) Toluene-d8                    12.49   98    65817     2.0713 ug/L  0.00
   Spiked Amount     25.000   Range  88 - 110    Recovery   =    8.28%#
  78) p-Bromofluorobenzene          15.65   95    24158     1.8736 ug/L -0.01
   Spiked Amount     25.000   Range  86 - 115    Recovery   =    7.48%#

 Target Compounds                                                     Qvalue
   2) Dichlorodifluoromethane        3.24   85     2952     0.4419 ug/L    92
   3) Chloromethane                  3.71   50     5824     0.9972 ug/L #  74
   4) Vinyl Chloride                 3.95   62     4522     0.5633 ug/L    96
   5) 1,3-Butadiene                  3.99   54     4718     0.9110 ug/L #  60
   6) Bromomethane                   4.86   94     1710     0.4273 ug/L    93
   7) Chloroethane                   5.01   64     2257     0.3939 ug/L #  58
   8) Trichlorofluoromethane         5.50  101     6143     0.4781 ug/L    99
  10) Isoprene                       6.06   67     4858     0.3959 ug/L    72
  12) 1,1,2-Trichloro-1,2,2-Trif     6.26  101     3318     0.4095 ug/L    78
  13) Acetone                        6.37   43     4143     2.2806 ug/L #  52
  14) 1,1-Dichloroethene             6.58   61     6251     0.5271 ug/L    92
  16) Dimethyl Sulfide               6.82   62     2667     0.3185 ug/L    79
  18) Methyl acetate                 7.10   43     3279     0.7168 ug/L #  66
  19) Methylene Chloride             7.33   84     6696     0.5875 ug/L    86
  20) Carbon Disulfide               7.38   76    15909     0.5715 ug/L #  38
  22) Methyl Tert Butyl Ether        7.54   73     7050     0.3167 ug/L #  68
  23) trans-1,2-Dichloroethene       7.78   96     4404     0.4831 ug/L    94
  24) n-Hexane                       7.84   57     6117     0.6621 ug/L #  78
  26) Vinyl Acetate                  8.33   43     4058     0.3348 ug/L #  76
  27) 1,1-Dichloroethane             8.35   63     6499     0.4376 ug/L    94
  29) 2-Butanone                     8.89   43     1587     0.5972 ug/L #  59
  31) 2,2-Dichloropropane            9.11   77     6094     0.4698 ug/L    97
  32) cis-1,2-Dichloroethene         9.17   96     4316     0.4267 ug/L    84
  33) Chloroform                     9.37   83     6629     0.4266 ug/L    93
  34) 1-Bromopropane                 9.49  122      643     0.3903 ug/L    32
  35) Bromochloromethane             9.60  130     2104     0.3463 ug/L    89
  38) 1,1,1-Trichloroethane          9.87   97     5531     0.3998 ug/L #  87
  39) Cyclohexane                    9.91   56     7265     0.5731 ug/L    89
  40) 1,1-Dichloropropene           10.06   75     5588     0.4722 ug/L    94
  41) Carbon Tetrachloride          10.21  117     5223     0.4033 ug/L    97
  44) 1,2-Dichloroethane            10.37   62     4049     0.3784 ug/L    92
  45) Benzene                       10.40   78    16451     0.4737 ug/L    91
  46) Trichloroethene               11.10  130     4445     0.4432 ug/L    99
  47) Methylcyclohexane             11.20   83     5582     0.4397 ug/L    98
  48) 1,2-Dichloropropane           11.30   63     3274     0.3781 ug/L    84
  49) 1,4-Dioxane                   11.59   88      224     2.7369 ug/L #  61
  50) Bromodichloromethane          11.59   83     4568     0.3917 ug/L #  94
  51) Dibromomethane                11.68   93     1627     0.3065 ug/L    90
  52) 2-Chloroethyl Vinyl Ether     11.85   63      941     0.2157 ug/L #  47
  54) cis-1,3-Dichloropropene       12.19   75    19400     1.3471 ug/L #  77
-------------------------------------------------------------------------
(#) = qualifier out of range (m) = manual integration
11M96662.D  8260_WT.M      Tue Nov 05 16:52:31 2013                          Page 1
```

```
                         Quantitation Report    (Not Reviewed)

Data File : C:\MSDchem\1\data\110513\11M96662.D          Vial: 2
Acq On    :  5 Nov 2013  16:30                       Operator: FJB
Sample    : WG451178-02 0.3ug/L STD 8260             Inst    : hpms11
Misc      : 1,1 STD61183                             Multiplr: 1.00
MS Integration Params: rteint.p
Quant Time: Nov 05 16:52:30 2013          Quant Results File: 8260_WT.RES

Quant Method : C:\MSDCHEM\1\METHODS\8260_WT.M (RTE Integrator)
Title        : 8260B/624 (SOP: OVL MSV01) Water 11/05/13 HPMS11
Last Update  : Wed Oct 23 10:24:39 2013
Response via : Initial Calibration
DataAcq Meth : 8260_WT


      Compound                     R.T. QIon  Response  Conc Unit   Qvalue
 -----------------------------------------------------------------------
  55) Dimethyl Disulfide          12.45   79     2475     0.2873 ug/L #  40
  58) Toluene                     12.58   91    19910     0.5577 ug/L    96
  59) Ethyl Methacrylate          12.66   69     2524     0.5444 ug/L #  28
  60) trans-1,3-Dichloropropene   12.75   75     4010     0.3188 ug/L #  80
  61) 1,1,2-Trichloroethane       12.96   97     2426     0.3362 ug/L    91
  62) 2-Hexanone                  12.87   43     1993     0.5270 ug/L #  26
  63) 1,3-Dichloropropane         13.23   76     3872     0.3134 ug/L    80
  64) Tetrachloroethene           13.36  164     2925     0.3463 ug/L    95
  65) Dibromochloromethane        13.60  129     2914     0.3166 ug/L    96
  66) 1,2-Dibromoethane           13.84  107     2151     0.2952 ug/L    96
  67) 1-Chlorohexane              13.91   91     4872     0.4159 ug/L    82
  68) Chlorobenzene               14.31  112    14102     0.5445 ug/L    98
  69) 1,1,1,2-Tetrachloroethane   14.34  131     2986     0.2971 ug/L    98
  70) Ethylbenzene                14.33  106     5316     0.4066 ug/L    86
  71) m-,p-Xylene                 14.41  106    15266     0.9981 ug/L    93
  72) o-Xylene                    14.94  106     6249     0.4006 ug/L    99
  73) Styrene                     14.97  104     9242     0.3619 ug/L #  63
  74) Bromoform                   15.45  173     1395     0.5196 ug/L #  51
  75) Isopropylbenzene            15.33  105    14801     0.4104 ug/L    95
  77) 1,1,2,2-Tetrachloroethane   15.53   83     2369     0.2817 ug/L    84
  79) 1,2,3-Trichloropropane      15.72  110      548     0.2186 ug/L #  31
  80) trans-1,4-Dichloro-2-Buten  15.75   53      694     0.5885 ug/L #  12
  81) n-Propylbenzene             15.80   91    20371     0.4858 ug/L    96
  82) Bromobenzene                15.93  156     3815     0.3307 ug/L #  10
  83) 1,3,5-Trimethylbenzene      15.97  105    15927     0.5344 ug/L    97
  84) 2-Chlorotoluene             16.06   91    12076     0.3958 ug/L    97
  85) 4-Chlorotoluene             16.11   91    13142     0.5141 ug/L    92
  86) a-Methylstyrene             16.35  118     5740     0.3308 ug/L    94
  87) tert-Butylbenzene           16.40  134     2364     0.3409 ug/L    90
  88) 1,2,4-Trimethylbenzene      16.46  105    15175     0.4968 ug/L    96
  89) sec-Butylbenzene            16.66  105    15837     0.4617 ug/L    96
  90) p-Isopropyltoluene          16.80  119    12500     0.4146 ug/L    95
  91) 1,3-Dichlorobenzene         17.00  146     8705     0.4287 ug/L    94
  92) 1,4-Dichlorobenzene         17.11  146     8980     0.4275 ug/L #  62
  93) n-Butylbenzene              17.29   91    13824     0.5182 ug/L    99
  94) 1,2-Dichlorobenzene         17.58  146     6646     0.3366 ug/L    98
  96) 1,2,4-Trichlorobenzene      19.56  180     5557     0.3915 ug/L    97
  97) Hexachlorobutadiene         19.69  225     1796     0.3337 ug/L    82
  98) Naphthalene                 19.91  128     9863     0.3620 ug/L #  96
  99) 1,2,3-Trichlorobenzene      20.20  180     4516     0.3445 ug/L    90

 -----------------------------------------------------------------------
 (#) = qualifier out of range (m) = manual integration
```

```
                              Quantitation Report    (Not Reviewed)
Data File : C:\MSDchem\1\data\110513\11M96662.D         Vial: 2
Acq On    :  5 Nov 2013  16:30                      Operator: FJB
Sample    : WG451178-02 0.3ug/L STD 8260            Inst    : hpms11
Misc      : 1,1 STD61183                            Multiplr: 1.00
MS Integration Params: rteint.p
Quant Time: Nov  5 16:52 2013           Quant Results File: 8260_WT.RES

Method       : C:\MSDCHEM\1\METHODS\8260_WT.M (RTE Integrator)
Title        : 8260B/624 (SOP: OVL MSV01) Water 11/05/13 HPMS11
Last Update  : Wed Oct 23 10:24:39 2013
Response via : Initial Calibration
```



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11M96662.D  8260_WT.M       Tue Nov 05 16:52:32 2013                       Page 3
```

```
                          Quantitation Report    (Not Reviewed)

Data File : C:\MSDchem\1\data\110513\11M96663.D          Vial: 3
Acq On    :  5 Nov 2013  17:02                       Operator: FJB
Sample    : WG451178-03 0.4ug/L STD 8260             Inst    : hpms11
Misc      : 1,1 STD61183                             Multiplr: 1.00
MS Integration Params: rteint.p
Quant Time: Nov 05 17:23:53 2013          Quant Results File: 8260_WT.RES

Quant Method : C:\MSDCHEM\1\METHODS\8260_WT.M (RTE Integrator)
Title        : 8260B/624 (SOP: OVL MSV01) Water 11/05/13 HPMS11
Last Update  : Wed Oct 23 10:24:39 2013
Response via : Initial Calibration
DataAcq Meth : 8260_WT

 Internal Standards                   R.T. QIon  Response  Conc Units Dev(Min)
 ------------------------------------------------------------------------------
   1) Fluorobenzene                  10.63   96   904392    25.00 ug/L    0.00
  56) Chlorobenzene-d5               14.26  117   709205    25.00 ug/L   -0.01
  76) 1,4-Dichlorobenzene-d4         17.07  152   365433    25.00 ug/L   -0.01

 System Monitoring Compounds
  37) Dibromofluoromethane            9.64  111     1154     0.1244 ug/L -0.01
   Spiked Amount     25.000   Range  86 - 118    Recovery   =     0.48%#
  43) 1,2-Dichloroethane-d4          10.25   65     1915     0.2255 ug/L  0.00
   Spiked Amount     25.000   Range  80 - 120    Recovery   =     0.92%#
  57) Toluene-d8                     12.49   98     7720     0.2430 ug/L  0.00
   Spiked Amount     25.000   Range  88 - 110    Recovery   =     0.96%#
  78) p-Bromofluorobenzene           15.65   95     3789     0.2971 ug/L -0.01
   Spiked Amount     25.000   Range  86 - 115    Recovery   =     1.20%#

 Target Compounds                                                     Qvalue
   2) Dichlorodifluoromethane         3.24   85     3373     0.5210 ug/L #  64
   3) Chloromethane                   3.70   50     5671     1.0018 ug/L    95
   4) Vinyl Chloride                  3.94   62     4969     0.6386 ug/L    95
   5) 1,3-Butadiene                   3.99   54     5478     1.0913 ug/L    82
   6) Bromomethane                    4.86   94     1903     0.4906 ug/L    78
   7) Chloroethane                    5.00   64     2544     0.4581 ug/L #  72
   8) Trichlorofluoromethane          5.49  101     6883     0.5528 ug/L    94
  10) Isoprene                        6.06   67     5909     0.4968 ug/L    84
  12) 1,1,2-Trichloro-1,2,2-Trif      6.29  101     4056     0.5166 ug/L    74
  13) Acetone                         6.36   43     2838     1.6119 ug/L #  52
  14) 1,1-Dichloroethene              6.57   61     6474     0.5632 ug/L    87
  16) Dimethyl Sulfide                6.82   62     3512     0.4327 ug/L    77
  18) Methyl acetate                  7.08   43     3931     0.8867 ug/L #  66
  19) Methylene Chloride              7.33   84     5633     0.4986 ug/L    87
  20) Carbon Disulfide                7.38   76    12880     0.4774 ug/L #  65
  22) Methyl Tert Butyl Ether         7.54   73     9264     0.4293 ug/L    87
  23) trans-1,2-Dichloroethene        7.78   96     4243     0.4802 ug/L    89
  24) n-Hexane                        7.84   57     6088     0.6799 ug/L #  69
  26) Vinyl Acetate                   8.33   43     4290     0.3652 ug/L #  85
  27) 1,1-Dichloroethane              8.36   63     7630     0.5300 ug/L #  89
  29) 2-Butanone                      8.90   43     1732     0.6725 ug/L #  59
  31) 2,2-Dichloropropane             9.10   77     8496     0.6758 ug/L    92
  32) cis-1,2-Dichloroethene          9.17   96     4234     0.4319 ug/L    88
  33) Chloroform                      9.37   83     8022     0.5326 ug/L    97
  34) 1-Bromopropane                  9.50  122      414     0.2864 ug/L    70
  35) Bromochloromethane              9.58  130     1909     0.3242 ug/L    84
  38) 1,1,1-Trichloroethane           9.87   97     7002     0.5222 ug/L #  93
  39) Cyclohexane                     9.90   56     8181     0.6659 ug/L    89
  40) 1,1-Dichloropropene            10.05   75     5638     0.4916 ug/L    98
  41) Carbon Tetrachloride           10.19  117     6262     0.4989 ug/L    96
  44) 1,2-Dichloroethane             10.36   62     5152     0.4968 ug/L    93
  45) Benzene                        10.40   78    18854     0.5602 ug/L    94
  46) Trichloroethene                11.10  130     4707     0.4842 ug/L    98
  47) Methylcyclohexane              11.19   83     6346     0.5158 ug/L    94
  48) 1,2-Dichloropropane            11.30   63     4241     0.5054 ug/L    84
  50) Bromodichloromethane           11.59   83     5652     0.5000 ug/L    94
  51) Dibromomethane                 11.67   93     2197     0.4271 ug/L    83
  52) 2-Chloroethyl Vinyl Ether      11.86   63     1835     0.4340 ug/L #  47
  53) 4-Methyl-2-Pentanone           11.89   58      274     0.1201 ug/L #  36
  54) cis-1,3-Dichloropropene        12.18   75     6277     0.4497 ug/L    96
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 (#) = qualifier out of range (m) = manual integration
 11M96663.D  8260_WT.M      Tue Nov 05 17:23:54 2013                           Page 1
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                                Quantitation Report    (Not Reviewed)

Data File : C:\MSDchem\1\data\110513\11M96663.D          Vial: 3
Acq On    :  5 Nov 2013  17:02                         Operator: FJB
Sample    : WG451178-03 0.4ug/L STD 8260               Inst    : hpms11
Misc      : 1,1 STD61183                               Multiplr: 1.00
MS Integration Params: rteint.p
Quant Time: Nov 05 17:23:53 2013          Quant Results File: 8260_WT.RES

Quant Method : C:\MSDCHEM\1\METHODS\8260_WT.M (RTE Integrator)
Title        : 8260B/624 (SOP: OVL MSV01) Water 11/05/13 HPMS11
Last Update  : Wed Oct 23 10:24:39 2013
Response via : Initial Calibration
DataAcq Meth : 8260_WT


      Compound                     R.T. QIon  Response  Conc Unit   Qvalue
 -----------------------------------------------------------------------
  55) Dimethyl Disulfide          12.44   79      3590     0.4300 ug/L    95
  58) Toluene                     12.58   91     17992     0.5040 ug/L    97
  59) Ethyl Methacrylate          12.66   69      3809     0.6689 ug/L    80
  60) trans-1,3-Dichloropropene   12.74   75      5318     0.4229 ug/L    95
  61) 1,1,2-Trichloroethane       12.96   97      2632     0.3648 ug/L    76
  62) 2-Hexanone                  12.88   43      2624     0.6939 ug/L #  24
  63) 1,3-Dichloropropane         13.22   76      5388     0.4362 ug/L    66
  64) Tetrachloroethene           13.36  164      3649     0.4321 ug/L    94
  65) Dibromochloromethane        13.60  129      3986     0.4332 ug/L    84
  66) 1,2-Dibromoethane           13.84  107      2686     0.3687 ug/L    98
  67) 1-Chlorohexane              13.91   91      5366     0.4582 ug/L    98
  68) Chlorobenzene               14.31  112     12546     0.4845 ug/L    94
  69) 1,1,1,2-Tetrachloroethane   14.33  131      3965     0.3946 ug/L    92
  70) Ethylbenzene                14.32  106      6268     0.4795 ug/L    88
  71) m-,p-Xylene                 14.40  106     15816     1.0342 ug/L    96
  72) o-Xylene                    14.93  106      7575     0.4856 ug/L    93
  73) Styrene                     14.97  104     11616     0.4549 ug/L    87
  74) Bromoform                   15.45  173      1984     0.6005 ug/L    74
  75) Isopropylbenzene            15.33  105     18489     0.5128 ug/L   100
  77) 1,1,2,2-Tetrachloroethane   15.53   83      3218     0.3868 ug/L    91
  79) 1,2,3-Trichloropropane      15.71  110       752     0.3032 ug/L #   1
  80) trans-1,4-Dichloro-2-Buten  15.74   53       481     0.5021 ug/L #   1
  81) n-Propylbenzene             15.80   91     22205     0.5353 ug/L    98
  82) Bromobenzene                15.94  156      3969     0.3478 ug/L #  18
  83) 1,3,5-Trimethylbenzene      15.96  105     15610     0.5294 ug/L    99
  84) 2-Chlorotoluene             16.07   91     17009     0.5636 ug/L    84
  85) 4-Chlorotoluene             16.07   91     17009     0.6726 ug/L    98
  86) a-Methylstyrene             16.35  118      7454     0.4342 ug/L    93
  87) tert-Butylbenzene           16.40  134      2781     0.4054 ug/L    79
  88) 1,2,4-Trimethylbenzene      16.45  105     15900     0.5263 ug/L    99
  89) sec-Butylbenzene            16.66  105     18015     0.5309 ug/L   100
  90) p-Isopropyltoluene          16.80  119     14830     0.4972 ug/L    99
  91) 1,3-Dichlorobenzene         16.99  146      9380     0.4670 ug/L    92
  92) 1,4-Dichlorobenzene         17.11  146      8471     0.4076 ug/L #  58
  93) n-Butylbenzene              17.29   91     14492     0.5492 ug/L    94
  94) 1,2-Dichlorobenzene         17.58  146      7683     0.3934 ug/L    96
  95) 1,2-Dibromo-3-Chloropropan  18.51   75       433     0.2938 ug/L #  43
  96) 1,2,4-Trichlorobenzene      19.56  180      5186     0.3694 ug/L    92
  97) Hexachlorobutadiene         19.70  225      2594     0.4873 ug/L    82
  98) Naphthalene                 19.91  128     10450     0.3878 ug/L #  91
  99) 1,2,3-Trichlorobenzene      20.20  180      5380     0.4149 ug/L    85

 -----------------------------------------------------------------------
 (#) = qualifier out of range (m) = manual integration
 11M96663.D  8260_WT.M      Tue Nov 05 17:23:54 2013                        Page 2
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                         Quantitation Report    (Not Reviewed)

  Data File : C:\MSDchem\1\data\110513\11M96663.D         Vial: 3
  Acq On    :  5 Nov 2013  17:02                       Operator: FJB
  Sample    : WG451178-03 0.4ug/L STD 8260             Inst    : hpms11
  Misc      : 1,1 STD61183                             Multiplr: 1.00
  MS Integration Params: rteint.p
  Quant Time: Nov  5 17:23 2013           Quant Results File: 8260_WT.RES

  Method       : C:\MSDCHEM\1\METHODS\8260_WT.M (RTE Integrator)
  Title        : 8260B/624 (SOP: OVL MSV01) Water 11/05/13 HPMS11
  Last Update  : Wed Oct 23 10:24:39 2013
  Response via : Initial Calibration
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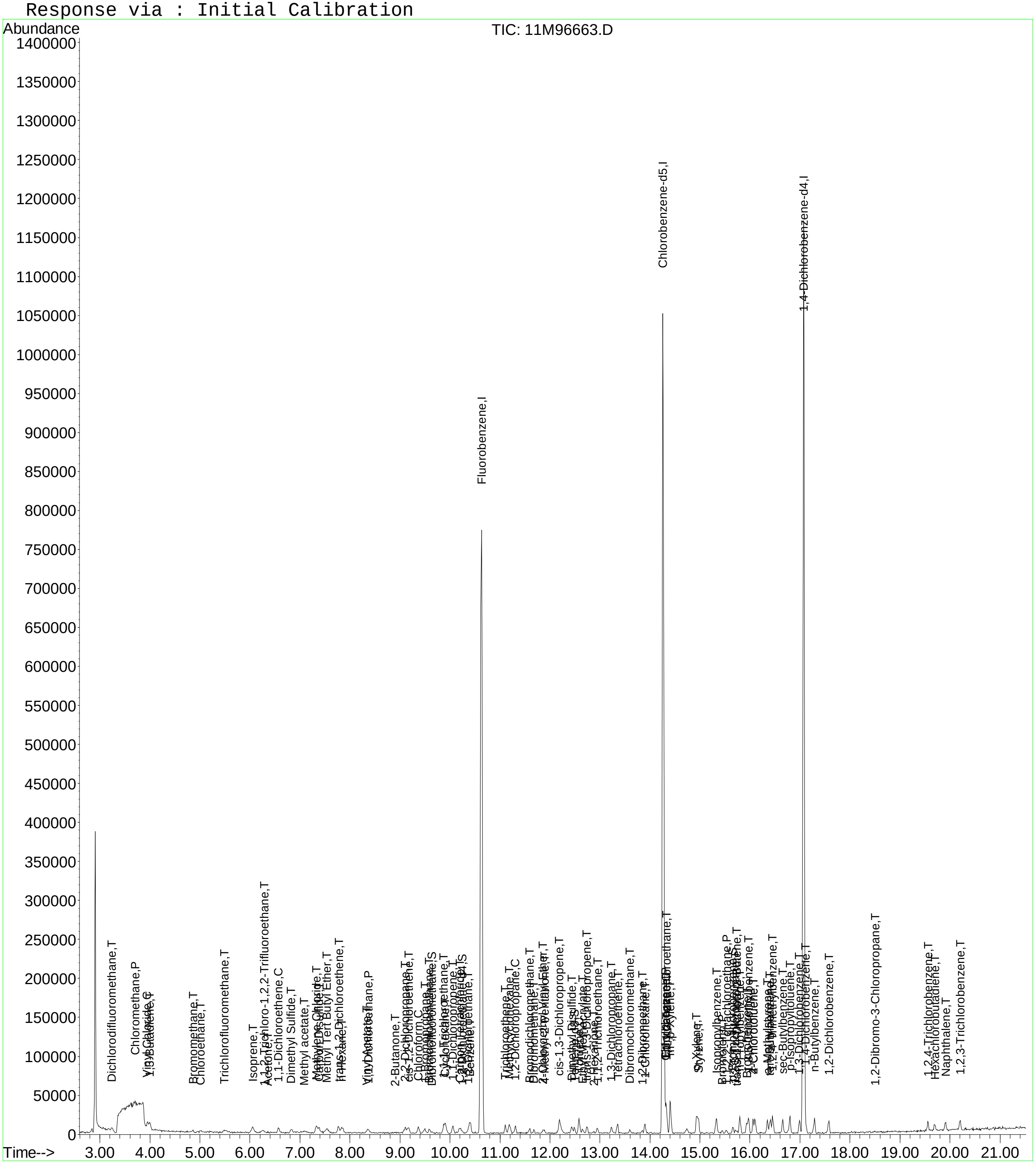

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                              Quantitation Report    (Not Reviewed)

Data File : C:\MSDchem\1\data\110513\11M96664.D          Vial: 4
Acq On    :  5 Nov 2013  17:37                       Operator: FJB
Sample    : WG451178-04 1ug/L STD 8260               Inst    : hpms11
Misc      : 1,1 STD61183                             Multiplr: 1.00
MS Integration Params: rteint.p
Quant Time: Nov 05 17:59:12 2013          Quant Results File: 8260_WT.RES

Quant Method : C:\MSDCHEM\1\METHODS\8260_WT.M (RTE Integrator)
Title        : 8260B/624 (SOP: OVL MSV01) Water 11/05/13 HPMS11
Last Update  : Wed Oct 23 10:24:39 2013
Response via : Initial Calibration
DataAcq Meth : 8260_WT

 Internal Standards                R.T. QIon  Response  Conc Units Dev(Min)
 ------------------------------------------------------------------------
   1) Fluorobenzene              10.63   96   869794    25.00 ug/L    0.00
  56) Chlorobenzene-d5           14.26  117   680013    25.00 ug/L   -0.01
  76) 1,4-Dichlorobenzene-d4     17.07  152   356992    25.00 ug/L   -0.01

 System Monitoring Compounds
  37) Dibromofluoromethane        9.64  111     6086     0.6822 ug/L -0.01
   Spiked Amount     25.000   Range  86 - 118    Recovery   =    2.72%#
  43) 1,2-Dichloroethane-d4      10.25   65     7298     0.8935 ug/L  0.00
   Spiked Amount     25.000   Range  80 - 120    Recovery   =    3.56%#
  57) Toluene-d8                 12.49   98    22946     0.7533 ug/L  0.00
   Spiked Amount     25.000   Range  88 - 110    Recovery   =    3.00%#
  78) p-Bromofluorobenzene       15.66   95     9406     0.7549 ug/L  0.00
   Spiked Amount     25.000   Range  86 - 115    Recovery   =    3.00%#

 Target Compounds                                                  Qvalue
   2) Dichlorodifluoromethane     3.23   85     7176     1.1524 ug/L    89
   3) Chloromethane               3.70   50    11415     2.0968 ug/L #  63
   4) Vinyl Chloride              3.94   62    10627     1.4202 ug/L    95
   5) 1,3-Butadiene               3.99   54    10726     2.2219 ug/L    82
   6) Bromomethane                4.85   94     4060     1.0883 ug/L   100
   7) Chloroethane                5.00   64     6139     1.1493 ug/L    94
   8) Trichlorofluoromethane      5.49  101    14187     1.1846 ug/L    99
   9) Diethyl ether               6.01   59    32785     5.7623 ug/L    95
  10) Isoprene                    6.05   67    12047     1.0532 ug/L    77
  11) Acrolein                    6.27   56      210     5.7222 ug/L #  50
  12) 1,1,2-Trichloro-1,2,2-Trif  6.26  101     7917     1.0484 ug/L    88
  13) Acetone                     6.36   43     3197     1.8880 ug/L #  52
  14) 1,1-Dichloroethene          6.57   61    14198     1.2843 ug/L    90
  15) Tert-Butyl Alcohol          6.67   59     5759    10.8034 ug/L    92
  16) Dimethyl Sulfide            6.82   62     7913     1.0137 ug/L    89
  18) Methyl acetate              7.09   43     6010     1.4095 ug/L #  77
  19) Methylene Chloride          7.33   84     9612     0.9510 ug/L    91
  20) Carbon Disulfide            7.37   76    26278     1.0128 ug/L #  85
  21) Acrylonitrile               7.51   53     5508     2.5049 ug/L    91
  22) Methyl Tert Butyl Ether     7.53   73    23154     1.1158 ug/L   100
  23) trans-1,2-Dichloroethene    7.78   96     9906     1.1657 ug/L    82
  24) n-Hexane                    7.84   57    12288     1.4270 ug/L #  93
  25) Diisopropyl ether           8.17   45   162959     6.7230 ug/L    98
  26) Vinyl Acetate               8.33   43    10526     0.9316 ug/L #  91
  27) 1,1-Dichloroethane          8.36   63    17422     1.2584 ug/L    98
  28) Ethyl-Tert-Butyl ether      8.71   59   149211     6.6172 ug/L    98
  29) 2-Butanone                  8.90   43     2958     1.1942 ug/L #  59
  30) Propionitrile               9.01   54     3837     4.9967 ug/L    85
  31) 2,2-Dichloropropane         9.11   77    15735     1.3015 ug/L    92
  32) cis-1,2-Dichloroethene      9.17   96    10049     1.0659 ug/L    96
  33) Chloroform                  9.37   83    17305     1.1947 ug/L   100
  34) 1-Bromopropane              9.50  122     1530     0.8708 ug/L    96
  35) Bromochloromethane          9.60  130     5518     0.9743 ug/L    91
  36) Tetrahydrofuran             9.62   42     9065     5.6603 ug/L    90
  38) 1,1,1-Trichloroethane       9.87   97    14961     1.1601 ug/L    91
  39) Cyclohexane                 9.91   56    16918     1.4318 ug/L    98
  40) 1,1-Dichloropropene        10.06   75    12561     1.1387 ug/L   100
  41) Carbon Tetrachloride       10.21  117    13838     1.1464 ug/L    97
  42) Tert-Amyl-Methyl ether     10.15   73   123525     5.5800 ug/L    94
  44) 1,2-Dichloroethane         10.36   62    12395     1.2427 ug/L    97
 ------------------------------------------------------------------------
 (#) = qualifier out of range (m) = manual integration
 11M96664.D  8260_WT.M      Tue Nov 05 17:59:12 2013                            Page 1
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                         Quantitation Report    (Not Reviewed)

Data File : C:\MSDchem\1\data\110513\11M96664.D         Vial: 4
Acq On    :  5 Nov 2013  17:37                       Operator: FJB
Sample    : WG451178-04 1ug/L STD 8260               Inst    : hpms11
Misc      : 1,1 STD61183                             Multiplr: 1.00
MS Integration Params: rteint.p
Quant Time: Nov 05 17:59:12 2013          Quant Results File: 8260_WT.RES

Quant Method : C:\MSDCHEM\1\METHODS\8260_WT.M (RTE Integrator)
Title        : 8260B/624 (SOP: OVL MSV01) Water 11/05/13 HPMS11
Last Update  : Wed Oct 23 10:24:39 2013
Response via : Initial Calibration
DataAcq Meth : 8260_WT


      Compound                      R.T. QIon  Response  Conc Unit   Qvalue
 ------------------------------------------------------------------------
  45) Benzene                      10.40   78    40477     1.2505 ug/L    99
  46) Trichloroethene              11.12  130     9533     1.0196 ug/L    97
  47) Methylcyclohexane            11.19   83    13310     1.1248 ug/L    96
  48) 1,2-Dichloropropane          11.31   63     9119     1.1299 ug/L    85
  50) Bromodichloromethane         11.59   83    13302     1.2236 ug/L    93
  51) Dibromomethane               11.67   93     4703     0.9506 ug/L    93
  52) 2-Chloroethyl Vinyl Ether    11.86   63     3801     0.9348 ug/L    93
  53) 4-Methyl-2-Pentanone         11.89   58     1872     0.8529 ug/L    96
  54) cis-1,3-Dichloropropene      12.18   75    13977     1.0413 ug/L    90
  55) Dimethyl Disulfide           12.44   79     7277     0.9062 ug/L    78
  58) Toluene                      12.58   91    38329     1.1199 ug/L   100
  59) Ethyl Methacrylate           12.66   69     8392     1.1477 ug/L    98
  60) trans-1,3-Dichloropropene    12.74   75    13282     1.1015 ug/L    96
  61) 1,1,2-Trichloroethane        12.95   97     6269     0.9063 ug/L    95
  62) 2-Hexanone                   12.87   43     3900     1.0756 ug/L #  77
  63) 1,3-Dichloropropane          13.22   76    11903     1.0049 ug/L   100
  64) Tetrachloroethene            13.35  164     7320     0.9040 ug/L    97
  65) Dibromochloromethane         13.60  129     8398     0.9519 ug/L    98
  66) 1,2-Dibromoethane            13.84  107     6558     0.9389 ug/L    96
  67) 1-Chlorohexane               13.91   91    12197     1.0861 ug/L    91
  68) Chlorobenzene                14.31  112    26169     1.0541 ug/L    98
  69) 1,1,1,2-Tetrachloroethane    14.33  131     9881     1.0256 ug/L    99
  70) Ethylbenzene                 14.32  106    13364     1.0663 ug/L    90
  71) m-,p-Xylene                  14.40  106    33667     2.2960 ug/L    97
  72) o-Xylene                     14.94  106    16823     1.1249 ug/L    84
  73) Styrene                      14.97  104    26870     1.0975 ug/L   100
  74) Bromoform                    15.45  173     4751     1.0087 ug/L    86
  75) Isopropylbenzene             15.33  105    39681     1.1478 ug/L    97
  77) 1,1,2,2-Tetrachloroethane    15.53   83     6747     0.8301 ug/L    87
  79) 1,2,3-Trichloropropane       15.71  110     2036     0.8403 ug/L #   1
  80) trans-1,4-Dichloro-2-Buten   15.75   53     1849     1.0957 ug/L #   1
  81) n-Propylbenzene              15.80   91    47708     1.1772 ug/L    98
  82) Bromobenzene                 15.93  156    10746     0.9639 ug/L #  52
  83) 1,3,5-Trimethylbenzene       15.97  105    35196     1.2219 ug/L    97
  84) 2-Chlorotoluene              16.06   91    30125     1.0218 ug/L    91
  85) 4-Chlorotoluene              16.10   91    31590     1.2787 ug/L    99
  86) a-Methylstyrene              16.35  118    15850     0.9452 ug/L    96
  87) tert-Butylbenzene            16.41  134     6623     0.9884 ug/L    93
  88) 1,2,4-Trimethylbenzene       16.46  105    36098     1.2230 ug/L    99
  89) sec-Butylbenzene             16.66  105    38497     1.1613 ug/L    98
  90) p-Isopropyltoluene           16.80  119    33760     1.1587 ug/L    99
  91) 1,3-Dichlorobenzene          17.00  146    18293     0.9323 ug/L    96
  92) 1,4-Dichlorobenzene          17.11  146    20952     1.0320 ug/L #  68
  93) n-Butylbenzene               17.29   91    28323     1.0986 ug/L   100
  94) 1,2-Dichlorobenzene          17.58  146    18938     0.9926 ug/L    98
  95) 1,2-Dibromo-3-Chloropropan   18.50   75     1356     0.9419 ug/L    68
  96) 1,2,4-Trichlorobenzene       19.56  180    13167     0.9600 ug/L    96
  97) Hexachlorobutadiene          19.70  225     4276     0.8222 ug/L    90
  98) Naphthalene                  19.91  128    23752     0.9022 ug/L    99
  99) 1,2,3-Trichlorobenzene       20.20  180    10774     0.8506 ug/L    95



 ------------------------------------------------------------------------
 (#) = qualifier out of range (m) = manual integration
 11M96664.D  8260_WT.M      Tue Nov 05 17:59:12 2013                     Page 2
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                    Quantitation Report    (Not Reviewed)

Data File : C:\MSDchem\1\data\110513\11M96664.D          Vial: 4
Acq On    :  5 Nov 2013  17:37                        Operator: FJB
Sample    : WG451178-04 1ug/L STD 8260                Inst    : hpms11
Misc      : 1,1 STD61183                              Multiplr: 1.00
MS Integration Params: rteint.p
Quant Time: Nov  5 17:59 2013            Quant Results File: 8260_WT.RES

Method       : C:\MSDCHEM\1\METHODS\8260_WT.M (RTE Integrator)
Title        : 8260B/624 (SOP: OVL MSV01) Water 11/05/13 HPMS11
Last Update  : Wed Oct 23 10:24:39 2013
Response via : Initial Calibration
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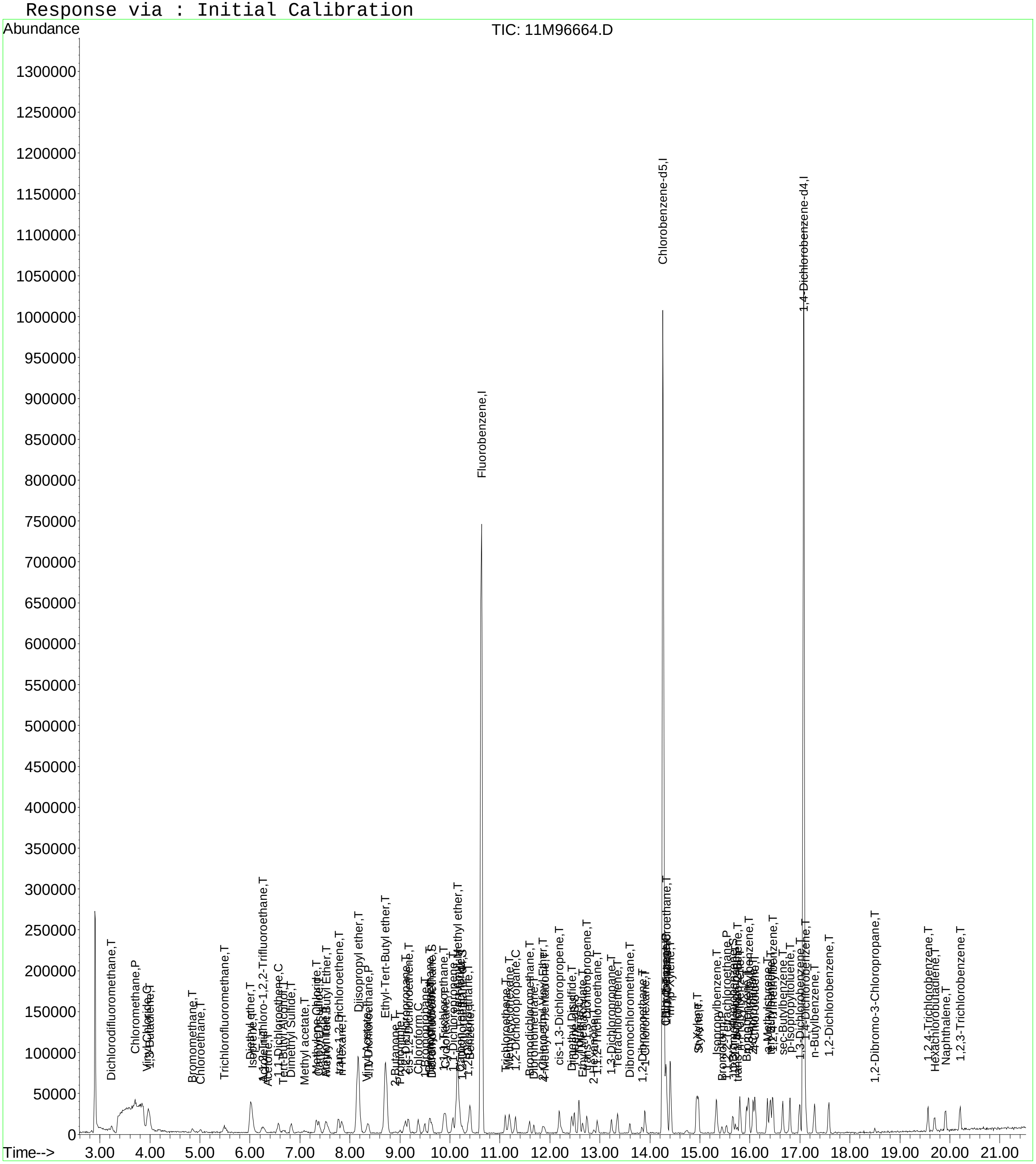

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                              Quantitation Report    (Not Reviewed)

Data File : C:\MSDchem\1\data\110513\11M96665.D          Vial: 5
Acq On    :  5 Nov 2013  18:22                        Operator: FJB
Sample    : WG451178-05 2ug/L STD 8260                Inst    : hpms11
Misc      : 1,1 STD61183                              Multiplr: 1.00
MS Integration Params: rteint.p
Quant Time: Nov 05 18:44:33 2013          Quant Results File: 8260_WT.RES

Quant Method : C:\MSDCHEM\1\METHODS\8260_WT.M (RTE Integrator)
Title        : 8260B/624 (SOP: OVL MSV01) Water 11/05/13 HPMS11
Last Update  : Wed Oct 23 10:24:39 2013
Response via : Initial Calibration
DataAcq Meth : 8260_WT

 Internal Standards                R.T. QIon  Response  Conc Units Dev(Min)
 -------------------------------------------------------------------------
   1) Fluorobenzene               10.63   96   901580    25.00 ug/L    0.00
  56) Chlorobenzene-d5            14.26  117   711345    25.00 ug/L   -0.01
  76) 1,4-Dichlorobenzene-d4      17.07  152   376475    25.00 ug/L   -0.01

 System Monitoring Compounds
  37) Dibromofluoromethane         9.65  111    13378     1.4467 ug/L  0.00
   Spiked Amount     25.000   Range  86 - 118    Recovery   =     5.80%#
  43) 1,2-Dichloroethane-d4       10.25   65    14545     1.7179 ug/L  0.00
   Spiked Amount     25.000   Range  80 - 120    Recovery   =     6.88%#
  57) Toluene-d8                  12.49   98    45270     1.4206 ug/L  0.00
   Spiked Amount     25.000   Range  88 - 110    Recovery   =     5.68%#
  78) p-Bromofluorobenzene        15.65   95    19645     1.4950 ug/L -0.01
   Spiked Amount     25.000   Range  86 - 115    Recovery   =     5.96%#

 Target Compounds                                                    Qvalue
   2) Dichlorodifluoromethane      3.24   85    17284     2.6778 ug/L    91
   3) Chloromethane                3.70   50    27725     4.9132 ug/L    99
   4) Vinyl Chloride               3.94   62    26255     3.3850 ug/L    97
   5) 1,3-Butadiene                3.99   54    24444     4.8850 ug/L    96
   6) Bromomethane                 4.85   94    11327     2.9292 ug/L    95
   7) Chloroethane                 5.01   64    15044     2.7172 ug/L   100
   8) Trichlorofluoromethane       5.48  101    34424     2.7731 ug/L    97
   9) Diethyl ether                6.01   59   172250    29.2072 ug/L    92
  10) Isoprene                     6.05   67    28707     2.4212 ug/L    82
  11) Acrolein                     6.25   56     1463    10.0317 ug/L    98
  12) 1,1,2-Trichloro-1,2,2-Trif   6.27  101    21141     2.7008 ug/L    85
  13) Acetone                      6.35   43     6235     3.5523 ug/L #  77
  14) 1,1-Dichloroethene           6.58   61    35667     3.1126 ug/L    97
  15) Tert-Butyl Alcohol           6.66   59    31690    57.3517 ug/L    96
  16) Dimethyl Sulfide             6.82   62    19355     2.3920 ug/L    91
  17) Iodomethane                  7.08  142      795     2.5690 ug/L #  26
  18) Methyl acetate               7.08   43    13224     2.9921 ug/L #  89
  19) Methylene Chloride           7.33   84    22204     2.2254 ug/L    93
  20) Carbon Disulfide             7.38   76    65672     2.4419 ug/L    95
  21) Acrylonitrile                7.51   53    29226    12.8227 ug/L    99
  22) Methyl Tert Butyl Ether      7.54   73    50259     2.3365 ug/L    97
  23) trans-1,2-Dichloroethene     7.77   96    21800     2.4749 ug/L    91
  24) n-Hexane                     7.85   57    28167     3.1557 ug/L   100
  25) Diisopropyl ether            8.16   45   862941    34.3459 ug/L    98
  26) Vinyl Acetate                8.33   43    23428     2.0004 ug/L    97
  27) 1,1-Dichloroethane           8.36   63    40444     2.8183 ug/L    98
  28) Ethyl-Tert-Butyl ether       8.71   59   767663    32.8442 ug/L    97
  29) 2-Butanone                   8.89   43     7012     2.7310 ug/L #  79
  30) Propionitrile                9.00   54    19375    24.3415 ug/L    94
  31) 2,2-Dichloropropane          9.11   77    38268     3.0536 ug/L    99
  32) cis-1,2-Dichloroethene       9.17   96    23233     2.3774 ug/L    99
  33) Chloroform                   9.37   83    40862     2.7216 ug/L    96
  34) 1-Bromopropane               9.50  122     4384     2.2647 ug/L    88
  35) Bromochloromethane           9.59  130    13455     2.2920 ug/L    99
  36) Tetrahydrofuran              9.61   42    40665    24.4966 ug/L    93
  38) 1,1,1-Trichloroethane        9.87   97    36551     2.7343 ug/L    95
  39) Cyclohexane                  9.91   56    38137     3.1138 ug/L    99
  40) 1,1-Dichloropropene         10.06   75    30359     2.6552 ug/L    96
  41) Carbon Tetrachloride        10.21  117    32535     2.6003 ug/L    97
  42) Tert-Amyl-Methyl ether      10.15   73   620284    27.0322 ug/L    92
 -------------------------------------------------------------------------
 (#) = qualifier out of range (m) = manual integration
 11M96665.D  8260_WT.M      Tue Nov 05 18:44:34 2013                          Page 1
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                          Quantitation Report    (Not Reviewed)

Data File : C:\MSDchem\1\data\110513\11M96665.D          Vial: 5
Acq On    :  5 Nov 2013  18:22                       Operator: FJB
Sample    : WG451178-05 2ug/L STD 8260               Inst    : hpms11
Misc      : 1,1 STD61183                             Multiplr: 1.00
MS Integration Params: rteint.p
Quant Time: Nov 05 18:44:33 2013          Quant Results File: 8260_WT.RES

Quant Method : C:\MSDCHEM\1\METHODS\8260_WT.M (RTE Integrator)
Title        : 8260B/624 (SOP: OVL MSV01) Water 11/05/13 HPMS11
Last Update  : Wed Oct 23 10:24:39 2013
Response via : Initial Calibration
DataAcq Meth : 8260_WT


      Compound                     R.T. QIon  Response  Conc Unit   Qvalue
 -----------------------------------------------------------------------
  44) 1,2-Dichloroethane          10.36   62    28940     2.7993 ug/L    98
  45) Benzene                     10.40   78    87018     2.5936 ug/L   100
  46) Trichloroethene             11.10  130    22821     2.3548 ug/L    98
  47) Methylcyclohexane           11.19   83    32334     2.6362 ug/L    94
  48) 1,2-Dichloropropane         11.30   63    21037     2.5147 ug/L    87
  49) 1,4-Dioxane                 11.56   88     2496    31.5644 ug/L    83
  50) Bromodichloromethane        11.59   83    29362     2.6056 ug/L    99
  51) Dibromomethane              11.67   93    11477     2.2379 ug/L    90
  52) 2-Chloroethyl Vinyl Ether   11.86   63     9343     2.2167 ug/L    99
  53) 4-Methyl-2-Pentanone        11.89   58     4948     2.1747 ug/L    88
  54) cis-1,3-Dichloropropene     12.18   75    35192     2.5293 ug/L    96
  55) Dimethyl Disulfide          12.44   79    17940     2.1554 ug/L    95
  58) Toluene                     12.58   91    89629     2.5034 ug/L    99
  59) Ethyl Methacrylate          12.66   69    17994     2.0377 ug/L    98
  60) trans-1,3-Dichloropropene   12.74   75    28369     2.2490 ug/L    94
  61) 1,1,2-Trichloroethane       12.95   97    14956     2.0670 ug/L    97
  62) 2-Hexanone                  12.88   43     8807     2.3220 ug/L #  76
  63) 1,3-Dichloropropane         13.23   76    27035     2.1819 ug/L    97
  64) Tetrachloroethene           13.36  164    18648     2.2016 ug/L    99
  65) Dibromochloromethane        13.61  129    18791     2.0361 ug/L   100
  66) 1,2-Dibromoethane           13.84  107    14721     2.0147 ug/L    97
  67) 1-Chlorohexane              13.91   91    28349     2.4133 ug/L    91
  68) Chlorobenzene               14.31  112    62012     2.3878 ug/L    96
  69) 1,1,1,2-Tetrachloroethane   14.33  131    22092     2.1921 ug/L    98
  70) Ethylbenzene                14.33  106    33714     2.5715 ug/L    99
  71) m-,p-Xylene                 14.41  106    79332     5.1719 ug/L    94
  72) o-Xylene                    14.94  106    38746     2.4766 ug/L    90
  73) Styrene                     14.97  104    61121     2.3864 ug/L    94
  74) Bromoform                   15.44  173    10486     1.7643 ug/L    98
  75) Isopropylbenzene            15.33  105    94817     2.6218 ug/L    97
  77) 1,1,2,2-Tetrachloroethane   15.53   83    16502     1.9252 ug/L    95
  79) 1,2,3-Trichloropropane      15.71  110     5471     2.1411 ug/L #  55
  80) trans-1,4-Dichloro-2-Buten  15.75   53     4349     2.0749 ug/L #   1
  81) n-Propylbenzene             15.80   91   115582     2.7044 ug/L    99
  82) Bromobenzene                15.93  156    23592     2.0066 ug/L #  45
  83) 1,3,5-Trimethylbenzene      15.97  105    80300     2.6436 ug/L    92
  84) 2-Chlorotoluene             16.06   91    72449     2.3303 ug/L    91
  85) 4-Chlorotoluene             16.10   91    74013     2.8408 ug/L    91
  86) a-Methylstyrene             16.35  118    39384     2.2270 ug/L    91
  87) tert-Butylbenzene           16.41  134    17223     2.4372 ug/L    79
  88) 1,2,4-Trimethylbenzene      16.46  105    82068     2.6366 ug/L    97
  89) sec-Butylbenzene            16.66  105    96593     2.7629 ug/L    98
  90) p-Isopropyltoluene          16.80  119    77353     2.5175 ug/L    96
  91) 1,3-Dichlorobenzene         17.00  146    46629     2.2535 ug/L   100
  92) 1,4-Dichlorobenzene         17.11  146    46755     2.1838 ug/L    83
  93) n-Butylbenzene              17.29   91    70083     2.5778 ug/L    99
  94) 1,2-Dichlorobenzene         17.58  146    41997     2.0874 ug/L    99
  95) 1,2-Dibromo-3-Chloropropan  18.50   75     2906     1.9140 ug/L    96
  96) 1,2,4-Trichlorobenzene      19.56  180    29129     2.0139 ug/L    99
  97) Hexachlorobutadiene         19.70  225    12068     2.2005 ug/L    92
  98) Naphthalene                 19.91  128    52856     1.9038 ug/L    99
  99) 1,2,3-Trichlorobenzene      20.20  180    24365     1.8240 ug/L    99


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 (#) = qualifier out of range (m) = manual integration
 11M96665.D  8260_WT.M      Tue Nov 05 18:44:34 2013                          Page 2
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                       Quantitation Report    (Not Reviewed)

Data File : C:\MSDchem\1\data\110513\11M96665.D          Vial: 5
Acq On    :  5 Nov 2013  18:22                       Operator: FJB
Sample    : WG451178-05 2ug/L STD 8260               Inst    : hpms11
Misc      : 1,1 STD61183                             Multiplr: 1.00
MS Integration Params: rteint.p
Quant Time: Nov  5 18:44 2013             Quant Results File: 8260_WT.RES

Method       : C:\MSDCHEM\1\METHODS\8260_WT.M (RTE Integrator)
Title        : 8260B/624 (SOP: OVL MSV01) Water 11/05/13 HPMS11
Last Update  : Wed Oct 23 10:24:39 2013
Response via : Initial Calibration
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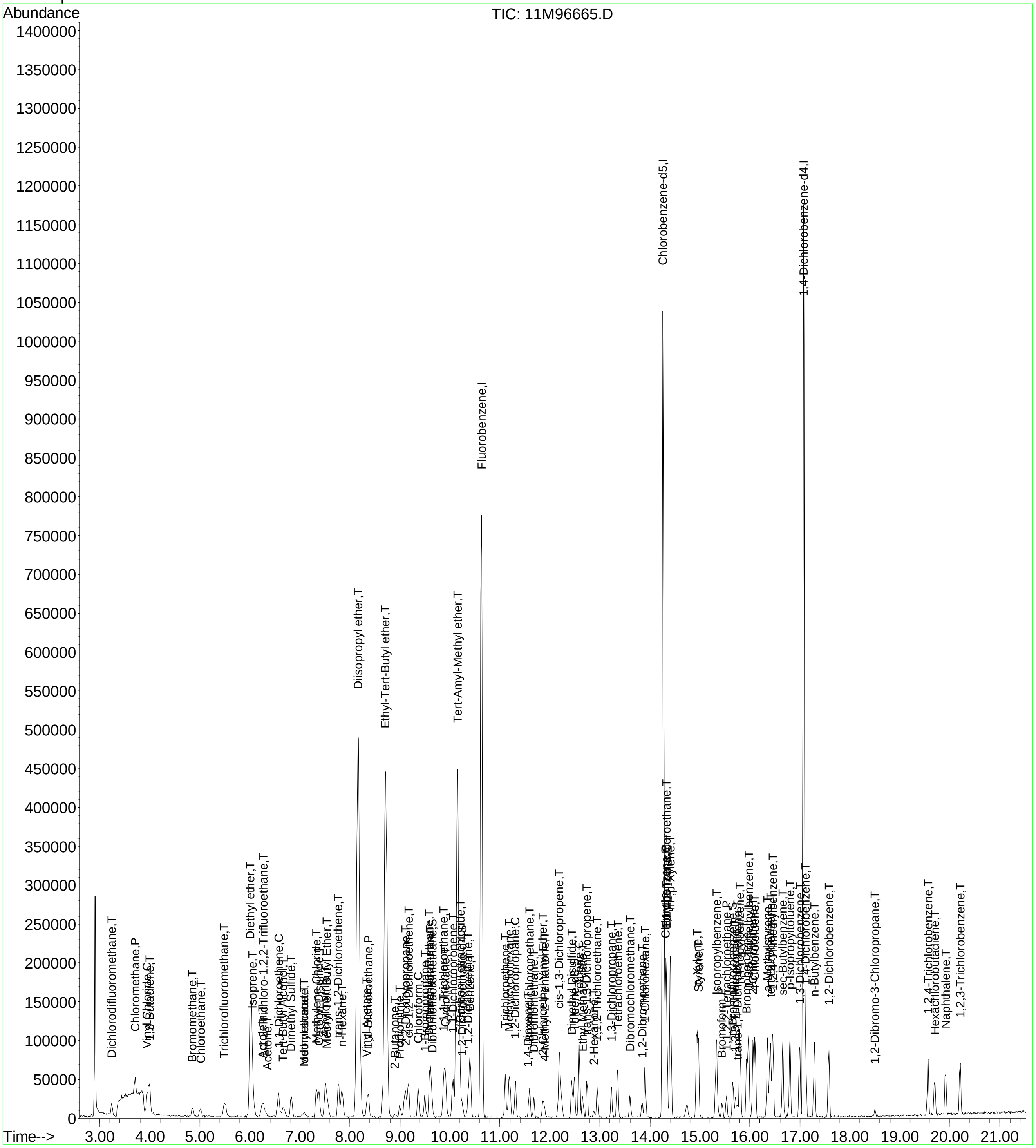

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11M96665.D  8260_WT.M       Tue Nov 05 18:44:34 2013                    Page 3
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                              Quantitation Report    (Not Reviewed)

Data File : C:\MSDchem\1\data\110513\11M96666.D         Vial: 6
Acq On    :  5 Nov 2013  18:54                       Operator: FJB
Sample    : WG451178-06 5ug/L STD 8260               Inst    : hpms11
Misc      : 1,1 STD61183                             Multiplr: 1.00
MS Integration Params: rteint.p
Quant Time: Nov 05 19:15:53 2013          Quant Results File: 8260_WT.RES

Quant Method : C:\MSDCHEM\1\METHODS\8260_WT.M (RTE Integrator)
Title        : 8260B/624 (SOP: OVL MSV01) Water 11/05/13 HPMS11
Last Update  : Wed Oct 23 10:24:39 2013
Response via : Initial Calibration
DataAcq Meth : 8260_WT

 Internal Standards                R.T. QIon  Response  Conc Units Dev(Min)
 ------------------------------------------------------------------------
   1) Fluorobenzene               10.63   96   878017    25.00 ug/L    0.00
  56) Chlorobenzene-d5            14.26  117   690625    25.00 ug/L   -0.01
  76) 1,4-Dichlorobenzene-d4      17.07  152   368283    25.00 ug/L   -0.01

 System Monitoring Compounds
  37) Dibromofluoromethane         9.64  111    24366     2.7057 ug/L -0.01
   Spiked Amount     25.000   Range  86 - 118    Recovery   =   10.84%#
  43) 1,2-Dichloroethane-d4       10.25   65    27748     3.3653 ug/L  0.00
   Spiked Amount     25.000   Range  80 - 120    Recovery   =   13.48%#
  57) Toluene-d8                  12.49   98    83340     2.6938 ug/L  0.00
   Spiked Amount     25.000   Range  88 - 110    Recovery   =   10.76%#
  78) p-Bromofluorobenzene        15.65   95    36300     2.8239 ug/L -0.01
   Spiked Amount     25.000   Range  86 - 115    Recovery   =   11.28%#

 Target Compounds                                                 Qvalue
   2) Dichlorodifluoromethane      3.24   85    37399     5.9498 ug/L    99
   3) Chloromethane                3.70   50    53518     9.7385 ug/L    99
   4) Vinyl Chloride               3.94   62    53508     7.0837 ug/L    95
   5) 1,3-Butadiene                3.98   54    50506    10.3643 ug/L    97
   6) Bromomethane                 4.85   94    22756     6.0427 ug/L    97
   7) Chloroethane                 5.01   64    32399     6.0089 ug/L    99
   8) Trichlorofluoromethane       5.49  101    75121     6.2140 ug/L   100
   9) Diethyl ether                6.01   59   319942    55.7061 ug/L    93
  10) Isoprene                     6.05   67    60753     5.2615 ug/L    82
  11) Acrolein                     6.26   56     3426    17.1428 ug/L    91
  12) 1,1,2-Trichloro-1,2,2-Trif   6.26  101    43992     5.7709 ug/L    89
  13) Acetone                      6.35   43    12446     7.2812 ug/L    94
  14) 1,1-Dichloroethene           6.57   61    75512     6.7666 ug/L    96
  15) Tert-Butyl Alcohol           6.67   59    59569   110.6996 ug/L    97
  16) Dimethyl Sulfide             6.82   62    44068     5.5923 ug/L    80
  17) Iodomethane                  7.09  142     3461     2.8691 ug/L    84
  18) Methyl acetate               7.08   43    30520     7.0909 ug/L    96
  19) Methylene Chloride           7.33   84    46204     4.8559 ug/L    89
  20) Carbon Disulfide             7.38   76   138008     5.2693 ug/L    98
  21) Acrylonitrile                7.51   53    54685    24.6366 ug/L    97
  22) Methyl Tert Butyl Ether      7.53   73   116405     5.5568 ug/L    98
  23) trans-1,2-Dichloroethene     7.77   96    47791     5.5712 ug/L    89
  24) n-Hexane                     7.84   57    58034     6.6763 ug/L    98
  25) Diisopropyl ether            8.16   45  1524483    62.3043 ug/L    97
  26) Vinyl Acetate                8.32   43    55082     4.8294 ug/L    97
  27) 1,1-Dichloroethane           8.36   63    87006     6.2257 ug/L    98
  28) Ethyl-Tert-Butyl ether       8.72   59  1417356    62.2685 ug/L    98
  29) 2-Butanone                   8.89   43    14250     5.6989 ug/L    95
  30) Propionitrile                9.00   54    37301    48.1202 ug/L    97
  31) 2,2-Dichloropropane          9.11   77    82145     6.7308 ug/L   100
  32) cis-1,2-Dichloroethene       9.17   96    52949     5.5636 ug/L    93
  33) Chloroform                   9.37   83    85083     5.8190 ug/L   100
  34) 1-Bromopropane               9.50  122     8466     4.4112 ug/L    95
  35) Bromochloromethane           9.60  130    29118     5.0933 ug/L    95
  36) Tetrahydrofuran              9.61   42    81899    50.6600 ug/L    93
  38) 1,1,1-Trichloroethane        9.87   97    77637     5.9638 ug/L    91
  39) Cyclohexane                  9.91   56    80459     6.7456 ug/L    95
  40) 1,1-Dichloropropene         10.06   75    67741     6.0836 ug/L    99
  41) Carbon Tetrachloride        10.21  117    72040     5.9123 ug/L    98
  42) Tert-Amyl-Methyl ether      10.15   73  1167666    52.2530 ug/L    92
 ------------------------------------------------------------------------
 (#) = qualifier out of range (m) = manual integration
 11M96666.D  8260_WT.M      Tue Nov 05 19:15:54 2013                            Page 1
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                          Quantitation Report    (Not Reviewed)

Data File : C:\MSDchem\1\data\110513\11M96666.D          Vial: 6
Acq On    :  5 Nov 2013  18:54                        Operator: FJB
Sample    : WG451178-06 5ug/L STD 8260                Inst    : hpms11
Misc      : 1,1 STD61183                              Multiplr: 1.00
MS Integration Params: rteint.p
Quant Time: Nov 05 19:15:53 2013          Quant Results File: 8260_WT.RES

Quant Method : C:\MSDCHEM\1\METHODS\8260_WT.M (RTE Integrator)
Title        : 8260B/624 (SOP: OVL MSV01) Water 11/05/13 HPMS11
Last Update  : Wed Oct 23 10:24:39 2013
Response via : Initial Calibration
DataAcq Meth : 8260_WT


      Compound                      R.T. QIon  Response  Conc Unit   Qvalue
 -------------------------------------------------------------------------
  44) 1,2-Dichloroethane          10.36   62    64644     6.4206 ug/L    96
  45) Benzene                     10.40   78   183719     5.6228 ug/L    99
  46) Trichloroethene             11.10  130    49339     5.2278 ug/L    99
  47) Methylcyclohexane           11.19   83    67185     5.6245 ug/L    92
  48) 1,2-Dichloropropane         11.31   63    46822     5.7472 ug/L    87
  49) 1,4-Dioxane                 11.57   88     5230    67.9134 ug/L    92
  50) Bromodichloromethane        11.59   83    65784     5.9944 ug/L    99
  51) Dibromomethane              11.67   93    26777     5.3614 ug/L    90
  52) 2-Chloroethyl Vinyl Ether   11.86   63    22206     5.4100 ug/L   100
  53) 4-Methyl-2-Pentanone        11.89   58    11091     5.0055 ug/L    98
  54) cis-1,3-Dichloropropene     12.18   75    77267     5.7023 ug/L   100
  55) Dimethyl Disulfide          12.44   79    40021     4.9373 ug/L    90
  58) Toluene                     12.58   91   194308     5.5899 ug/L    98
  59) Ethyl Methacrylate          12.66   69    46348     4.9101 ug/L    87
  60) trans-1,3-Dichloropropene   12.74   75    66205     5.4059 ug/L    96
  61) 1,1,2-Trichloroethane       12.95   97    34374     4.8931 ug/L    95
  62) 2-Hexanone                  12.87   43    21160     5.7464 ug/L    82
  63) 1,3-Dichloropropane         13.23   76    62363     5.1841 ug/L    98
  64) Tetrachloroethene           13.35  164    38559     4.6889 ug/L   100
  65) Dibromochloromethane        13.60  129    42680     4.7633 ug/L    99
  66) 1,2-Dibromoethane           13.84  107    33982     4.7904 ug/L    95
  67) 1-Chlorohexane              13.91   91    62414     5.4725 ug/L    83
  68) Chlorobenzene               14.31  112   132858     5.2691 ug/L    98
  69) 1,1,1,2-Tetrachloroethane   14.33  131    47261     4.8301 ug/L    99
  70) Ethylbenzene                14.33  106    70889     5.5693 ug/L    97
  71) m-,p-Xylene                 14.41  106   172457    11.5804 ug/L    92
  72) o-Xylene                    14.93  106    86231     5.6772 ug/L    88
  73) Styrene                     14.97  104   139208     5.5984 ug/L    92
  74) Bromoform                   15.45  173    25532     3.9303 ug/L    97
  75) Isopropylbenzene            15.32  105   208470     5.9374 ug/L    97
  77) 1,1,2,2-Tetrachloroethane   15.53   83    41392     4.9364 ug/L   100
  79) 1,2,3-Trichloropropane      15.71  110    11609     4.6442 ug/L #  41
  80) trans-1,4-Dichloro-2-Buten  15.75   53    11380     5.0480 ug/L #   1
  81) n-Propylbenzene             15.80   91   245769     5.8785 ug/L    99
  82) Bromobenzene                15.93  156    53302     4.6344 ug/L    55
  83) 1,3,5-Trimethylbenzene      15.97  105   178019     5.9909 ug/L    97
  84) 2-Chlorotoluene             16.06   91   157690     5.1848 ug/L    92
  85) 4-Chlorotoluene             16.10   91   157986     6.1988 ug/L    87
  86) a-Methylstyrene             16.35  118    92225     5.3310 ug/L    90
  87) tert-Butylbenzene           16.40  134    37048     5.3592 ug/L    81
  88) 1,2,4-Trimethylbenzene      16.45  105   176786     5.8060 ug/L    95
  89) sec-Butylbenzene            16.66  105   204471     5.9788 ug/L   100
  90) p-Isopropyltoluene          16.80  119   174143     5.7936 ug/L    97
  91) 1,3-Dichlorobenzene         17.00  146   101351     5.0071 ug/L    98
  92) 1,4-Dichlorobenzene         17.11  146   102181     4.8789 ug/L    92
  93) n-Butylbenzene              17.29   91   151486     5.6960 ug/L    99
  94) 1,2-Dichlorobenzene         17.58  146    95142     4.8340 ug/L   100
  95) 1,2-Dibromo-3-Chloropropan  18.50   75     7138     4.8060 ug/L   100
  96) 1,2,4-Trichlorobenzene      19.56  180    63866     4.5137 ug/L    96
  97) Hexachlorobutadiene         19.70  225    22632     4.2185 ug/L    92
  98) Naphthalene                 19.91  128   129022     4.7505 ug/L #  96
  99) 1,2,3-Trichlorobenzene      20.20  180    57432     4.3952 ug/L    98


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 (#) = qualifier out of range (m) = manual integration
 11M96666.D  8260_WT.M      Tue Nov 05 19:15:54 2013                         Page 2
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                         Quantitation Report    (Not Reviewed)
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00192948

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Data File : C:\MSDchem\1\data\110513\11M96666.D           Vial: 6
Acq On    :  5 Nov 2013  18:54                        Operator: FJB
Sample    : WG451178-06 5ug/L STD 8260                Inst    : hpms11
Misc      : 1,1 STD61183                              Multiplr: 1.00
MS Integration Params: rteint.p
Quant Time: Nov  5 19:15 2013           Quant Results File: 8260_WT.RES

Method       : C:\MSDCHEM\1\METHODS\8260_WT.M (RTE Integrator)
Title        : 8260B/624 (SOP: OVL MSV01) Water 11/05/13 HPMS11
Last Update  : Wed Oct 23 10:24:39 2013
Response via : Initial Calibration
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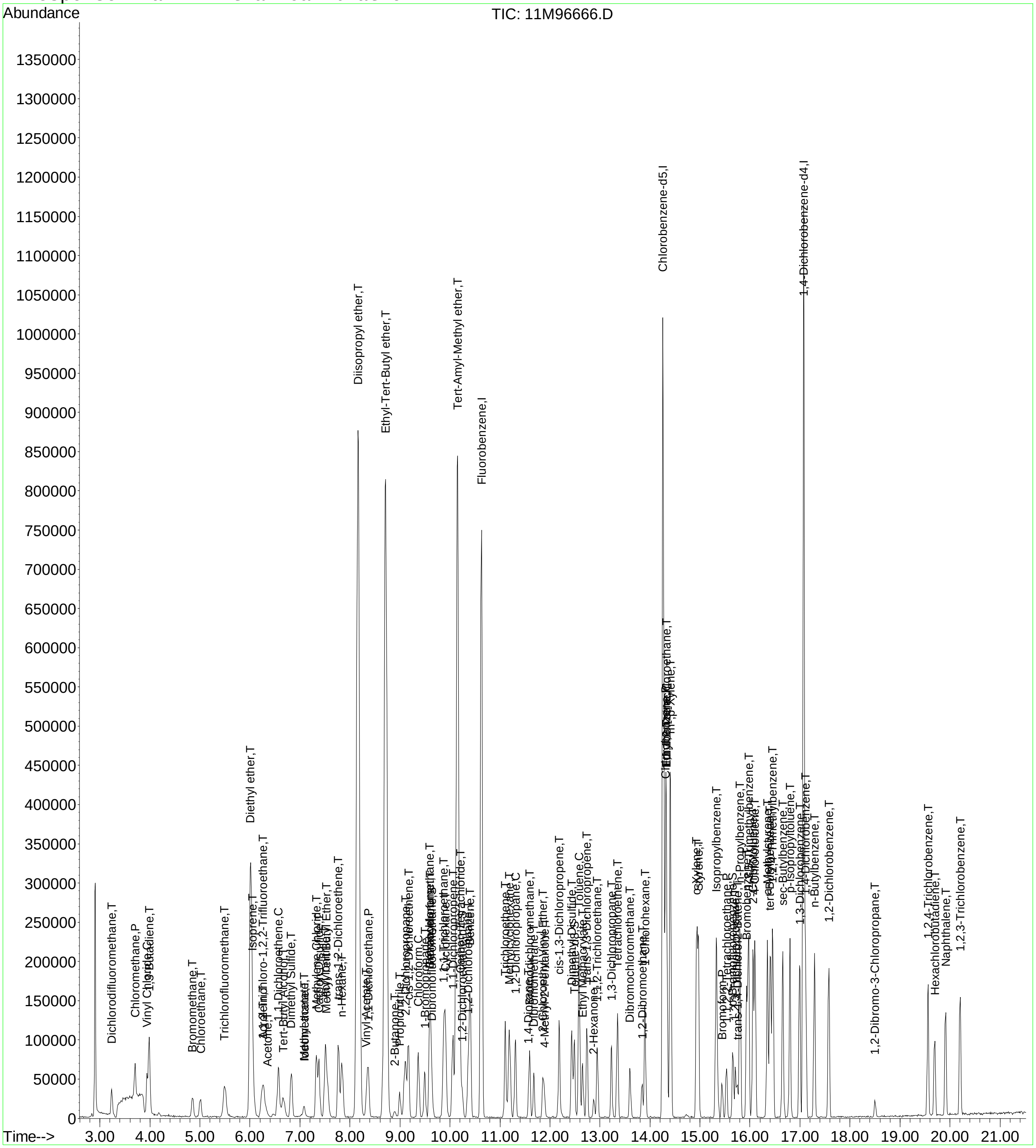

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11M96666.D  8260_WT.M       Tue Nov 05 19:15:54 2013                  Page 3
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                              Quantitation Report    (Not Reviewed)

   Data File : C:\MSDchem\1\data\110513\11M96667.D          Vial: 7
   Acq On    :  5 Nov 2013  19:34                       Operator: FJB
   Sample    : WG451178-07 20ug/L STD 8260              Inst    : hpms11
   Misc      : 1,1 STD61183                             Multiplr: 1.00
   MS Integration Params: rteint.p
   Quant Time: Nov 05 19:55:59 2013          Quant Results File: 8260_WT.RES

   Quant Method : C:\MSDCHEM\1\METHODS\8260_WT.M (RTE Integrator)
   Title        : 8260B/624 (SOP: OVL MSV01) Water 11/05/13 HPMS11
   Last Update  : Wed Oct 23 10:24:39 2013
   Response via : Initial Calibration
   DataAcq Meth : 8260_WT

    Internal Standards                R.T. QIon  Response  Conc Units Dev(Min)
    ------------------------------------------------------------------------
      1) Fluorobenzene               10.63   96   884471    25.00 ug/L    0.00
     56) Chlorobenzene-d5            14.26  117   697676    25.00 ug/L   -0.01
     76) 1,4-Dichlorobenzene-d4      17.07  152   367950    25.00 ug/L   -0.01

    System Monitoring Compounds
     37) Dibromofluoromethane         9.64  111   102424    11.2904 ug/L -0.01
      Spiked Amount     25.000   Range  86 - 118    Recovery   =   45.16%#
     43) 1,2-Dichloroethane-d4       10.25   65   115545    13.9111 ug/L  0.00
      Spiked Amount     25.000   Range  80 - 120    Recovery   =   55.64%#
     57) Toluene-d8                  12.49   98   353911    11.3238 ug/L  0.00
      Spiked Amount     25.000   Range  88 - 110    Recovery   =   45.28%#
     78) p-Bromofluorobenzene        15.65   95   147150    11.4576 ug/L -0.01
      Spiked Amount     25.000   Range  86 - 115    Recovery   =   45.84%#

    Target Compounds                                                 Qvalue
      2) Dichlorodifluoromethane      3.24   85   190865    30.1430 ug/L    98
      3) Chloromethane                3.70   50   252456    45.6033 ug/L    99
      4) Vinyl Chloride               3.94   62   249561    32.7973 ug/L    98
      5) 1,3-Butadiene                3.99   54   189971    38.6992 ug/L    97
      6) Bromomethane                 4.85   94    92554    24.3977 ug/L   100
      7) Chloroethane                 5.00   64   138316    25.4657 ug/L    99
      8) Trichlorofluoromethane       5.49  101   332052    27.2667 ug/L    98
      9) Diethyl ether                6.01   59   526680    91.0327 ug/L    93
     10) Isoprene                     6.06   67   271169    23.3134 ug/L    84
     11) Acrolein                     6.25   56     4681    21.4809 ug/L    77
     12) 1,1,2-Trichloro-1,2,2-Trif   6.27  101   191466    24.9333 ug/L    90
     13) Acetone                      6.34   43    34564    20.0733 ug/L    91
     14) 1,1-Dichloroethene           6.57   61   327808    29.1604 ug/L    95
     15) Tert-Butyl Alcohol           6.67   59    93841   173.1162 ug/L    98
     16) Dimethyl Sulfide             6.82   62   187984    23.6813 ug/L    85
     17) Iodomethane                  7.08  142    89257    12.3787 ug/L    91
     18) Methyl acetate               7.08   43   110210    25.4190 ug/L    97
     19) Methylene Chloride           7.33   84   195000    20.7066 ug/L    88
     20) Carbon Disulfide             7.38   76   617503    23.4050 ug/L    99
     21) Acrylonitrile                7.50   53    94733    42.3675 ug/L    98
     22) Methyl Tert Butyl Ether      7.54   73   468781    22.2150 ug/L    99
     23) trans-1,2-Dichloroethene     7.77   96   203574    23.5582 ug/L    89
     24) n-Hexane                     7.84   57   257418    29.3977 ug/L    97
     25) Diisopropyl ether            8.17   45  2551927   103.5339 ug/L    98
     26) Vinyl Acetate                8.32   43   254221    22.1266 ug/L    98
     27) 1,1-Dichloroethane           8.36   63   372378    26.4511 ug/L    97
     28) Ethyl-Tert-Butyl ether       8.72   59  2315735   100.9945 ug/L    97
     29) 2-Butanone                   8.89   43    51326    20.3767 ug/L    90
     30) Propionitrile                9.00   54    63262    81.0158 ug/L    97
     31) 2,2-Dichloropropane          9.10   77   350243    28.4887 ug/L   100
     32) cis-1,2-Dichloroethene       9.17   96   219500    22.8955 ug/L    97
     33) Chloroform                   9.37   83   365518    24.8163 ug/L    99
     34) 1-Bromopropane               9.50  122    40118    20.4516 ug/L    97
     35) Bromochloromethane           9.59  130   126167    21.9079 ug/L    99
     36) Tetrahydrofuran              9.61   42   129529    79.5378 ug/L    92
     38) 1,1,1-Trichloroethane        9.87   97   336788    25.6820 ug/L    92
     39) Cyclohexane                  9.91   56   344004    28.6305 ug/L    94
     40) 1,1-Dichloropropene         10.06   75   287384    25.6205 ug/L    99
     41) Carbon Tetrachloride        10.20  117   309376    25.2050 ug/L    96
     42) Tert-Amyl-Methyl ether      10.15   73  1903474    84.5587 ug/L    92
    ------------------------------------------------------------------------
    (#) = qualifier out of range (m) = manual integration
    11M96667.D  8260_WT.M      Tue Nov 05 19:56:00 2013                  Page 1
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                          Quantitation Report    (Not Reviewed)

Data File : C:\MSDchem\1\data\110513\11M96667.D         Vial: 7
Acq On    :  5 Nov 2013  19:34                        Operator: FJB
Sample    : WG451178-07 20ug/L STD 8260               Inst    : hpms11
Misc      : 1,1 STD61183                              Multiplr: 1.00
MS Integration Params: rteint.p
Quant Time: Nov 05 19:55:59 2013          Quant Results File: 8260_WT.RES

Quant Method : C:\MSDCHEM\1\METHODS\8260_WT.M (RTE Integrator)
Title        : 8260B/624 (SOP: OVL MSV01) Water 11/05/13 HPMS11
Last Update  : Wed Oct 23 10:24:39 2013
Response via : Initial Calibration
DataAcq Meth : 8260_WT


      Compound                     R.T. QIon  Response  Conc Unit   Qvalue
 -------------------------------------------------------------------------
  44) 1,2-Dichloroethane          10.36   62   270808    26.7009 ug/L    97
  45) Benzene                     10.40   78   782267    23.7671 ug/L    98
  46) Trichloroethene             11.10  130   212554    22.3571 ug/L    98
  47) Methylcyclohexane           11.19   83   306327    25.4577 ug/L    89
  48) 1,2-Dichloropropane         11.31   63   201732    24.5812 ug/L    87
  49) 1,4-Dioxane                 11.57   88     9441   121.7001 ug/L    90
  50) Bromodichloromethane        11.59   83   279691    25.3000 ug/L    99
  51) Dibromomethane              11.67   93   109310    21.7267 ug/L    90
  52) 2-Chloroethyl Vinyl Ether   11.86   63    94091    22.7561 ug/L   100
  53) 4-Methyl-2-Pentanone        11.89   58    45226    20.2623 ug/L    98
  54) cis-1,3-Dichloropropene     12.18   75   328997    24.1028 ug/L    99
  55) Dimethyl Disulfide          12.44   79   178807    21.8983 ug/L    89
  58) Toluene                     12.58   91   818982    23.3228 ug/L    99
  59) Ethyl Methacrylate          12.66   69   187570    18.7686 ug/L    90
  60) trans-1,3-Dichloropropene   12.74   75   286459    23.1543 ug/L    96
  61) 1,1,2-Trichloroethane       12.95   97   142197    20.0371 ug/L    96
  62) 2-Hexanone                  12.87   43    80077    21.5265 ug/L    85
  63) 1,3-Dichloropropane         13.23   76   257547    21.1930 ug/L    93
  64) Tetrachloroethene           13.35  164   166385    20.0285 ug/L   100
  65) Dibromochloromethane        13.61  129   188027    20.7726 ug/L    99
  66) 1,2-Dibromoethane           13.84  107   144931    20.2242 ug/L    99
  67) 1-Chlorohexane              13.91   91   275875    23.9446 ug/L    84
  68) Chlorobenzene               14.31  112   556332    21.8411 ug/L    99
  69) 1,1,1,2-Tetrachloroethane   14.33  131   202232    20.4594 ug/L    99
  70) Ethylbenzene                14.33  106   303846    23.6299 ug/L    95
  71) m-,p-Xylene                 14.41  106   730068    48.5283 ug/L    93
  72) o-Xylene                    14.94  106   364361    23.7459 ug/L    88
  73) Styrene                     14.97  104   598126    23.8111 ug/L    91
  74) Bromoform                   15.45  173   108223    15.4432 ug/L    98
  75) Isopropylbenzene            15.32  105   882051    24.8675 ug/L    96
  77) 1,1,2,2-Tetrachloroethane   15.53   83   166753    19.9049 ug/L    97
  79) 1,2,3-Trichloropropane      15.72  110    47587    19.0546 ug/L #  41
  80) trans-1,4-Dichloro-2-Buten  15.75   53    54545    23.0788 ug/L #   1
  81) n-Propylbenzene             15.80   91  1067400    25.5539 ug/L    99
  82) Bromobenzene                15.93  156   223367    19.4384 ug/L #  51
  83) 1,3,5-Trimethylbenzene      15.97  105   752621    25.3511 ug/L    93
  84) 2-Chlorotoluene             16.06   91   655090    21.5585 ug/L    92
  85) 4-Chlorotoluene             16.10   91   690414    27.1140 ug/L    99
  86) a-Methylstyrene             16.35  118   409058    23.6665 ug/L    90
  87) tert-Butylbenzene           16.41  134   153596    22.2387 ug/L    85
  88) 1,2,4-Trimethylbenzene      16.46  105   767991    25.2451 ug/L    95
  89) sec-Butylbenzene            16.66  105   875476    25.6223 ug/L   100
  90) p-Isopropyltoluene          16.80  119   752485    25.0571 ug/L    97
  91) 1,3-Dichlorobenzene         17.00  146   427720    21.1499 ug/L    99
  92) 1,4-Dichlorobenzene         17.11  146   433293    20.7073 ug/L    98
  93) n-Butylbenzene              17.29   91   668001    25.1401 ug/L    99
  94) 1,2-Dichlorobenzene         17.58  146   396086    20.1428 ug/L    99
  95) 1,2-Dibromo-3-Chloropropan  18.50   75    29476    19.8639 ug/L    94
  96) 1,2,4-Trichlorobenzene      19.56  180   271364    19.1957 ug/L    99
  97) Hexachlorobutadiene         19.70  225   104778    19.5479 ug/L    97
  98) Naphthalene                 19.91  128   524923    19.3447 ug/L    98
  99) 1,2,3-Trichlorobenzene      20.20  180   239253    18.3263 ug/L    99


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 (#) = qualifier out of range (m) = manual integration
 11M96667.D  8260_WT.M      Tue Nov 05 19:56:00 2013                         Page 2
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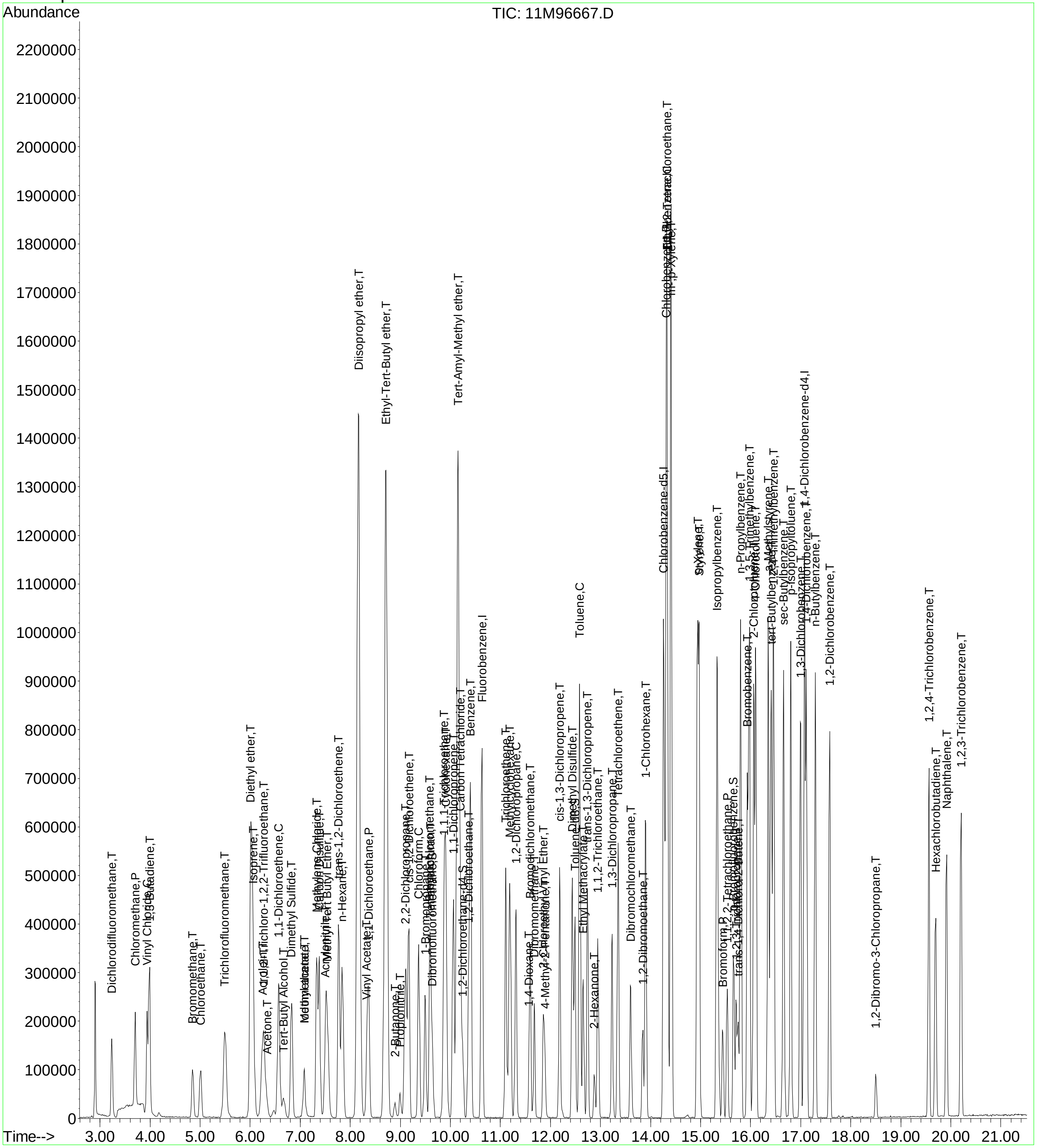
                              Quantitation Report    (Not Reviewed)

  Data File : C:\MSDchem\1\data\110513\11M96667.D         Vial: 7
  Acq On    :  5 Nov 2013  19:34                       Operator: FJB
  Sample    : WG451178-07 20ug/L STD 8260              Inst     : hpms11
  Misc      : 1,1 STD61183                             Multiplr: 1.00
  MS Integration Params: rteint.p
  Quant Time: Nov  5 19:55 2013           Quant Results File: 8260_WT.RES

  Method       : C:\MSDCHEM\1\METHODS\8260_WT.M (RTE Integrator)
  Title        : 8260B/624 (SOP: OVL MSV01) Water 11/05/13 HPMS11
  Last Update  : Wed Oct 23 10:24:39 2013
  Response via : Initial Calibration
```



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11M96667.D  8260_WT.M       Tue Nov 05 19:56:00 2013                    Page 3
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                                      Quantitation Report    (Not Reviewed)

Data File : C:\MSDchem\1\data\110513\11M96668.D          Vial: 8
Acq On    :  5 Nov 2013  20:05                       Operator: FJB
Sample    : WG451178-08 50ug/L STD 8260              Inst    : hpms11
Misc      : 1,1 STD61183                             Multiplr: 1.00
MS Integration Params: rteint.p
Quant Time: Nov 05 20:27:21 2013          Quant Results File: 8260_WT.RES

Quant Method : C:\MSDCHEM\1\METHODS\8260_WT.M (RTE Integrator)
Title        : 8260B/624 (SOP: OVL MSV01) Water 11/05/13 HPMS11
Last Update  : Wed Oct 23 10:24:39 2013
Response via : Initial Calibration
DataAcq Meth : 8260_WT

 Internal Standards                  R.T. QIon  Response  Conc Units Dev(Min)
------------------------------------------------------------------------------
   1) Fluorobenzene                 10.63   96   886698    25.00 ug/L    0.00
  56) Chlorobenzene-d5              14.26  117   702242    25.00 ug/L   -0.01
  76) 1,4-Dichlorobenzene-d4        17.07  152   381974    25.00 ug/L   -0.01

 System Monitoring Compounds
  37) Dibromofluoromethane           9.64  111   248692    27.3450 ug/L -0.01
   Spiked Amount     25.000   Range  86 - 118    Recovery   =  109.36%
  43) 1,2-Dichloroethane-d4         10.25   65   279430    33.5576 ug/L  0.00
   Spiked Amount     25.000   Range  80 - 120    Recovery   =  134.24%#
  57) Toluene-d8                    12.49   98   859377    27.3180 ug/L  0.00
   Spiked Amount     25.000   Range  88 - 110    Recovery   =  109.28%
  78) p-Bromofluorobenzene          15.65   95   356239    26.7196 ug/L -0.01
   Spiked Amount     25.000   Range  86 - 115    Recovery   =  106.88%

 Target Compounds                                                     Qvalue
   2) Dichlorodifluoromethane        3.24   85   471547    74.2836 ug/L    97
   3) Chloromethane                  3.70   50   584417   105.3030 ug/L    98
   4) Vinyl Chloride                 3.94   62   620323    81.3182 ug/L    99
   5) 1,3-Butadiene                  3.98   54   371170    75.4216 ug/L    96
   6) Bromomethane                   4.85   94   220267    57.9176 ug/L    99
   7) Chloroethane                   5.00   64   348134    63.9349 ug/L    99
   8) Trichlorofluoromethane         5.49  101   837300    68.5828 ug/L   100
   9) Diethyl ether                  6.01   59   695575   119.9230 ug/L    93
  10) Isoprene                       6.05   67   656386    56.2901 ug/L    82
  11) Acrolein                       6.25   56     7420    31.0768 ug/L   100
  12) 1,1,2-Trichloro-1,2,2-Trif     6.27  101   481144    62.4988 ug/L    90
  13) Acetone                        6.34   43    94593    54.7976 ug/L    84
  14) 1,1-Dichloroethene             6.57   61   825030    73.2068 ug/L    95
  15) Tert-Butyl Alcohol             6.67   59   136256   250.7313 ug/L    99
  16) Dimethyl Sulfide               6.82   62   454147    57.0676 ug/L    84
  17) Iodomethane                    7.07  142   347703    40.9365 ug/L    90
  18) Methyl acetate                 7.08   43   280363    64.5010 ug/L    94
  19) Methylene Chloride             7.33   84   480707    51.4721 ug/L    89
  20) Carbon Disulfide               7.38   76  1456333    55.0602 ug/L    99
  21) Acrylonitrile                  7.50   53   131864    58.8255 ug/L    97
  22) Methyl Tert Butyl Ether        7.53   73  1234346    58.3473 ug/L    98
  23) trans-1,2-Dichloroethene       7.77   96   506096    58.4198 ug/L    90
  24) n-Hexane                       7.84   57   619433    70.5628 ug/L    98
  25) Diisopropyl ether              8.16   45  3259372   131.9035 ug/L    97
  26) Vinyl Acetate                  8.32   43   655444    56.9046 ug/L    97
  27) 1,1-Dichloroethane             8.37   63   933451    66.1393 ug/L    98
  28) Ethyl-Tert-Butyl ether         8.71   59  3022768   131.4988 ug/L    96
  29) 2-Butanone                     8.89   43   145479    57.6110 ug/L    91
  30) Propionitrile                  9.00   54    89121   113.8452 ug/L   100
  31) 2,2-Dichloropropane            9.11   77   874460    70.9498 ug/L    99
  32) cis-1,2-Dichloroethene         9.17   96   544951    56.6997 ug/L    97
  33) Chloroform                     9.37   83   914329    61.9210 ug/L    99
  34) 1-Bromopropane                 9.50  122    95247    48.3230 ug/L    96
  35) Bromochloromethane             9.59  130   314769    54.5199 ug/L    99
  36) Tetrahydrofuran                9.61   42   187606   114.9108 ug/L    94
  38) 1,1,1-Trichloroethane          9.87   97   852193    64.8213 ug/L    93
  39) Cyclohexane                    9.91   56   827869    68.7281 ug/L    94
  40) 1,1-Dichloropropene           10.06   75   717453    63.8009 ug/L    97
  41) Carbon Tetrachloride          10.20  117   795546    64.6507 ug/L    97
  42) Tert-Amyl-Methyl ether        10.15   73  2489762   110.3258 ug/L    93
------------------------------------------------------------------------------
 (#) = qualifier out of range (m) = manual integration
 11M96668.D  8260_WT.M      Tue Nov 05 20:27:22 2013                                    Page 1
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                        Quantitation Report    (Not Reviewed)

Data File : C:\MSDchem\1\data\110513\11M96668.D         Vial: 8
Acq On    :  5 Nov 2013  20:05                        Operator: FJB
Sample    : WG451178-08 50ug/L STD 8260               Inst    : hpms11
Misc      : 1,1 STD61183                              Multiplr: 1.00
MS Integration Params: rteint.p
Quant Time: Nov 05 20:27:21 2013          Quant Results File: 8260_WT.RES

Quant Method : C:\MSDCHEM\1\METHODS\8260_WT.M (RTE Integrator)
Title        : 8260B/624 (SOP: OVL MSV01) Water 11/05/13 HPMS11
Last Update  : Wed Oct 23 10:24:39 2013
Response via : Initial Calibration
DataAcq Meth : 8260_WT


      Compound                     R.T. QIon  Response  Conc Unit   Qvalue
 -------------------------------------------------------------------------
  44) 1,2-Dichloroethane          10.36   62   688980    67.7608 ug/L    96
  45) Benzene                     10.40   78  1912094    57.9480 ug/L    99
  46) Trichloroethene             11.11  130   530769    55.6878 ug/L    99
  47) Methylcyclohexane           11.19   83   721183    59.7842 ug/L    91
  48) 1,2-Dichloropropane         11.31   63   510551    62.0547 ug/L    85
  49) 1,4-Dioxane                 11.58   88    14182   182.3553 ug/L    96
  50) Bromodichloromethane        11.59   83   712040    64.2471 ug/L    99
  51) Dibromomethane              11.67   93   283941    56.2951 ug/L    91
  52) 2-Chloroethyl Vinyl Ether   11.86   63   244517    58.9884 ug/L   100
  53) 4-Methyl-2-Pentanone        11.89   58   130207    58.1892 ug/L    99
  54) cis-1,3-Dichloropropene     12.18   75   825770    60.3452 ug/L    99
  55) Dimethyl Disulfide          12.44   79   442731    54.0845 ug/L    89
  58) Toluene                     12.58   91  2009984    56.8676 ug/L    99
  59) Ethyl Methacrylate          12.66   69   497567    48.9732 ug/L    88
  60) trans-1,3-Dichloropropene   12.74   75   743314    59.6909 ug/L    95
  61) 1,1,2-Trichloroethane       12.95   97   370204    51.8266 ug/L    95
  62) 2-Hexanone                  12.87   43   237746    63.4960 ug/L    83
  63) 1,3-Dichloropropane         13.23   76   663165    54.2156 ug/L    93
  64) Tetrachloroethene           13.35  164   408178    48.8148 ug/L    99
  65) Dibromochloromethane        13.60  129   495355    54.3693 ug/L   100
  66) 1,2-Dibromoethane           13.84  107   378611    52.4892 ug/L    99
  67) 1-Chlorohexane              13.91   91   658002    56.7400 ug/L    85
  68) Chlorobenzene               14.31  112  1383496    53.9616 ug/L   100
  69) 1,1,1,2-Tetrachloroethane   14.33  131   518027    52.0670 ug/L   100
  70) Ethylbenzene                14.33  106   766780    59.2443 ug/L    90
  71) m-,p-Xylene                 14.40  106  1832089   120.9888 ug/L    86
  72) o-Xylene                    14.94  106   905589    58.6347 ug/L    87
  73) Styrene                     14.97  104  1505231    59.5330 ug/L    92
  74) Bromoform                   15.44  173   296229    41.4325 ug/L    99
  75) Isopropylbenzene            15.32  105  2177926    61.0025 ug/L    95
  77) 1,1,2,2-Tetrachloroethane   15.53   83   449132    51.6435 ug/L    98
  79) 1,2,3-Trichloropropane      15.71  110   129726    50.0372 ug/L #  44
  80) trans-1,4-Dichloro-2-Buten  15.75   53   148943    60.2173 ug/L #   1
  81) n-Propylbenzene             15.80   91  2607899    60.1417 ug/L    98
  82) Bromobenzene                15.93  156   561071    47.0343 ug/L #  50
  83) 1,3,5-Trimethylbenzene      15.97  105  1855474    60.2047 ug/L    92
  84) 2-Chlorotoluene             16.06   91  1634314    51.8094 ug/L    93
  85) 4-Chlorotoluene             16.10   91  1669549    63.1594 ug/L    85
  86) a-Methylstyrene             16.35  118  1012972    56.4549 ug/L    90
  87) tert-Butylbenzene           16.41  134   387746    54.0795 ug/L    83
  88) 1,2,4-Trimethylbenzene      16.45  105  1901198    60.2010 ug/L    93
  89) sec-Butylbenzene            16.66  105  2177050    61.3757 ug/L   100
  90) p-Isopropyltoluene          16.80  119  1867468    59.9019 ug/L    96
  91) 1,3-Dichlorobenzene         17.00  146  1068572    50.8988 ug/L    99
  92) 1,4-Dichlorobenzene         17.11  146  1080675    49.7498 ug/L    98
  93) n-Butylbenzene              17.29   91  1658552    60.1275 ug/L    99
  94) 1,2-Dichlorobenzene         17.58  146  1001362    49.0543 ug/L    98
  95) 1,2-Dibromo-3-Chloropropan  18.50   75    87783    56.9851 ug/L    99
  96) 1,2,4-Trichlorobenzene      19.56  180   685828    46.7329 ug/L   100
  97) Hexachlorobutadiene         19.70  225   256178    46.0392 ug/L    97
  98) Naphthalene                 19.91  128  1413964    50.1948 ug/L    98
  99) 1,2,3-Trichlorobenzene      20.20  180   616706    45.5041 ug/L    98


 -------------------------------------------------------------------------
 (#) = qualifier out of range (m) = manual integration
 11M96668.D  8260_WT.M      Tue Nov 05 20:27:22 2013                         Page 2
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Quantitation Report   (Not Reviewed)

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Data File : C:\MSDchem\1\data\110513\11M96668.D          Vial: 8
Acq On    :  5 Nov 2013  20:05                        Operator: FJB
Sample    : WG451178-08 50ug/L STD 8260               Inst    : hpms11
Misc      : 1,1 STD61183                              Multiplr: 1.00
MS Integration Params: rteint.p
Quant Time: Nov  5 20:27 2013           Quant Results File: 8260_WT.RES

Method       : C:\MSDCHEM\1\METHODS\8260_WT.M (RTE Integrator)
Title        : 8260B/624 (SOP: OVL MSV01) Water 11/05/13 HPMS11
Last Update  : Wed Oct 23 10:24:39 2013
Response via : Initial Calibration
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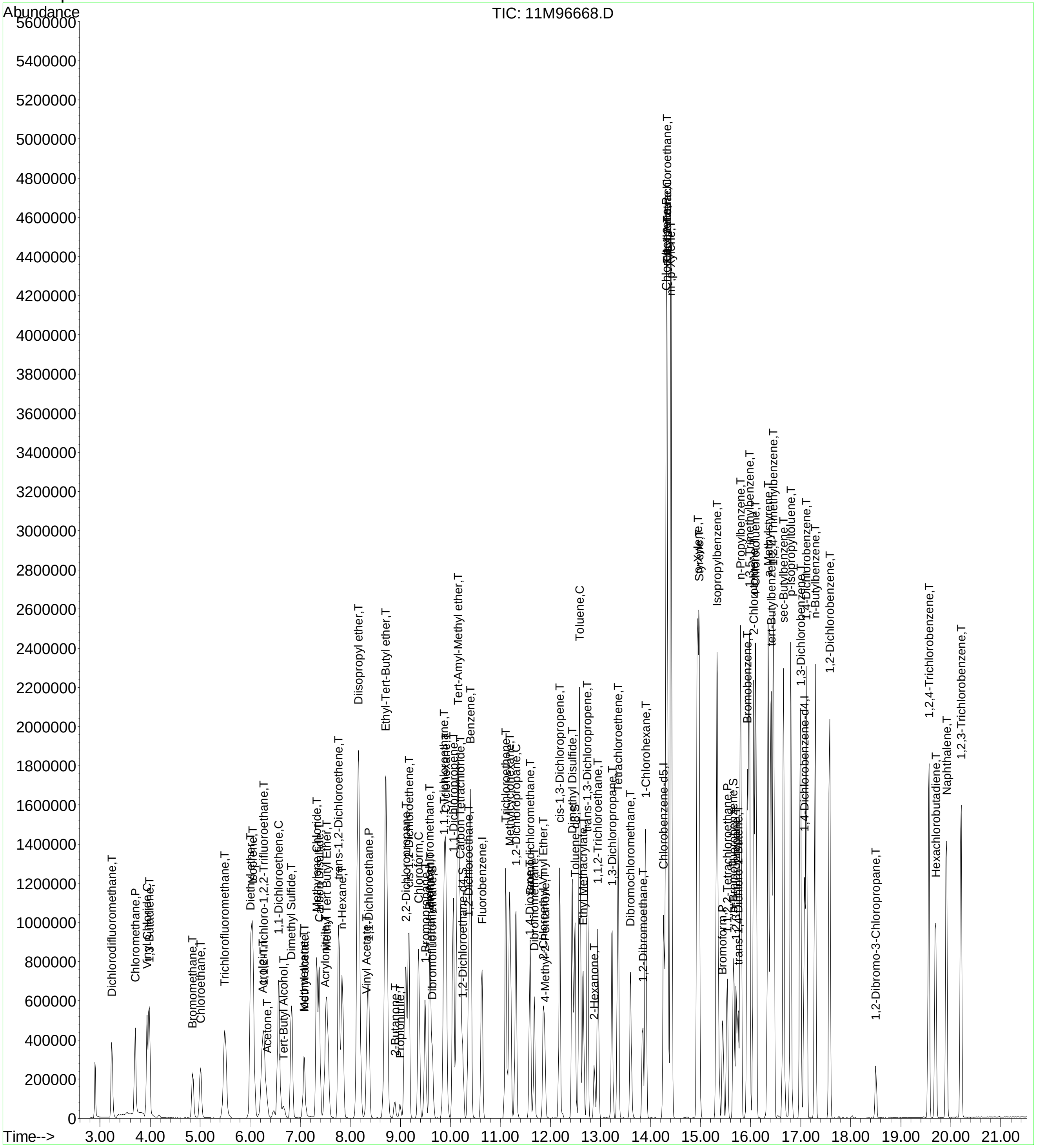

11M96668.D 8260_WT.M   Tue Nov 05 20:27:22 2013   Page 3

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                     Evaluate Continuing Calibration Report

    Data File : C:\MSDCHEM\1\DATA\110513\11M96668.D         Vial: 8
    Acq On    :  5 Nov 2013  20:05                       Operator: FJB
    Sample    : WG451178-08 50ug/L STD 8260              Inst    : hpms11
    Misc      : 1,1 STD61183                             Multiplr: 1.00
    MS Integration Params: rteint.p

    Method       : C:\MSDCHEM\1\METHODS\8260_WT.M (RTE Integrator)
    Title        : 8260B/624 (SOP: OVL MSV01) Water 11/05/13 HPMS11
    Last Update  : Wed Nov 06 14:52:21 2013
    Response via : Multiple Level Calibration

    Min. RRF     :   0.000  Min. Rel. Area :  50%  Max. R.T. Dev  0.50min
    Max. RRF Dev :  25%     Max. Rel. Area : 150%

         Compound                       AvgRF   CCRF       %Dev Area% Dev(min)
   ---------------------------------------------------------------------------
  1 I    Fluorobenzene                  1.0000   1.0000       0.0  100   0.00
  2 T    Dichlorodifluoromethane        0.2466   0.2659      -7.8  100   0.00
  3 P    Chloromethane                  0.3481   0.3296       5.3  100   0.00
  4 C    Vinyl Chloride                 0.3298   0.3498      -6.0  100   0.00
  5 T    1,3-Butadiene                  0.2061   0.2093      -1.6  100   0.00
  6 T    Bromomethane                   0.1415   0.1242      12.2  100   0.00
  7 T    Chloroethane                   0.1919   0.1963      -2.3  100   0.00
  8 T    Trichlorofluoromethane         0.4592   0.4721      -2.8  100   0.00
  9 T    Diethyl ether                  0.1927   0.1961      -1.8  100   0.00
 10 T    Isoprene                       0.3779   0.3701       2.1  100   0.00
 11 T    Acrolein                       0.0037   0.0042     -13.0  100   0.00
 12 T    1,1,2-Trichloro-1,2,2-Trifl    0.2680   0.2713      -1.2  100   0.00
 13 T    Acetone                        0.0581   0.0533       8.2  100   0.00
 14 C    1,1-Dichloroethene             0.4537   0.4652      -2.6  100   0.00
 15 T    Tert-Butyl Alcohol             0.0180   0.0192      -6.5  100   0.00
 16 T    Dimethyl Sulfide               0.2574   0.2561       0.5  100   0.00
 17 T    Iodomethane                    0.1709   0.1961     -14.7  100   0.00
 18 T    Methyl acetate                 0.1683   0.1581       6.1  100   0.00
 19 T    Methylene Chloride             0.2901   0.2711       6.6  100   0.00
 20 T    Carbon Disulfide               0.8258   0.8212       0.6  100   0.00
 21 T    Acrylonitrile                  0.0709   0.0744      -4.9  100   0.00
 22 T    Methyl Tert Butyl Ether        0.6767   0.6960      -2.9  100   0.00
 23 T    trans-1,2-Dichloroethene       0.2865   0.2854       0.4  100   0.00
 24 T    n-Hexane                       0.3543   0.3493       1.4  100   0.00
 25 T    Diisopropyl ether              0.9066   0.9190      -1.4  100   0.00
 26 T    Vinyl Acetate                  0.3403   0.3696      -8.6  100   0.00
 27 P    1,1-Dichloroethane             0.5205   0.5264      -1.1  100   0.00
 28 T    Ethyl-Tert-Butyl ether         0.8335   0.8522      -2.2  100   0.00
 29 T    2-Butanone                     0.0844   0.0820       2.8  100   0.00
 30 T    Propionitrile                  0.0235   0.0251      -6.9  100   0.00
 31 T    2,2-Dichloropropane            0.4971   0.4931       0.8  100   0.00
 32 T    cis-1,2-Dichloroethene         0.3057   0.3073      -0.5  100   0.00
 33 C    Chloroform                     0.5227   0.5156       1.4  100   0.00
 34 T    1-Bromopropane                 0.0546   0.0537       1.5  100   0.00
 35 T    Bromochloromethane             0.1704   0.1775      -4.2  100   0.00
 36 T    Tetrahydrofuran                0.0501   0.0529      -5.6  100   0.00
 37 S    Dibromofluoromethane           0.3024   0.2805       7.3  100   0.00
 38 T    1,1,1-Trichloroethane          0.4706   0.4805      -2.1  100   0.00
 39 T    Cyclohexane                    0.4925   0.4668       5.2  100   0.00
 40 T    1,1-Dichloropropene            0.3956   0.4046      -2.3  100   0.00
 41 T    Carbon Tetrachloride           0.4328   0.4486      -3.7  100   0.00
 42 T    Tert-Amyl-Methyl ether         0.6866   0.7020      -2.2  100   0.00
 43 S    1,2-Dichloroethane-d4          0.3415   0.3151       7.7  100   0.00
 44 T    1,2-Dichloroethane             0.3779   0.3885      -2.8  100   0.00
 45 T    Benzene                        1.0910   1.0782       1.2  100   0.00
 46 T    Trichloroethene                0.2995   0.2993       0.1  100   0.00
 47 T    Methylcyclohexane              0.4144   0.4067       1.9  100   0.00
 48 C    1,2-Dichloropropane            0.2838   0.2879      -1.4  100   0.00
 49 T    1,4-Dioxane                    0.0019   0.0020      -7.5  100   0.00
 50 T    Bromodichloromethane           0.3943   0.4015      -1.8  100   0.00
 51 T    Dibromomethane                 0.1552   0.1601      -3.1  100   0.00
 52 T    2-Chloroethyl Vinyl Ether      0.1319   0.1379      -4.5  100   0.00
 53 T    4-Methyl-2-Pentanone           0.0687   0.0734      -6.8  100   0.00
 54 T    cis-1,3-Dichloropropene        0.4526   0.4656      -2.9  100   0.00
 --------------------------------------------------------------------------
  (#) = Out of Range
  11M96668.D  8260_WT.M      Sat Nov 09 18:57:11 2013                              Page 1
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                    Evaluate Continuing Calibration Report

   Data File : C:\MSDCHEM\1\DATA\110513\11M96668.D         Vial: 8
   Acq On    :  5 Nov 2013  20:05                      Operator: FJB
   Sample    : WG451178-08 50ug/L STD 8260             Inst    : hpms11
   Misc      : 1,1 STD61183                            Multiplr: 1.00
   MS Integration Params: rteint.p

   Method       : C:\MSDCHEM\1\METHODS\8260_WT.M (RTE Integrator)
   Title        : 8260B/624 (SOP: OVL MSV01) Water 11/05/13 HPMS11
   Last Update  : Wed Nov 06 14:52:21 2013
   Response via : Multiple Level Calibration

   Min. RRF     :   0.000  Min. Rel. Area :  50%  Max. R.T. Dev  0.50min
   Max. RRF Dev :  25%     Max. Rel. Area : 150%

        Compound                       AvgRF   CCRF       %Dev Area% Dev(min)
  ------------------------------------------------------------------------------
 55 T    Dimethyl Disulfide            0.2488   0.2497      -0.3  100   0.00
 56 I    Chlorobenzene-d5              1.0000   1.0000       0.0  100   0.00
 57 S    Toluene-d8                    1.2555   1.2238       2.5  100   0.00
 58 C    Toluene                       1.3907   1.4311      -2.9  100   0.00
 59 T    Ethyl Methacrylate            0.3426   0.3543      -3.4  100   0.00
 60 T    trans-1,3-Dichloropropene     0.5009   0.5292      -5.7  100   0.00
 61 T    1,1,2-Trichloroethane         0.2523   0.2636      -4.5  100   0.00
 62 T    2-Hexanone                    0.1585   0.1693      -6.8  100   0.00
 63 T    1,3-Dichloropropane           0.4610   0.4722      -2.4  100   0.00
 64 T    Tetrachloroethene             0.2937   0.2906       1.1  100   0.00
 65 T    Dibromochloromethane          0.3381   0.3527      -4.3  100   0.00
 66 T    1,2-Dibromoethane             0.2577   0.2696      -4.6  100   0.00
 67 T    1-Chlorohexane                0.4694   0.4685       0.2  100   0.00
 68 P    Chlorobenzene                 0.9806   0.9851      -0.5  100   0.00
 69 T    1,1,1,2-Tetrachloroethane     0.3657   0.3688      -0.9  100   0.00
 70 C    Ethylbenzene                  0.5430   0.5460      -0.5  100   0.00
 71 T    m-,p-Xylene                   0.6296   0.6522      -3.6  100   0.00
 72 T    o-Xylene                      0.6434   0.6448      -0.2  100   0.00
 73 T    Styrene                       1.0243   1.0717      -4.6  100   0.00
 74 P    Bromoform                     0.1971   0.2109      -7.0  100   0.00
 75 T    Isopropylbenzene              1.4844   1.5507      -4.5  100   0.00

 76 I    1,4-Dichlorobenzene-d4        1.0000   1.0000       0.0  100   0.00
 77 P    1,1,2,2-Tetrachloroethane     0.5598   0.5879      -5.0  100   0.00
 78 S    p-Bromofluorobenzene          1.0040   0.9326       7.1  100   0.00
 79 T    1,2,3-Trichloropropane        0.1665   0.1698      -2.0  100   0.00
 80 T    trans-1,4-Dichloro-2-Butene   0.1803   0.1950      -8.1  100   0.00
 81 T    n-Propylbenzene               3.4087   3.4137      -0.1  100   0.00
 82 T    Bromobenzene                  0.7517   0.7344       2.3  100   0.00
 83 T    1,3,5-Trimethylbenzene        2.4115   2.4288      -0.7  100   0.00
 84 T    2-Chlorotoluene               2.2261   2.1393       3.9  100   0.00
 85 T    4-Chlorotoluene               2.2770   2.1854       4.0  100   0.00
 86 T    a-Methylstyrene               1.2900   1.3260      -2.8  100   0.00
 87 T    tert-Butylbenzene             0.5109   0.5076       0.7  100   0.00
 88 T    1,2,4-Trimethylbenzene        2.4480   2.4886      -1.7  100   0.00
 89 T    sec-Butylbenzene              2.7643   2.8497      -3.1  100   0.00
 90 T    p-Isopropyltoluene            2.3623   2.4445      -3.5  100   0.00
 91 T    1,3-Dichlorobenzene           1.4056   1.3987       0.5  100   0.00
 92 T    1,4-Dichlorobenzene           1.4766   1.4146       4.2  100   0.00
 93 T    n-Butylbenzene                2.1041   2.1710      -3.2  100   0.00
 94 T    1,2-Dichlorobenzene           1.3224   1.3108       0.9  100   0.00
 95 T    1,2-Dibromo-3-Chloropropane   0.1035   0.1149     -11.0  100   0.00
 96 T    1,2,4-Trichlorobenzene        0.8940   0.8977      -0.4  100   0.00
 97 T    Hexachlorobutadiene           0.3454   0.3353       2.9  100   0.00
 98 T    Naphthalene                   1.7286   1.8509      -7.1  100   0.00
 99 T    1,2,3-Trichlorobenzene        0.8232   0.8073       1.9  100   0.00

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  (#) = Out of Range            SPCC's out = 0  CCC's out = 0
  11M96668.D  8260_WT.M      Sat Nov 09 18:57:11 2013                         Page 2
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                    Evaluate Continuing Calibration Report

  Data File : C:\MSDCHEM\1\DATA\110513\11M96668.D         Vial: 8
  Acq On    :  5 Nov 2013  20:05                      Operator: FJB
  Sample    : WG451178-08 50ug/L STD 8260             Inst    : hpms11
  Misc      : 1,1 STD61183                            Multiplr: 1.00
  MS Integration Params: rteint.p

  Method       : C:\MSDCHEM\1\METHODS\8260_WT.M (RTE Integrator)
  Title        : 8260B/624 (SOP: OVL MSV01) Water 11/05/13 HPMS11
  Last Update  : Wed Nov 06 14:52:21 2013
  Response via : Multiple Level Calibration

  Min. RRF     :   0.000  Min. Rel. Area :  50%  Max. R.T. Dev  0.50min
  Max. RRF Dev :  25%     Max. Rel. Area : 150%

       Compound                       Amount  Calc.      %Dev Area% Dev(min)
 -----------------------------------------------------------------------------
 1 I    Fluorobenzene                25.0000  25.0000       0.0  100   0.00
 2 T    Dichlorodifluoromethane      50.0000  74.2836     -48.6# 100   0.00
 3 P    Chloromethane                50.0000 105.3030     -110.6# 100   0.00
 4 C    Vinyl Chloride               50.0000  81.3182     -62.6# 100   0.00
 5 T    1,3-Butadiene                50.0000  75.4216     -50.8# 100   0.00
 6 T    Bromomethane                 50.0000  57.9176     -15.8  100   0.00
 7 T    Chloroethane                 50.0000  63.9349     -27.9# 100   0.00
 8 T    Trichlorofluoromethane       50.0000  68.5828     -37.2# 100   0.00
 9 T    Diethyl ether               100.0000 119.9230     -19.9  100   0.00
10 T    Isoprene                     50.0000  56.2901     -12.6  100   0.00
11 T    Acrolein                     50.0000  31.0769      37.8# 100   0.00
12 T    1,1,2-Trichloro-1,2,2-Trifl  50.0000  62.4988     -25.0  100   0.00
13 T    Acetone                      50.0000  54.7976      -9.6  100   0.00
14 C    1,1-Dichloroethene           50.0000  73.2068     -46.4# 100   0.00
15 T    Tert-Butyl Alcohol          200.0000 250.7313     -25.4# 100   0.00
16 T    Dimethyl Sulfide             50.0000  57.0676     -14.1  100   0.00
17 T    Iodomethane                  50.0000  40.9365      18.1  100   0.00
18 T    Methyl acetate               50.0000  64.5010     -29.0# 100   0.00
19 T    Methylene Chloride           50.0000  51.4721      -2.9  100   0.00
20 T    Carbon Disulfide             50.0000  55.0602     -10.1  100   0.00
21 T    Acrylonitrile                50.0000  58.8255     -17.7  100   0.00
22 T    Methyl Tert Butyl Ether      50.0000  58.3473     -16.7  100   0.00
23 T    trans-1,2-Dichloroethene     50.0000  58.4198     -16.8  100   0.00
24 T    n-Hexane                     50.0000  70.5628     -41.1# 100   0.00
25 T    Diisopropyl ether           100.0000 131.9035     -31.9# 100   0.00
26 T    Vinyl Acetate                50.0000  56.9046     -13.8  100   0.00
27 P    1,1-Dichloroethane           50.0000  66.1393     -32.3# 100   0.00
28 T    Ethyl-Tert-Butyl ether      100.0000 131.4988     -31.5# 100   0.00
29 T    2-Butanone                   50.0000  57.6110     -15.2  100   0.00
30 T    Propionitrile               100.0000 113.8452     -13.8  100   0.00
31 T    2,2-Dichloropropane          50.0000  70.9498     -41.9# 100   0.00
32 T    cis-1,2-Dichloroethene       50.0000  56.6997     -13.4  100   0.00
33 C    Chloroform                   50.0000  61.9210     -23.8# 100   0.00
34 T    1-Bromopropane               50.0000  48.3230       3.4  100   0.00
35 T    Bromochloromethane           50.0000  54.5199      -9.0  100   0.00
36 T    Tetrahydrofuran             100.0000 114.9108     -14.9  100   0.00
37 S    Dibromofluoromethane         25.0000  27.3450      -9.4  100   0.00
38 T    1,1,1-Trichloroethane        50.0000  64.8213     -29.6# 100   0.00
39 T    Cyclohexane                  50.0000  68.7281     -37.5# 100   0.00
40 T    1,1-Dichloropropene          50.0000  63.8009     -27.6# 100   0.00
41 T    Carbon Tetrachloride         50.0000  64.6507     -29.3# 100   0.00
42 T    Tert-Amyl-Methyl ether      100.0000 110.3259     -10.3  100   0.00
43 S    1,2-Dichloroethane-d4        25.0000  33.5576     -34.2# 100   0.00
44 T    1,2-Dichloroethane           50.0000  67.7609     -35.5# 100   0.00
45 T    Benzene                      50.0000  57.9480     -15.9  100   0.00
46 T    Trichloroethene              50.0000  55.6878     -11.4  100   0.00
47 T    Methylcyclohexane            50.0000  59.7842     -19.6  100   0.00
48 C    1,2-Dichloropropane          50.0000  62.0547     -24.1# 100   0.00
49 T    1,4-Dioxane                 200.0000 182.3553       8.8  100   0.00
50 T    Bromodichloromethane         50.0000  64.2471     -28.5# 100   0.00
51 T    Dibromomethane               50.0000  56.2951     -12.6  100   0.00
52 T    2-Chloroethyl Vinyl Ether    50.0000  58.9884     -18.0  100   0.00
53 T    4-Methyl-2-Pentanone         50.0000  58.1892     -16.4  100   0.00
54 T    cis-1,3-Dichloropropene      50.0000  60.3452     -20.7  100   0.00
---------------------------------------------------------------------------
 (#) = Out of Range
 11M96668.D  8260_WT.M      Sat Nov 09 18:57:08 2013                    Page 1
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                         Evaluate Continuing Calibration Report

   Data File : C:\MSDCHEM\1\DATA\110513\11M96668.D         Vial: 8
   Acq On    :  5 Nov 2013  20:05                       Operator: FJB
   Sample    : WG451178-08 50ug/L STD 8260              Inst    : hpms11
   Misc      : 1,1 STD61183                             Multiplr: 1.00
   MS Integration Params: rteint.p

   Method       : C:\MSDCHEM\1\METHODS\8260_WT.M (RTE Integrator)
   Title        : 8260B/624 (SOP: OVL MSV01) Water 11/05/13 HPMS11
   Last Update  : Wed Nov 06 14:52:21 2013
   Response via : Multiple Level Calibration

   Min. RRF     :   0.000  Min. Rel. Area :  50%  Max. R.T. Dev  0.50min
   Max. RRF Dev :  25%     Max. Rel. Area : 150%

        Compound                        Amount  Calc.      %Dev Area% Dev(min)
  -----------------------------------------------------------------------------
 55 T   Dimethyl Disulfide             50.0000  54.0845      -8.2  100   0.00
 56 I   Chlorobenzene-d5               25.0000  25.0000       0.0  100   0.00
 57 S   Toluene-d8                     25.0000  27.3180      -9.3  100   0.00
 58 C   Toluene                        50.0000  56.8676     -13.7  100   0.00
 59 T   Ethyl Methacrylate             50.0000  48.9732       2.1  100   0.00
 60 T   trans-1,3-Dichloropropene      50.0000  59.6909     -19.4  100   0.00
 61 T   1,1,2-Trichloroethane          50.0000  51.8266      -3.7  100   0.00
 62 T   2-Hexanone                     50.0000  63.4960     -27.0# 100   0.00
 63 T   1,3-Dichloropropane            50.0000  54.2156      -8.4  100   0.00
 64 T   Tetrachloroethene              50.0000  48.8148       2.4  100   0.00
 65 T   Dibromochloromethane           50.0000  54.3693      -8.7  100   0.00
 66 T   1,2-Dibromoethane              50.0000  52.4892      -5.0  100   0.00
 67 T   1-Chlorohexane                 50.0000  56.7400     -13.5  100   0.00
 68 P   Chlorobenzene                  50.0000  53.9616      -7.9  100   0.00
 69 T   1,1,1,2-Tetrachloroethane      50.0000  52.0670      -4.1  100   0.00
 70 C   Ethylbenzene                   50.0000  59.2443     -18.5  100   0.00
 71 T   m-,p-Xylene                   100.0000 120.9888     -21.0  100   0.00
 72 T   o-Xylene                       50.0000  58.6347     -17.3  100   0.00
 73 T   Styrene                        50.0000  59.5330     -19.1  100   0.00
 74 P   Bromoform                      50.0000  41.4325      17.1  100   0.00
 75 T   Isopropylbenzene               50.0000  61.0025     -22.0  100   0.00

 76 I   1,4-Dichlorobenzene-d4         25.0000  25.0000       0.0  100   0.00
 77 P   1,1,2,2-Tetrachloroethane      50.0000  51.6435      -3.3  100   0.00
 78 S   p-Bromofluorobenzene           25.0000  26.7196      -6.9  100   0.00
 79 T   1,2,3-Trichloropropane         50.0000  50.0372      -0.1  100   0.00
 80 T   trans-1,4-Dichloro-2-Butene    50.0000  60.2173     -20.4  100   0.00
 81 T   n-Propylbenzene                50.0000  60.1417     -20.3  100   0.00
 82 T   Bromobenzene                   50.0000  47.0343       5.9  100   0.00
 83 T   1,3,5-Trimethylbenzene         50.0000  60.2047     -20.4  100   0.00
 84 T   2-Chlorotoluene                50.0000  51.8094      -3.6  100   0.00
 85 T   4-Chlorotoluene                50.0000  63.1594     -26.3# 100   0.00
 86 T   a-Methylstyrene                50.0000  56.4549     -12.9  100   0.00
 87 T   tert-Butylbenzene              50.0000  54.0795      -8.2  100   0.00
 88 T   1,2,4-Trimethylbenzene         50.0000  60.2010     -20.4  100   0.00
 89 T   sec-Butylbenzene               50.0000  61.3757     -22.8  100   0.00
 90 T   p-Isopropyltoluene             50.0000  59.9019     -19.8  100   0.00
 91 T   1,3-Dichlorobenzene            50.0000  50.8988      -1.8  100   0.00
 92 T   1,4-Dichlorobenzene            50.0000  49.7498       0.5  100   0.00
 93 T   n-Butylbenzene                 50.0000  60.1275     -20.3  100   0.00
 94 T   1,2-Dichlorobenzene            50.0000  49.0543       1.9  100   0.00
 95 T   1,2-Dibromo-3-Chloropropane    50.0000  56.9851     -14.0  100   0.00
 96 T   1,2,4-Trichlorobenzene         50.0000  46.7329       6.5  100   0.00
 97 T   Hexachlorobutadiene            50.0000  46.0391       7.9  100   0.00
 98 T   Naphthalene                    50.0000  50.1948      -0.4  100   0.00
 99 T   1,2,3-Trichlorobenzene         50.0000  45.5041       9.0  100   0.00




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  (#) = Out of Range             SPCC's out = 0  CCC's out = 4
  11M96668.D  8260_WT.M      Sat Nov 09 18:57:08 2013                          Page 2
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                             Quantitation Report    (Not Reviewed)

Data File : C:\MSDchem\1\data\110513\11M96669.D          Vial: 9
Acq On    :  5 Nov 2013  20:36                        Operator: FJB
Sample    : WG451178-09 100ug/L STD 8260              Inst     : hpms11
Misc      : 1,1 STD61183                              Multiplr: 1.00
MS Integration Params: rteint.p
Quant Time: Nov 05 20:58:25 2013          Quant Results File: 8260_WT.RES

Quant Method : C:\MSDCHEM\1\METHODS\8260_WT.M (RTE Integrator)
Title        : 8260B/624 (SOP: OVL MSV01) Water 11/05/13 HPMS11
Last Update  : Wed Oct 23 10:24:39 2013
Response via : Initial Calibration
DataAcq Meth : 8260_WT

 Internal Standards                 R.T. QIon  Response  Conc Units Dev(Min)
 ------------------------------------------------------------------------
   1) Fluorobenzene               10.63   96   877253    25.00 ug/L    0.00
  56) Chlorobenzene-d5            14.26  117   718705    25.00 ug/L   -0.01
  76) 1,4-Dichlorobenzene-d4      17.07  152   382418    25.00 ug/L   -0.01

 System Monitoring Compounds
  37) Dibromofluoromethane         9.64  111   504630    56.0841 ug/L -0.01
   Spiked Amount     25.000   Range  86 - 118    Recovery   =  224.32%#
  43) 1,2-Dichloroethane-d4       10.25   65   568157    68.9663 ug/L  0.00
   Spiked Amount     25.000   Range  80 - 120    Recovery   =  275.88%#
  57) Toluene-d8                  12.49   98  1734885    53.8855 ug/L  0.00
   Spiked Amount     25.000   Range  88 - 110    Recovery   =  215.56%#
  78) p-Bromofluorobenzene        15.65   95   725137    54.3255 ug/L -0.01
   Spiked Amount     25.000   Range  86 - 115    Recovery   =  217.32%#

 Target Compounds                                                   Qvalue
   2) Dichlorodifluoromethane      3.24   85   945561   150.5595 ug/L    97
   3) Chloromethane                3.70   50  1192855   217.2484 ug/L    99
   4) Vinyl Chloride               3.94   62  1232124   163.2582 ug/L    98
   5) 1,3-Butadiene                3.97   54   583844   119.9142 ug/L    96
   6) Bromomethane                 4.85   94   506625   134.6476 ug/L    97
   7) Chloroethane                 5.00   64   698615   129.6821 ug/L   100
   8) Trichlorofluoromethane       5.49  101  1678569   138.9710 ug/L   100
   9) Diethyl ether                6.01   59  1390268   242.2747 ug/L    93
  10) Isoprene                     6.05   67  1367791   118.5614 ug/L    83
  11) Acrolein                     6.25   56    14519    56.6053 ug/L    99
  12) 1,1,2-Trichloro-1,2,2-Trif   6.26  101   968782   127.1960 ug/L    90
  13) Acetone                      6.34   43   200714   117.5251 ug/L    88
  14) 1,1-Dichloroethene           6.57   61  1639688   147.0598 ug/L    94
  15) Tert-Butyl Alcohol           6.67   59   273785   509.2294 ug/L    97
  16) Dimethyl Sulfide             6.82   62   950060   120.6688 ug/L    84
  17) Iodomethane                  7.07  142   806196    92.6031 ug/L    92
  18) Methyl acetate               7.07   43   583617   135.7140 ug/L    94
  19) Methylene Chloride           7.33   84   976134   107.3796 ug/L    88
  20) Carbon Disulfide             7.38   76  3005892   114.8686 ug/L    99
  21) Acrylonitrile                7.50   53   268192   120.9305 ug/L    95
  22) Methyl Tert Butyl Ether      7.53   73  2469451   117.9873 ug/L    98
  23) trans-1,2-Dichloroethene     7.77   96  1014538   118.3713 ug/L    90
  24) n-Hexane                     7.84   57  1273175   146.5955 ug/L    97
  25) Diisopropyl ether            8.16   45  6226893   254.7092 ug/L    97
  26) Vinyl Acetate                8.32   43  1349475   118.4206 ug/L    97
  27) 1,1-Dichloroethane           8.36   63  1862681   133.4006 ug/L    97
  28) Ethyl-Tert-Butyl ether       8.72   59  5800390   255.0498 ug/L    94
  29) 2-Butanone                   8.88   43   300614   120.3276 ug/L    90
  30) Propionitrile                9.00   54   179267   231.4653 ug/L   100
  31) 2,2-Dichloropropane          9.10   77  1754389   143.8759 ug/L   100
  32) cis-1,2-Dichloroethene       9.17   96  1105236   116.2330 ug/L    96
  33) Chloroform                   9.37   83  1816775   124.3619 ug/L    99
  34) 1-Bromopropane               9.50  122   204639   104.8454 ug/L    99
  35) Bromochloromethane           9.58  130   638791   111.8337 ug/L    99
  36) Tetrahydrofuran              9.61   42   369880   228.9949 ug/L    93
  38) 1,1,1-Trichloroethane        9.87   97  1709079   131.3992 ug/L    92
  39) Cyclohexane                  9.91   56  1726826   144.9012 ug/L    94
  40) 1,1-Dichloropropene         10.06   75  1437529   129.2115 ug/L    98
  41) Carbon Tetrachloride        10.19  117  1590679   130.6596 ug/L    97
  42) Tert-Amyl-Methyl ether      10.15   73  4798550   214.9217 ug/L    94
 ------------------------------------------------------------------------
 (#) = qualifier out of range (m) = manual integration
 11M96669.D  8260_WT.M      Tue Nov 05 20:58:25 2013                           Page 1
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                              Quantitation Report    (Not Reviewed)

Data File : C:\MSDchem\1\data\110513\11M96669.D          Vial: 9
Acq On    :  5 Nov 2013  20:36                       Operator: FJB
Sample    : WG451178-09 100ug/L STD 8260             Inst    : hpms11
Misc      : 1,1 STD61183                             Multiplr: 1.00
MS Integration Params: rteint.p
Quant Time: Nov 05 20:58:25 2013          Quant Results File: 8260_WT.RES

Quant Method : C:\MSDCHEM\1\METHODS\8260_WT.M (RTE Integrator)
Title        : 8260B/624 (SOP: OVL MSV01) Water 11/05/13 HPMS11
Last Update  : Wed Oct 23 10:24:39 2013
Response via : Initial Calibration
DataAcq Meth : 8260_WT


      Compound                     R.T. QIon  Response  Conc Unit   Qvalue
 ------------------------------------------------------------------------
  44) 1,2-Dichloroethane          10.36   62  1382782   137.4601 ug/L    95
  45) Benzene                     10.40   78  3752528   114.9486 ug/L   100
  46) Trichloroethene             11.10  130  1068392   113.3016 ug/L   100
  47) Methylcyclohexane           11.19   83  1495491   125.3071 ug/L    90
  48) 1,2-Dichloropropane         11.31   63  1018047   125.0704 ug/L    86
  49) 1,4-Dioxane                 11.58   88    27623   359.0068 ug/L    94
  50) Bromodichloromethane        11.59   83  1432667   130.6608 ug/L    99
  51) Dibromomethane              11.67   93   569124   114.0514 ug/L    91
  52) 2-Chloroethyl Vinyl Ether   11.86   63   496033   120.9537 ug/L    98
  53) 4-Methyl-2-Pentanone        11.89   58   263045   118.8198 ug/L    99
  54) cis-1,3-Dichloropropene     12.18   75  1660814   122.6749 ug/L    99
  55) Dimethyl Disulfide          12.44   79   937253   115.7286 ug/L    91
  58) Toluene                     12.58   91  3882606   107.3327 ug/L    96
  59) Ethyl Methacrylate          12.66   69  1047650   100.4361 ug/L    88
  60) trans-1,3-Dichloropropene   12.74   75  1492932   117.1419 ug/L    94
  61) 1,1,2-Trichloroethane       12.95   97   742582   101.5763 ug/L    94
  62) 2-Hexanone                  12.87   43   481113   125.5498 ug/L    85
  63) 1,3-Dichloropropane         13.23   76  1334582   106.6066 ug/L    92
  64) Tetrachloroethene           13.35  164   820730    95.9044 ug/L    99
  65) Dibromochloromethane        13.60  129  1001436   107.3981 ug/L    98
  66) 1,2-Dibromoethane           13.84  107   769649   104.2571 ug/L   100
  67) 1-Chlorohexane              13.91   91  1357436   114.3714 ug/L    85
  68) Chlorobenzene               14.31  112  2749755   104.7942 ug/L    99
  69) 1,1,1,2-Tetrachloroethane   14.33  131  1064040   104.4971 ug/L    99
  70) Ethylbenzene                14.33  106  1566134   118.2335 ug/L    83
  71) m-,p-Xylene                 14.41  106  3601315   232.3784 ug/L    78
  72) o-Xylene                    14.94  106  1844588   116.6968 ug/L    82
  73) Styrene                     14.97  104  3029449   117.0723 ug/L    93
  74) Bromoform                   15.45  173   613727    83.5376 ug/L    98
  75) Isopropylbenzene            15.32  105  4243359   116.1316 ug/L    93
  77) 1,1,2,2-Tetrachloroethane   15.53   83   900733   103.4507 ug/L    97
  79) 1,2,3-Trichloropropane      15.71  110   263577   101.5475 ug/L #  41
  80) trans-1,4-Dichloro-2-Buten  15.75   53   321169   129.3510 ug/L #   1
  81) n-Propylbenzene             15.80   91  4950991   114.0440 ug/L    94
  82) Bromobenzene                15.93  156  1143723    95.7664 ug/L    53
  83) 1,3,5-Trimethylbenzene      15.97  105  3680953   119.2974 ug/L    90
  84) 2-Chlorotoluene             16.06   91  3152020    99.8062 ug/L    95
  85) 4-Chlorotoluene             16.10   91  3278682   123.8892 ug/L    83
  86) a-Methylstyrene             16.35  118  2112187   117.5795 ug/L    91
  87) tert-Butylbenzene           16.41  134   794965   110.7462 ug/L    81
  88) 1,2,4-Trimethylbenzene      16.45  105  3750776   118.6295 ug/L    90
  89) sec-Butylbenzene            16.66  105  4213742   118.6565 ug/L    97
  90) p-Isopropyltoluene          16.80  119  3675400   117.7571 ug/L    95
  91) 1,3-Dichlorobenzene         17.00  146  2152888   102.4284 ug/L    98
  92) 1,4-Dichlorobenzene         17.11  146  2161815    99.4054 ug/L    97
  93) n-Butylbenzene              17.29   91  3207908   116.1613 ug/L    97
  94) 1,2-Dichlorobenzene         17.58  146  2010785    98.3892 ug/L    98
  95) 1,2-Dibromo-3-Chloropropan  18.50   75   179188   116.1864 ug/L    99
  96) 1,2,4-Trichlorobenzene      19.56  180  1346795    91.6653 ug/L   100
  97) Hexachlorobutadiene         19.70  225   496850    89.1880 ug/L    96
  98) Naphthalene                 19.91  128  2718036    96.3765 ug/L    99
  99) 1,2,3-Trichlorobenzene      20.20  180  1210049    89.1806 ug/L    98


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 (#) = qualifier out of range (m) = manual integration
 11M96669.D  8260_WT.M      Tue Nov 05 20:58:25 2013                            Page 2
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Quantitation Report   (Not Reviewed)

00192961

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Data File : C:\MSDchem\1\data\110513\11M96669.D          Vial: 9
Acq On    :  5 Nov 2013  20:36                        Operator: FJB
Sample    : WG451178-09 100ug/L STD 8260              Inst    : hpms11
Misc      : 1,1 STD61183                              Multiplr: 1.00
MS Integration Params: rteint.p
Quant Time: Nov  5 20:58 2013           Quant Results File: 8260_WT.RES

Method       : C:\MSDCHEM\1\METHODS\8260_WT.M (RTE Integrator)
Title        : 8260B/624 (SOP: OVL MSV01) Water 11/05/13 HPMS11
Last Update  : Wed Oct 23 10:24:39 2013
Response via : Initial Calibration
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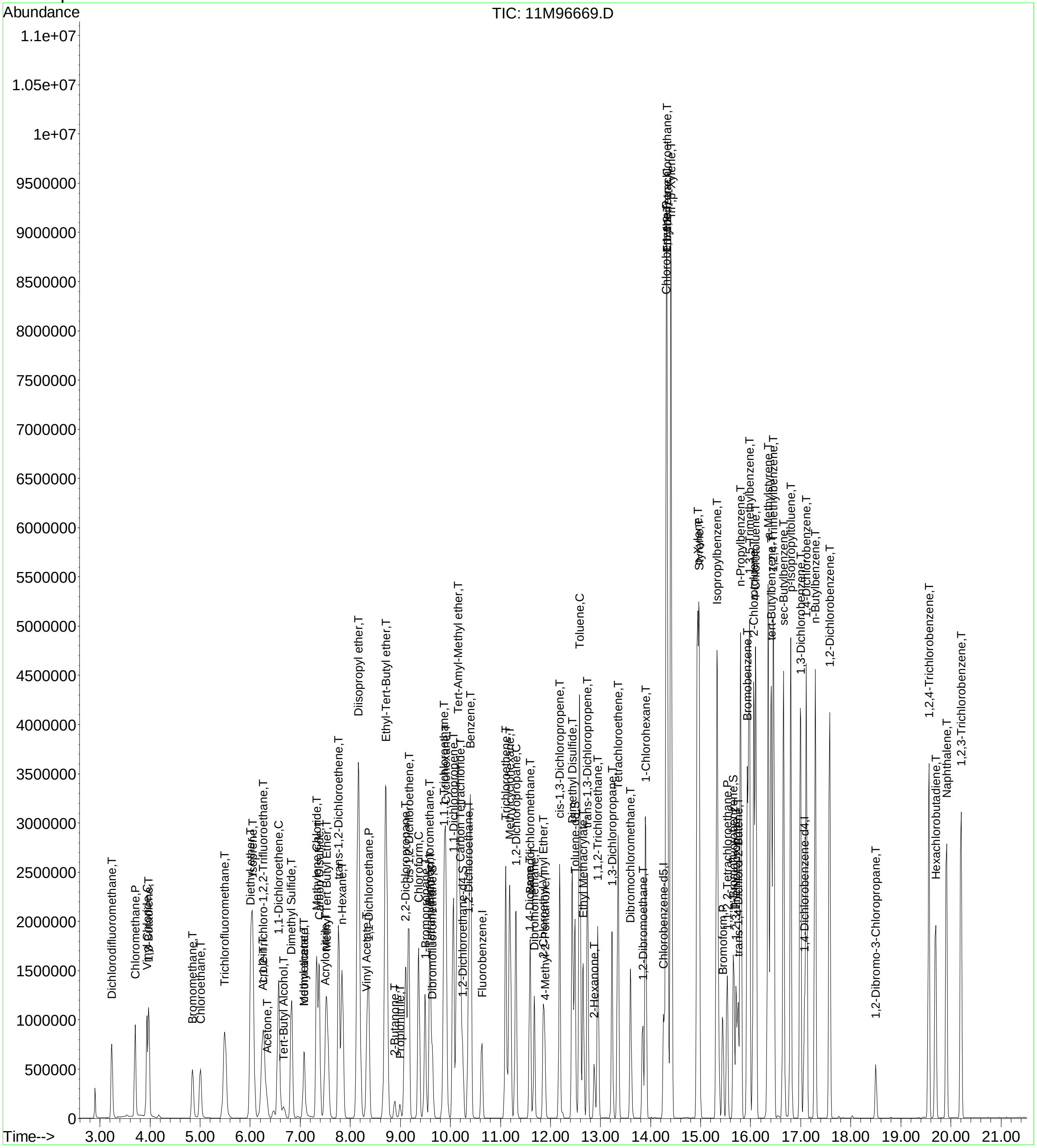

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                              Quantitation Report    (Not Reviewed)

Data File : C:\MSDchem\1\data\110513\11M96670.D          Vial: 10
Acq On    :  5 Nov 2013  21:08                       Operator: FJB
Sample    : WG451178-10 200ug/L STD 8260             Inst    : hpms11
Misc      : 1,1 STD61183                             Multiplr: 1.00
MS Integration Params: rteint.p
Quant Time: Nov 05 21:30:06 2013          Quant Results File: 8260_WT.RES

Quant Method : C:\MSDCHEM\1\METHODS\8260_WT.M (RTE Integrator)
Title        : 8260B/624 (SOP: OVL MSV01) Water 11/05/13 HPMS11
Last Update  : Wed Oct 23 10:24:39 2013
Response via : Initial Calibration
DataAcq Meth : 8260_WT

 Internal Standards                   R.T. QIon  Response  Conc Units Dev(Min)
 -------------------------------------------------------------------------
   1) Fluorobenzene                 10.63   96   880967    25.00 ug/L    0.00
  56) Chlorobenzene-d5              14.26  117   700925    25.00 ug/L   -0.01
  76) 1,4-Dichlorobenzene-d4        17.07  152   380041    25.00 ug/L   -0.01

 System Monitoring Compounds
  37) Dibromofluoromethane           9.64  111   983884   108.8869 ug/L -0.01
   Spiked Amount     25.000   Range  86 - 118    Recovery   =  435.56%#
  43) 1,2-Dichloroethane-d4         10.25   65  1102637   133.2804 ug/L  0.00
   Spiked Amount     25.000   Range  80 - 120    Recovery   =  533.12%#
  57) Toluene-d8                    12.49   98  3264625   103.9713 ug/L  0.00
   Spiked Amount     25.000   Range  88 - 110    Recovery   =  415.88%#
  78) p-Bromofluorobenzene          15.65   95  1417196   106.8369 ug/L -0.01
   Spiked Amount     25.000   Range  86 - 115    Recovery   =  427.36%#

 Target Compounds                                                     Qvalue
   2) Dichlorodifluoromethane        3.24   85  1787398   283.4035 ug/L    96
   3) Chloromethane                  3.70   50  2327600   422.1264 ug/L   100
   4) Vinyl Chloride                 3.93   62  2296308   302.9814 ug/L    97
   5) 1,3-Butadiene                  3.97   54  1092757   223.4923 ug/L    96
   6) Bromomethane                   4.85   94  1129812   299.0084 ug/L    99
   7) Chloroethane                   5.00   64  1341426   247.9557 ug/L    99
   8) Trichlorofluoromethane         5.49  101  3180086   262.1736 ug/L   100
   9) Diethyl ether                  6.02   59     8215     1.4255 ug/L    98
  10) Isoprene                       6.05   67  2590950   223.6392 ug/L    83
  11) Acrolein                       6.25   56     2077    12.3246 ug/L    81
  12) 1,1,2-Trichloro-1,2,2-Trif     6.27  101  1856780   242.7578 ug/L    90
  13) Acetone                        6.34   43   415708   242.3855 ug/L    88
  14) 1,1-Dichloroethene             6.57   61  3117301   278.4048 ug/L    93
  15) Tert-Butyl Alcohol             6.67   59     8498    15.7393 ug/L #  75
  16) Dimethyl Sulfide               6.82   62  1848034   233.7326 ug/L    84
  17) Iodomethane                    7.07  142  1585021   178.9170 ug/L    93
  18) Methyl acetate                 7.07   43  1162152   269.1069 ug/L    92
  19) Methylene Chloride             7.33   84  1896931   214.2356 ug/L    86
  20) Carbon Disulfide               7.37   76  5466555   208.0208 ug/L    97
  21) Acrylonitrile                  7.53   53    53472    24.0094 ug/L #  34
  22) Methyl Tert Butyl Ether        7.53   73  4775479   227.2045 ug/L    97
  23) trans-1,2-Dichloroethene       7.77   96  1939611   225.3503 ug/L    89
  24) n-Hexane                       7.84   57  2359400   270.5200 ug/L    97
  25) Diisopropyl ether              8.17   45    13716     0.5587 ug/L #  77
  26) Vinyl Acetate                  8.32   43  2553671   223.1479 ug/L    97
  27) 1,1-Dichloroethane             8.36   63  3532569   251.9272 ug/L    96
  28) Ethyl-Tert-Butyl ether         8.72   59    12242     0.5360 ug/L    90
  29) 2-Butanone                     8.89   43   599182   238.8252 ug/L    90
  30) Propionitrile                  9.00   54     4656     5.9864 ug/L #  59
  31) 2,2-Dichloropropane            9.10   77  3284462   268.2203 ug/L    98
  32) cis-1,2-Dichloroethene         9.17   96  2116311   221.6252 ug/L    96
  33) Chloroform                     9.37   83  3426833   233.5847 ug/L    97
  34) 1-Bromopropane                 9.49  122   396928   202.4308 ug/L   100
  35) Bromochloromethane             9.59  130  1231956   214.7703 ug/L    99
  36) Tetrahydrofuran                9.62   42     7323     4.5146 ug/L    90
  38) 1,1,1-Trichloroethane          9.87   97  3208450   245.6354 ug/L    91
  39) Cyclohexane                    9.91   56  3267689   273.0420 ug/L    94
  40) 1,1-Dichloropropene           10.06   75  2705896   242.1925 ug/L    96
  41) Carbon Tetrachloride          10.20  117  2986425   244.2731 ug/L    97
  42) Tert-Amyl-Methyl ether        10.14   73    11003     0.4907 ug/L #  82
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 (#) = qualifier out of range (m) = manual integration
 11M96670.D  8260_WT.M      Tue Nov 05 21:30:06 2013                        Page 1
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                              Quantitation Report    (Not Reviewed)

Data File : C:\MSDchem\1\data\110513\11M96670.D          Vial: 10
Acq On    :  5 Nov 2013  21:08                       Operator: FJB
Sample    : WG451178-10 200ug/L STD 8260             Inst    : hpms11
Misc      : 1,1 STD61183                             Multiplr: 1.00
MS Integration Params: rteint.p
Quant Time: Nov 05 21:30:06 2013          Quant Results File: 8260_WT.RES

Quant Method : C:\MSDCHEM\1\METHODS\8260_WT.M (RTE Integrator)
Title        : 8260B/624 (SOP: OVL MSV01) Water 11/05/13 HPMS11
Last Update  : Wed Oct 23 10:24:39 2013
Response via : Initial Calibration
DataAcq Meth : 8260_WT


      Compound                     R.T. QIon  Response  Conc Unit   Qvalue
 -----------------------------------------------------------------------
  44) 1,2-Dichloroethane          10.36   62  2646626   261.9877 ug/L    94
  45) Benzene                     10.40   78  6663051   203.2442 ug/L    96
  46) Trichloroethene             11.10  130  2044401   215.8921 ug/L   100
  47) Methylcyclohexane           11.19   83  2807705   234.2656 ug/L    91
  48) 1,2-Dichloropropane         11.31   63  1995749   244.1507 ug/L    86
  49) 1,4-Dioxane                 11.58   88     4582    59.2996 ug/L #  38
  50) Bromodichloromethane        11.59   83  2747041   249.4769 ug/L    98
  51) Dibromomethane              11.67   93  1117488   222.9984 ug/L    91
  52) 2-Chloroethyl Vinyl Ether   11.86   63   973802   236.4528 ug/L    98
  53) 4-Methyl-2-Pentanone        11.88   58   528597   237.7654 ug/L    99
  54) cis-1,3-Dichloropropene     12.18   75  3170436   233.1948 ug/L    97
  55) Dimethyl Disulfide          12.44   79  1857967   228.4478 ug/L    95
  58) Toluene                     12.58   91  6747612   191.2661 ug/L    91
  59) Ethyl Methacrylate          12.66   69  2061144   202.3050 ug/L    88
  60) trans-1,3-Dichloropropene   12.74   75  2866299   230.6072 ug/L    93
  61) 1,1,2-Trichloroethane       12.95   97  1448816   203.2078 ug/L    94
  62) 2-Hexanone                  12.87   43   959760   256.8093 ug/L    86
  63) 1,3-Dichloropropane         13.23   76  2575606   210.9587 ug/L    93
  64) Tetrachloroethene           13.35  164  1573837   188.5719 ug/L    99
  65) Dibromochloromethane        13.60  129  1974205   217.0924 ug/L    98
  66) 1,2-Dibromoethane           13.84  107  1513238   210.1839 ug/L   100
  67) 1-Chlorohexane              13.91   91  2576721   222.6100 ug/L    85
  68) Chlorobenzene               14.31  112  5097697   199.2032 ug/L    94
  69) 1,1,1,2-Tetrachloroethane   14.33  131  2089687   210.4295 ug/L   100
  70) Ethylbenzene                14.33  106  3077188   238.2017 ug/L    64
  71) m-,p-Xylene                 14.41  106  6458714   427.3265 ug/L    62
  72) o-Xylene                    14.94  106  3546479   230.0573 ug/L    73
  73) Styrene                     14.97  104  5610041   222.2981 ug/L    96
  74) Bromoform                   15.45  173  1231388   171.5157 ug/L    99
  75) Isopropylbenzene            15.32  105  7368811   206.7842 ug/L    86
  77) 1,1,2,2-Tetrachloroethane   15.53   83  1779833   205.6953 ug/L    96
  79) 1,2,3-Trichloropropane      15.71  110   526753   204.2098 ug/L #  40
  80) trans-1,4-Dichloro-2-Buten  15.75   53   644998   261.0920 ug/L #   1
  81) n-Propylbenzene             15.80   91  8147173   188.8404 ug/L    85
  82) Bromobenzene                15.93  156  2230424   187.9264 ug/L    58
  83) 1,3,5-Trimethylbenzene      15.97  105  6478737   211.2852 ug/L    84
  84) 2-Chlorotoluene             16.06   91  5528178   176.1401 ug/L   100
  85) 4-Chlorotoluene             16.06   91  5528178   210.1959 ug/L    79
  86) a-Methylstyrene             16.35  118  3958566   221.7405 ug/L    93
  87) tert-Butylbenzene           16.41  134  1541808   216.1319 ug/L    74
  88) 1,2,4-Trimethylbenzene      16.46  105  6527142   207.7316 ug/L    83
  89) sec-Butylbenzene            16.66  105  7228783   204.8314 ug/L    92
  90) p-Isopropyltoluene          16.80  119  6367837   205.2969 ug/L    89
  91) 1,3-Dichlorobenzene         17.00  146  3965300   189.8379 ug/L    94
  92) 1,4-Dichlorobenzene         17.11  146  3988774   184.5606 ug/L    94
  93) n-Butylbenzene              17.29   91  5569266   202.9296 ug/L    93
  94) 1,2-Dichlorobenzene         17.58  146  3717921   183.0584 ug/L    94
  95) 1,2-Dibromo-3-Chloropropan  18.50   75   347202   226.5356 ug/L    99
  96) 1,2,4-Trichlorobenzene      19.56  180  2496822   171.0010 ug/L    98
  97) Hexachlorobutadiene         19.70  225   925049   167.0912 ug/L    97
  98) Naphthalene                 19.91  128  4891254   174.5195 ug/L    98
  99) 1,2,3-Trichlorobenzene      20.20  180  2266711   168.1015 ug/L   100


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 (#) = qualifier out of range (m) = manual integration
 11M96670.D  8260_WT.M      Tue Nov 05 21:30:07 2013                             Page 2
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                         Quantitation Report    (Not Reviewed)

  Data File : C:\MSDchem\1\data\110513\11M96670.D          Vial: 10
  Acq On    :  5 Nov 2013  21:08                       Operator: FJB
  Sample    : WG451178-10 200ug/L STD 8260             Inst    : hpms11
  Misc      : 1,1 STD61183                             Multiplr: 1.00
  MS Integration Params: rteint.p
  Quant Time: Nov  5 21:30 2013            Quant Results File: 8260_WT.RES

  Method       : C:\MSDCHEM\1\METHODS\8260_WT.M (RTE Integrator)
  Title        : 8260B/624 (SOP: OVL MSV01) Water 11/05/13 HPMS11
  Last Update  : Wed Oct 23 10:24:39 2013
  Response via : Initial Calibration
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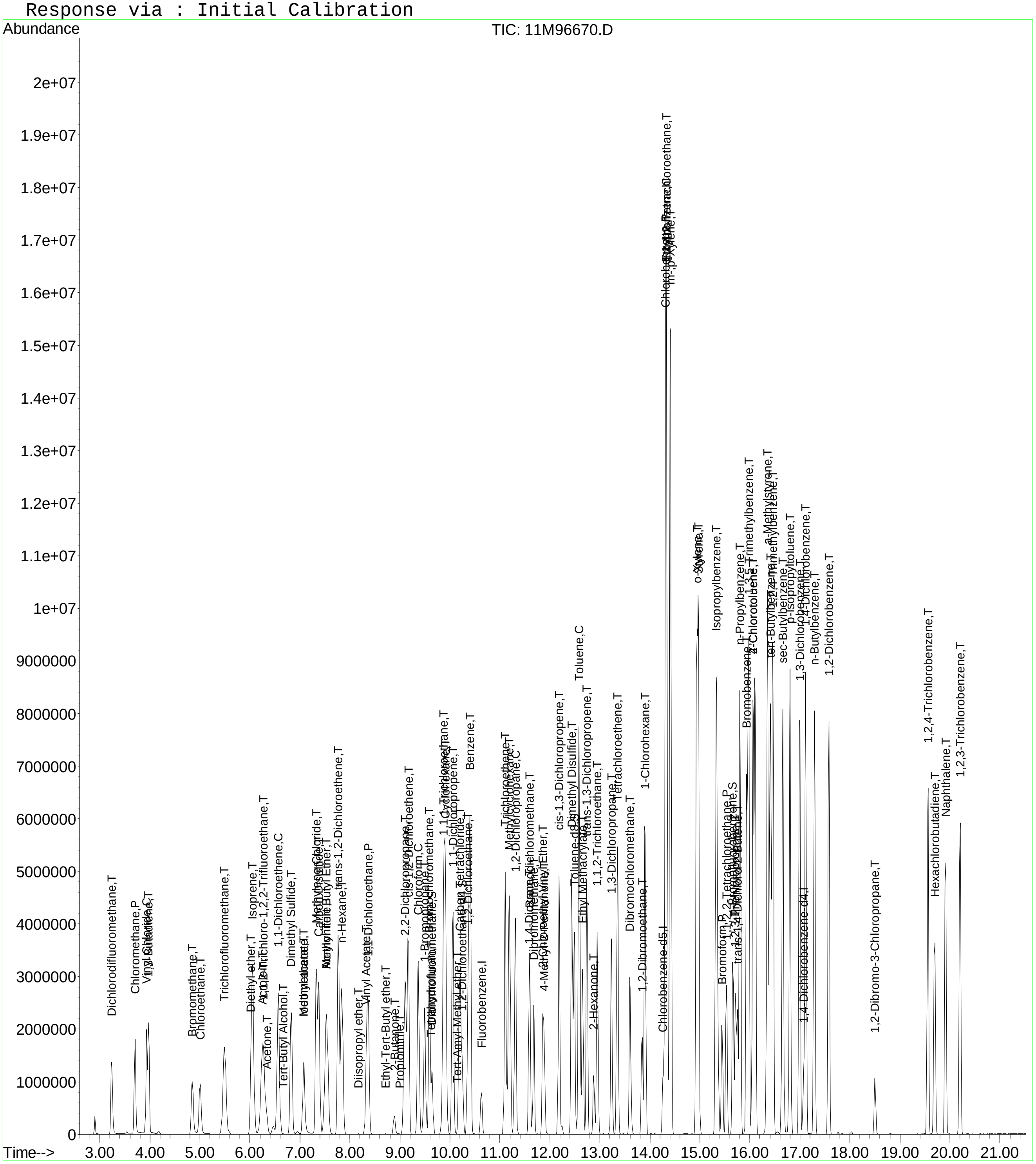

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                          Quantitation Report    (Not Reviewed)

Data File : C:\MSDchem\1\data\110513\11M96671.D          Vial: 11
Acq On    :  5 Nov 2013  21:39                       Operator: FJB
Sample    : WG451178-11 300ug/L STD 8260             Inst    : hpms11
Misc      : 1,1 STD61183                             Multiplr: 1.00
MS Integration Params: rteint.p
Quant Time: Nov 05 22:01:29 2013          Quant Results File: 8260_WT.RES

Quant Method : C:\MSDCHEM\1\METHODS\8260_WT.M (RTE Integrator)
Title        : 8260B/624 (SOP: OVL MSV01) Water 11/05/13 HPMS11
Last Update  : Wed Oct 23 10:24:39 2013
Response via : Initial Calibration
DataAcq Meth : 8260_WT

 Internal Standards                R.T. QIon  Response  Conc Units Dev(Min)
 ------------------------------------------------------------------------
   1) Fluorobenzene               10.63   96   835552    25.00 ug/L    0.00
  56) Chlorobenzene-d5            14.26  117   686338    25.00 ug/L   -0.01
  76) 1,4-Dichlorobenzene-d4      17.08  152   365159    25.00 ug/L    0.00

 System Monitoring Compounds
  37) Dibromofluoromethane         9.64  111  1425100   166.2889 ug/L -0.01
   Spiked Amount     25.000   Range  86 - 118    Recovery   =  665.16%#
  43) 1,2-Dichloroethane-d4       10.25   65  1579307   201.2734 ug/L  0.00
   Spiked Amount     25.000   Range  80 - 120    Recovery   =  805.08%#
  57) Toluene-d8                  12.49   98  4644488   151.0607 ug/L  0.00
   Spiked Amount     25.000   Range  88 - 110    Recovery   =  604.24%#
  78) p-Bromofluorobenzene        15.65   95  2026991   159.0347 ug/L -0.01
   Spiked Amount     25.000   Range  86 - 115    Recovery   =  636.12%#

 Target Compounds                                                   Qvalue
   2) Dichlorodifluoromethane      3.24   85  2694267   450.4128 ug/L    97
   3) Chloromethane                3.70   50  3678630   703.4066 ug/L    99
   4) Vinyl Chloride               3.93   62  2722537   378.7440 ug/L    96
   5) 1,3-Butadiene                3.97   54  1501673   323.8177 ug/L    96
   6) Bromomethane                 4.84   94  1796230   501.2165 ug/L    99
   7) Chloroethane                 5.00   64  2010876   391.9033 ug/L    99
   8) Trichlorofluoromethane       5.49  101  4747511   412.6693 ug/L    99
   9) Diethyl ether                6.01   59  2072591   379.2054 ug/L    92
  10) Isoprene                     6.05   67  3929677   357.6283 ug/L    84
  11) Acrolein                     6.25   56    23566    92.9635 ug/L    99
  12) 1,1,2-Trichloro-1,2,2-Trif   6.26  101  2801075   386.1211 ug/L    90
  13) Acetone                      6.35   43   593624   364.9354 ug/L    83
  14) 1,1-Dichloroethene           6.57   61  4659374   438.7445 ug/L    92
  15) Tert-Butyl Alcohol           6.68   59   399425   779.9925 ug/L    97
  16) Dimethyl Sulfide             6.82   62  2730468   364.1099 ug/L    84
  17) Iodomethane                  7.07  142  2294492   271.7730 ug/L    93
  18) Methyl acetate               7.07   43  1717141   419.2317 ug/L    93
  19) Methylene Chloride           7.33   84  2809910   347.9721 ug/L    86
  20) Carbon Disulfide             7.37   76  7665631   307.5581 ug/L    95
  21) Acrylonitrile                7.51   53   440704   208.6356 ug/L    90
  22) Methyl Tert Butyl Ether      7.53   73  6866866   344.4647 ug/L    96
  23) trans-1,2-Dichloroethene     7.77   96  2895932   354.7464 ug/L    88
  24) n-Hexane                     7.84   57  3505041   423.7182 ug/L    97
  25) Diisopropyl ether            8.16   45  8785919   377.3217 ug/L    96
  26) Vinyl Acetate                8.32   43  3506029   323.0200 ug/L    97
  27) 1,1-Dichloroethane           8.36   63  5166892   388.5080 ug/L    94
  28) Ethyl-Tert-Butyl ether       8.72   59  8235952   380.2182 ug/L    92
  29) 2-Butanone                   8.89   43   874416   367.4731 ug/L    88
  30) Propionitrile                9.00   54   268285   363.6916 ug/L   100
  31) 2,2-Dichloropropane          9.10   77  4833298   416.1569 ug/L    98
  32) cis-1,2-Dichloroethene       9.17   96  3140165   346.7195 ug/L    95
  33) Chloroform                   9.37   83  4977155   357.6999 ug/L    96
  34) 1-Bromopropane               9.50  122   585564   314.8208 ug/L   100
  35) Bromochloromethane           9.59  130  1782343   327.6095 ug/L    98
  36) Tetrahydrofuran              9.61   42   556409   361.6684 ug/L    93
  38) 1,1,1-Trichloroethane        9.87   97  4751149   383.5134 ug/L    90
  39) Cyclohexane                  9.91   56  4865755   428.6720 ug/L    93
  40) 1,1-Dichloropropene         10.06   75  3994139   376.9285 ug/L    95
  41) Carbon Tetrachloride        10.20  117  4413170   380.5930 ug/L    97
  42) Tert-Amyl-Methyl ether      10.15   73  6864390   322.7926 ug/L    95
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 (#) = qualifier out of range (m) = manual integration
 11M96671.D  8260_WT.M      Tue Nov 05 22:01:30 2013                           Page 1
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                         Quantitation Report    (Not Reviewed)

Data File : C:\MSDchem\1\data\110513\11M96671.D          Vial: 11
Acq On    :  5 Nov 2013  21:39                        Operator: FJB
Sample    : WG451178-11 300ug/L STD 8260              Inst    : hpms11
Misc      : 1,1 STD61183                              Multiplr: 1.00
MS Integration Params: rteint.p
Quant Time: Nov 05 22:01:29 2013          Quant Results File: 8260_WT.RES

Quant Method : C:\MSDCHEM\1\METHODS\8260_WT.M (RTE Integrator)
Title        : 8260B/624 (SOP: OVL MSV01) Water 11/05/13 HPMS11
Last Update  : Wed Oct 23 10:24:39 2013
Response via : Initial Calibration
DataAcq Meth : 8260_WT


      Compound                     R.T. QIon  Response  Conc Unit   Qvalue
 -------------------------------------------------------------------------
  44) 1,2-Dichloroethane          10.36   62  3794853   396.0677 ug/L    92
  45) Benzene                     10.40   78  9033224   290.5186 ug/L    90
  46) Trichloroethene             11.10  130  3053533   339.9847 ug/L    99
  47) Methylcyclohexane           11.19   83  4146161   364.7450 ug/L    90
  48) 1,2-Dichloropropane         11.31   63  2950483   380.5671 ug/L    86
  49) 1,4-Dioxane                 11.58   88    43130   588.5219 ug/L   100
  50) Bromodichloromethane        11.59   83  4006096   383.5948 ug/L    97
  51) Dibromomethane              11.67   93  1636451   344.3087 ug/L    91
  52) 2-Chloroethyl Vinyl Ether   11.86   63  1402332   359.0135 ug/L    98
  53) 4-Methyl-2-Pentanone        11.89   58   772426   366.3254 ug/L    99
  54) cis-1,3-Dichloropropene     12.18   75  4572567   354.6061 ug/L    95
  55) Dimethyl Disulfide          12.44   79  2731465   354.1040 ug/L    98
  58) Toluene                     12.58   91  8956746   259.2816 ug/L    84
  59) Ethyl Methacrylate          12.66   69  2946701   295.2330 ug/L    88
  60) trans-1,3-Dichloropropene   12.74   75  4121023   338.6023 ug/L    91
  61) 1,1,2-Trichloroethane       12.95   97  2152785   308.3623 ug/L    94
  62) 2-Hexanone                  12.87   43  1360481   371.7698 ug/L    86
  63) 1,3-Dichloropropane         13.23   76  3731965   312.1685 ug/L    93
  64) Tetrachloroethene           13.35  164  2396669   293.2641 ug/L    99
  65) Dibromochloromethane        13.60  129  2909654   326.7587 ug/L    98
  66) 1,2-Dibromoethane           13.84  107  2224374   315.5248 ug/L   100
  67) 1-Chlorohexane              13.91   91  3782019   333.6834 ug/L    86
  68) Chlorobenzene               14.31  112  7073978   282.3056 ug/L    89
  69) 1,1,1,2-Tetrachloroethane   14.33  131  3079939   316.7387 ug/L   100
  70) Ethylbenzene                14.33  106  4559810   360.4717 ug/L    50
  71) m-,p-Xylene                 14.41  106  8582027   579.8787 ug/L    52
  72) o-Xylene                    14.94  106  5172858   342.6911 ug/L    63
  73) Styrene                     14.97  104  7642163   309.2569 ug/L    98
  74) Bromoform                   15.45  173  1788353   254.2290 ug/L   100
  75) Isopropylbenzene            15.32  105  9673857   277.2382 ug/L #  77
  77) 1,1,2,2-Tetrachloroethane   15.53   83  2527143   303.9649 ug/L    96
  79) 1,2,3-Trichloropropane      15.72  110   759391   306.3963 ug/L #  38
  80) trans-1,4-Dichloro-2-Buten  15.75   53   928163   390.8789 ug/L #   1
  81) n-Propylbenzene             15.80   91 10289739   248.2223 ug/L #  74
  82) Bromobenzene                15.93  156  3256314   285.5453 ug/L    60
  83) 1,3,5-Trimethylbenzene      15.97  105  8600266   291.9033 ug/L    77
  84) 2-Chlorotoluene             16.06   91  7210965   239.1212 ug/L    79
  85) 4-Chlorotoluene             16.06   91  7210965   285.3540 ug/L #  55
  86) a-Methylstyrene             16.35  118  5550219   323.5681 ug/L    96
  87) tert-Butylbenzene           16.41  134  2313428   337.5150 ug/L    65
  88) 1,2,4-Trimethylbenzene      16.46  105  8602545   284.9409 ug/L    74
  89) sec-Butylbenzene            16.66  105  9474098   279.3944 ug/L    84
  90) p-Isopropyltoluene          16.80  119  8453531   283.6463 ug/L    82
  91) 1,3-Dichlorobenzene         17.00  146  5595828   278.8173 ug/L    91
  92) 1,4-Dichlorobenzene         17.11  146  5578784   268.6504 ug/L    90
  93) n-Butylbenzene              17.29   91  7546840   286.1943 ug/L    86
  94) 1,2-Dichlorobenzene         17.58  146  5278608   270.4939 ug/L    91
  95) 1,2-Dibromo-3-Chloropropan  18.50   75   537030   364.6710 ug/L    99
  96) 1,2,4-Trichlorobenzene      19.56  180  3862731   275.3303 ug/L    95
  97) Hexachlorobutadiene         19.70  225  1476150   277.5030 ug/L    96
  98) Naphthalene                 19.91  128  6923635   257.1025 ug/L #  94
  99) 1,2,3-Trichlorobenzene      20.20  180  3474915   268.2058 ug/L    98


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 (#) = qualifier out of range (m) = manual integration
 11M96671.D  8260_WT.M      Tue Nov 05 22:01:30 2013                    Page 2
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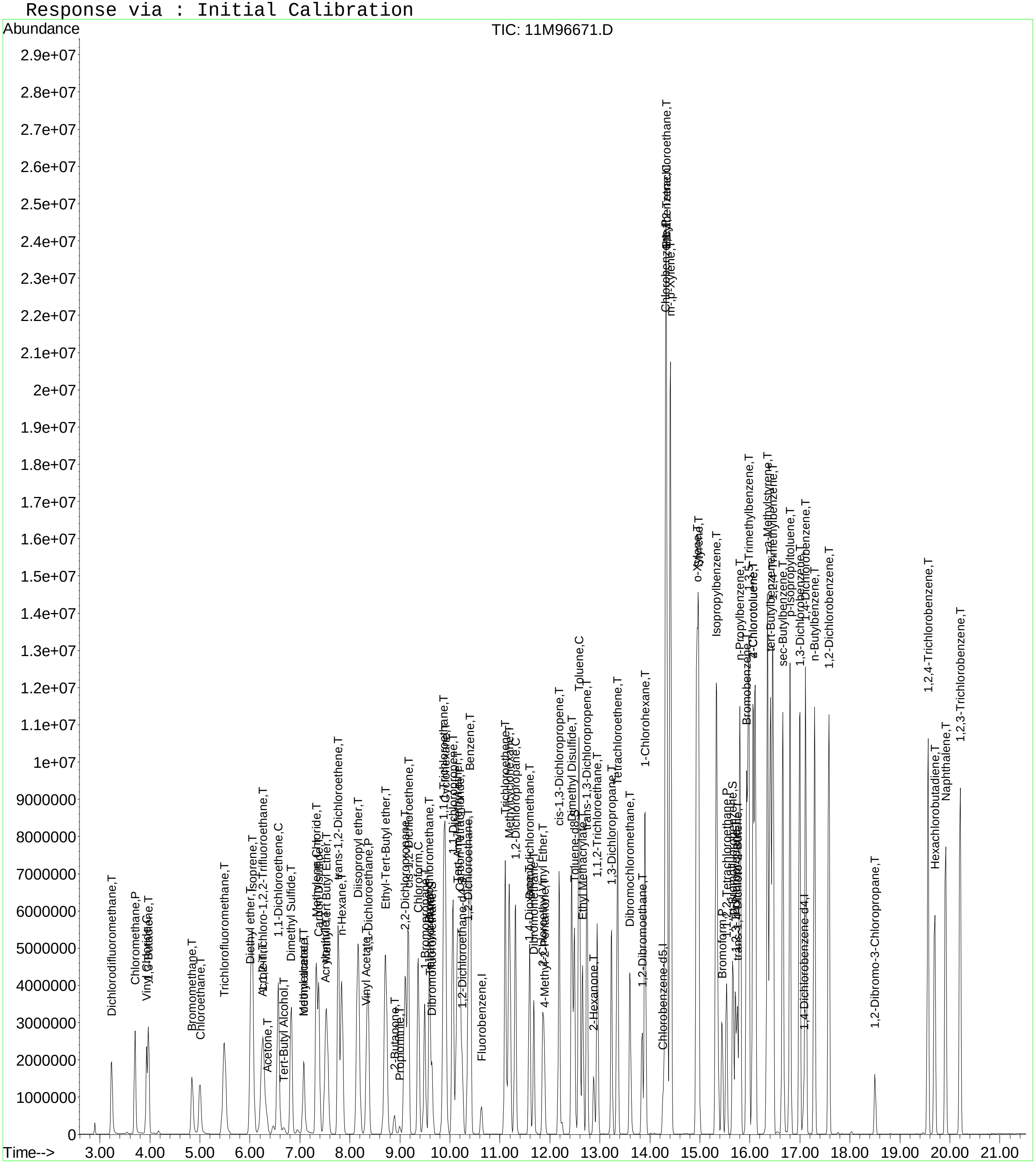
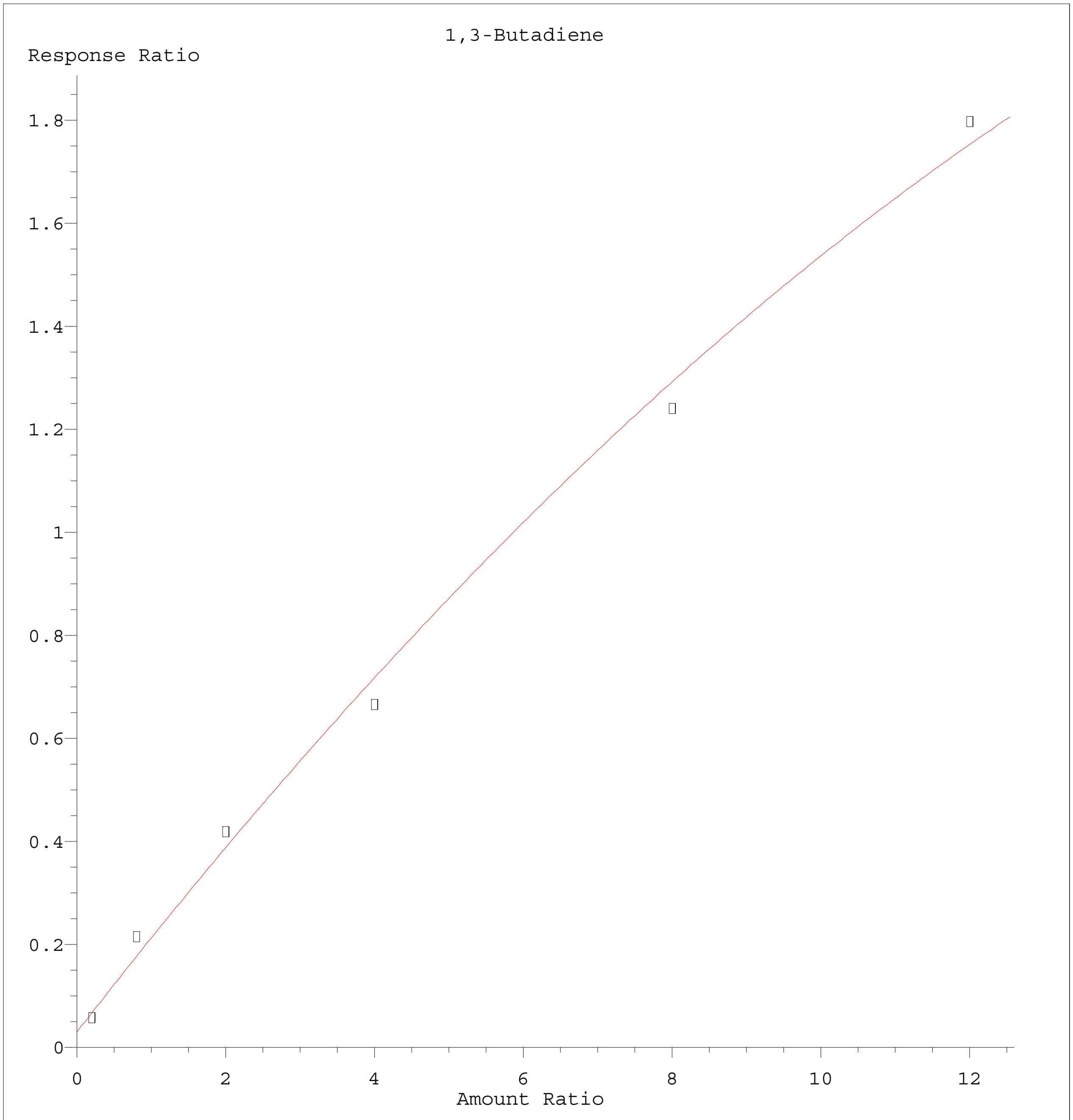
Quantitation Report (Not Reviewed)

```
Data File : C:\MSDchem\1\data\110513\11M96671.D         Vial: 11
Acq On    :  5 Nov 2013  21:39                         Operator: FJB
Sample    : WG451178-11 300ug/L STD 8260               Inst    : hpms11
Misc      : 1,1 STD61183                               Multiplr: 1.00
MS Integration Params: rteint.p
Quant Time: Nov  5 22:01 2013           Quant Results File: 8260_WT.RES

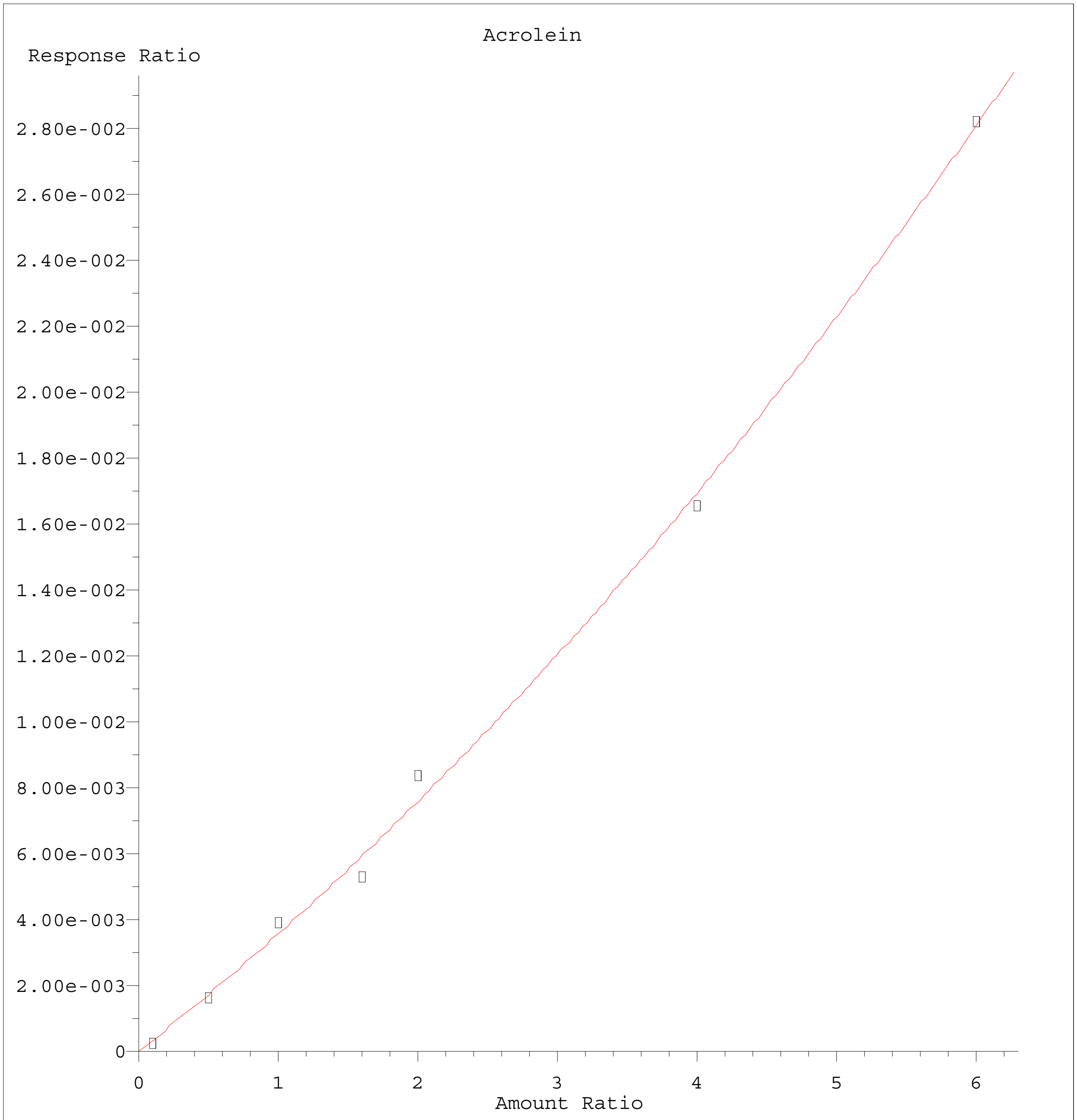
Method       : C:\MSDCHEM\1\METHODS\8260_WT.M (RTE Integrator)
Title        : 8260B/624 (SOP: OVL MSV01) Water 11/05/13 HPMS11
Last Update  : Wed Oct 23 10:24:39 2013
Response via : Initial Calibration
```





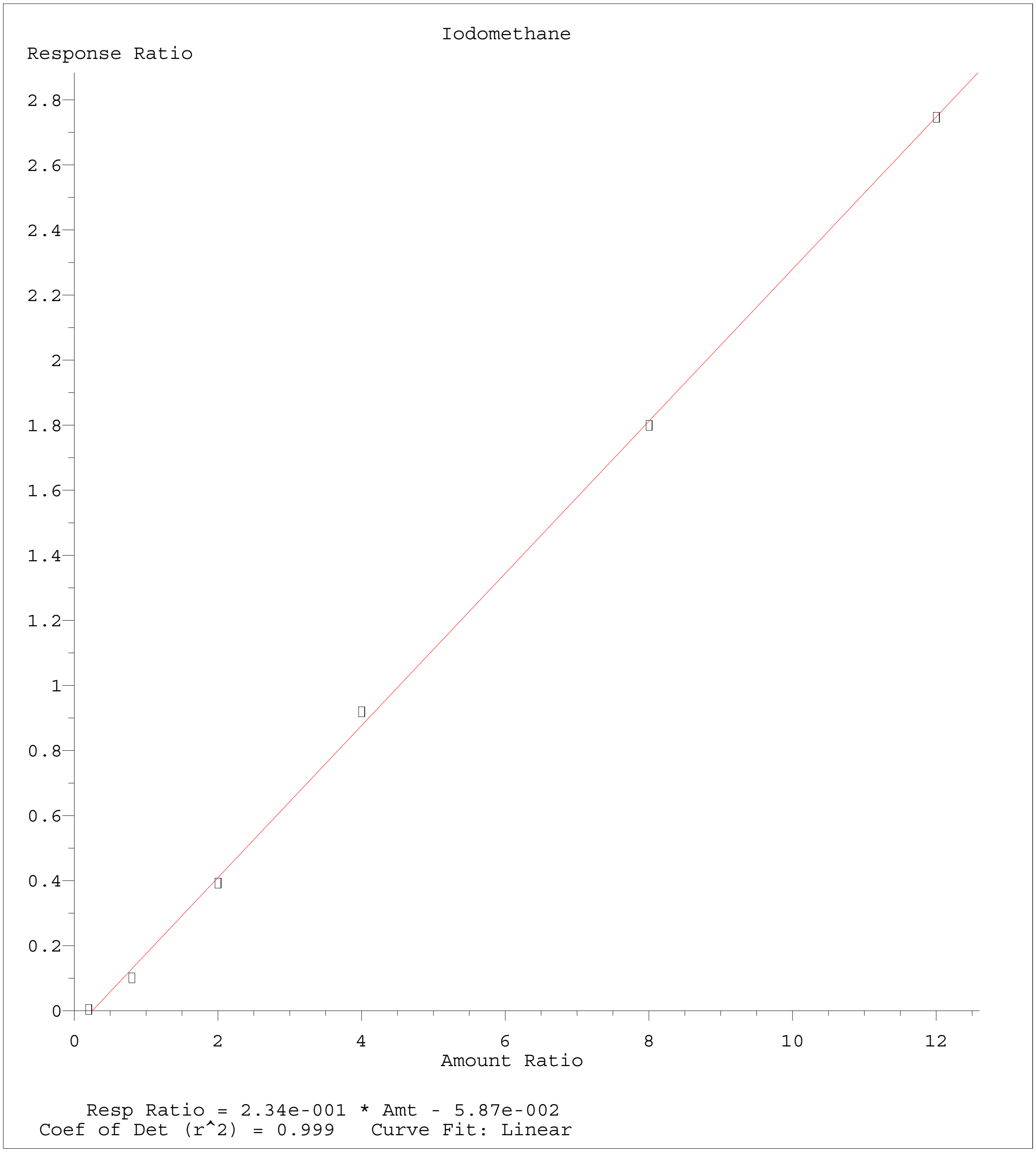
R = -3.54e-003 A*A + 1.86e-001 A + 2.99e-002
Coef of Det (r^2)=0.999   Curve Fit: Quadratic w(1/a)

Method Name: C:\MSDCHEM\1\METHODS\8260_WT.M
Calibration Table Last Updated: Wed Nov 06 14:52:21 2013



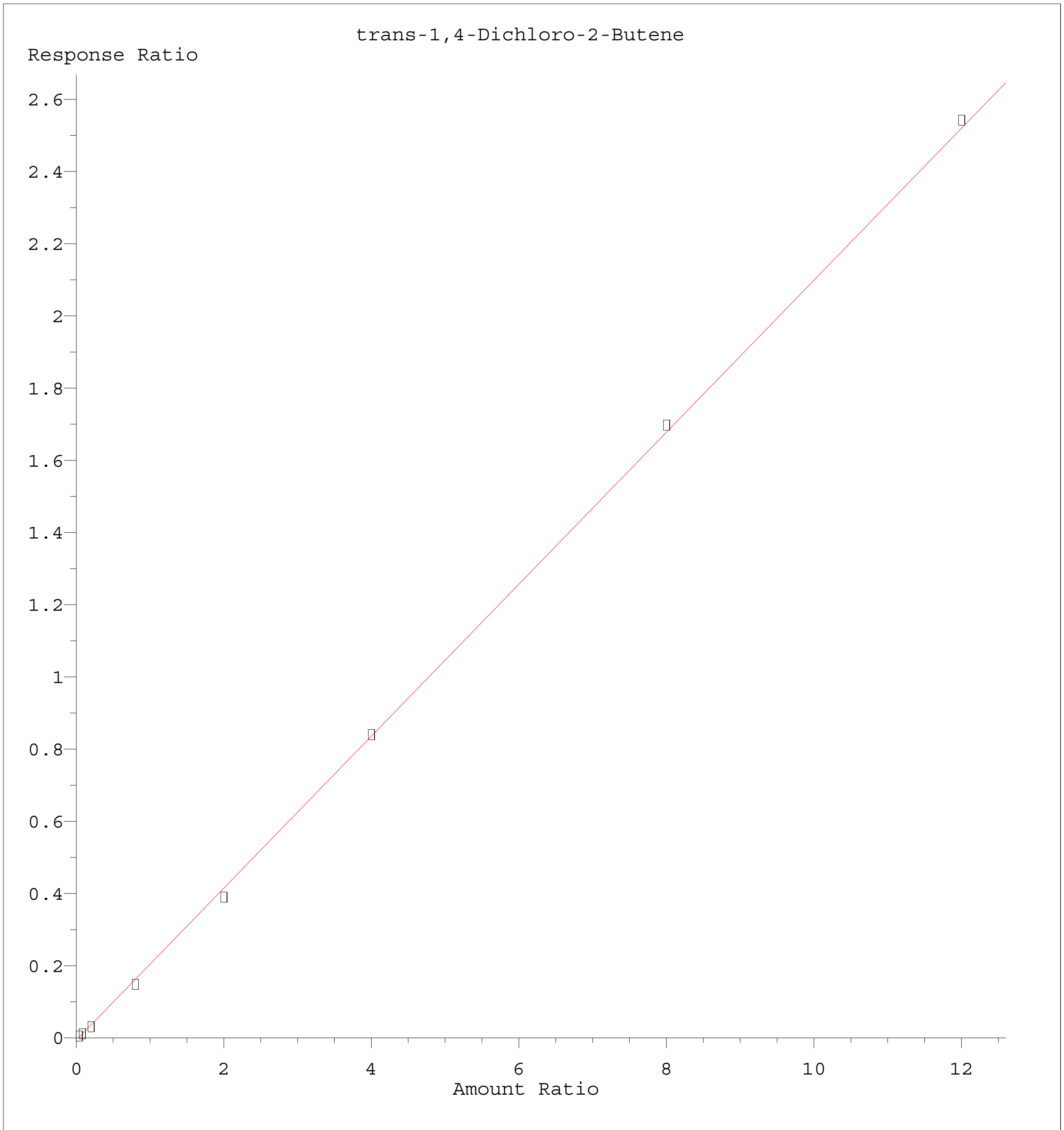
R = 2.23e-004 A*A + 3.34e-003 A + 9.05e-006
Coef of Det (r^2)=0.998   Curve Fit: Quadratic

Method Name: C:\MSDCHEM\1\METHODS\8260_WT.M
Calibration Table Last Updated: Wed Nov 06 14:52:21 2013



Resp Ratio = 2.34e-001 * Amt - 5.87e-002
Coef of Det (r^2) = 0.999   Curve Fit: Linear

Method Name: C:\MSDCHEM\1\METHODS\8260_WT.M
Calibration Table Last Updated: Wed Nov 06 14:52:21 2013



Resp Ratio = 2.10e-001 * Amt - 5.39e-003
Coef of Det (r^2) = 0.999   Curve Fit: wlr(1/a)

Method Name: C:\MSDCHEM\1\METHODS\8260_WT.M
Calibration Table Last Updated: Wed Nov 06 14:52:21 2013

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                               Quantitation Report    (Not Reviewed)
Data File : C:\MSDCHEM\1\DATA\110513\11M96673.D          Vial: 13
Acq On    :  5 Nov 2013  22:42                       Operator: FJB
Sample    : WG451178-12 20ug/L ALT SRC 8260          Inst    : hpms11
Misc      : 1,1 STD61121                             Multiplr: 1.00
MS Integration Params: rteint.p
Quant Time: Nov 06 14:52:47 2013          Quant Results File: 8260_WT.RES

Quant Method : C:\MSDCHEM\1\METHODS\8260_WT.M (RTE Integrator)
Title        : 8260B/624 (SOP: OVL MSV01) Water 11/05/13 HPMS11
Last Update  : Wed Nov 06 14:52:21 2013
Response via : Initial Calibration
DataAcq Meth : 8260_WT

 Internal Standards                R.T. QIon  Response  Conc Units Dev(Min)
 -------------------------------------------------------------------------
   1) Fluorobenzene               10.63   96   853018    25.00 ug/L    0.00
  56) Chlorobenzene-d5            14.26  117   672477    25.00 ug/L    0.00
  76) 1,4-Dichlorobenzene-d4      17.07  152   366330    25.00 ug/L    0.00

 System Monitoring Compounds
  37) Dibromofluoromethane         9.64  111   100687     9.7575 ug/L  0.00
   Spiked Amount     25.000   Range  86 - 118    Recovery   =   39.04%#
  43) 1,2-Dichloroethane-d4       10.25   65   111589     9.5754 ug/L  0.00
   Spiked Amount     25.000   Range  80 - 120    Recovery   =   38.32%#
  57) Toluene-d8                  12.49   98   351398    10.4046 ug/L  0.00
   Spiked Amount     25.000   Range  88 - 110    Recovery   =   41.60%#
  78) p-Bromofluorobenzene        15.65   95   146143     9.9335 ug/L  0.00
   Spiked Amount     25.000   Range  86 - 115    Recovery   =   39.72%#

 Target Compounds                                                   Qvalue
   2) Dichlorodifluoromethane      3.24   85   260003    30.9006 ug/L    98
   3) Chloromethane                3.70   50   275386    23.1880 ug/L    98
   4) Vinyl Chloride               3.93   62   267431    23.7626 ug/L    99
   5) 1,3-Butadiene                3.97   54    74973     7.8349 ug/L    93
   6) Bromomethane                 4.84   94    99057    20.5139 ug/L    99
   7) Chloroethane                 5.00   64   137587    21.0128 ug/L    99
   8) Trichlorofluoromethane       5.49  101   362854    23.1575 ug/L   100
   9) Diethyl ether                6.01   59   618428    94.0690 ug/L    92
  10) Isoprene                     6.05   67   283516    21.9865 ug/L    82
  11) Acrolein                     6.25   56    40298   221.9320 ug/L    98
  12) 1,1,2-Trichloro-1,2,2-Trif   6.26  101   208982    22.8509 ug/L    85
  13) Acetone                      6.35   43    47103    23.7704 ug/L    95
  14) 1,1-Dichloroethene           6.57   61   304155    19.6499 ug/L    94
  15) Tert-Butyl Alcohol           6.67   59   116078   188.5514 ug/L    98
  16) Dimethyl Sulfide             6.82   62   221630    25.2361 ug/L    84
  17) Iodomethane                  7.08  142    40933    11.4083 ug/L #  66
  18) Methyl acetate               7.08   43   121895    21.2297 ug/L    97
  19) Methylene Chloride           7.33   84   193475    19.5472 ug/L    89
  20) Carbon Disulfide             7.37   76   606784    21.5339 ug/L   100
  21) Acrylonitrile                7.51   53    53390    22.0796 ug/L    98
  22) Methyl Tert Butyl Ether      7.54   73   516303    22.3614 ug/L    99
  23) trans-1,2-Dichloroethene     7.77   96   195673    20.0158 ug/L    88
  24) n-Hexane                     7.84   57   231868    19.1797 ug/L    98
  25) Diisopropyl ether            8.16   45  2730664    88.2745 ug/L    97
  26) Vinyl Acetate                8.32   43   307409    26.4727 ug/L    98
  27) 1,1-Dichloroethane           8.36   63   368673    20.7599 ug/L    98
  28) Ethyl-Tert-Butyl ether       8.72   59  2516568    88.4852 ug/L    96
  29) 2-Butanone                   8.89   43    60860    21.1322 ug/L    93
  30) Propionitrile                9.00   54    75478    94.0922 ug/L    99
  31) 2,2-Dichloropropane          9.10   77   320901    18.9195 ug/L   100
  32) cis-1,2-Dichloroethene       9.17   96   214157    20.5335 ug/L    96
  33) Chloroform                   9.37   83   370643    20.7805 ug/L    99
  34) 1-Bromopropane               9.50  122    41831    22.4735 ug/L    99
  35) Bromochloromethane           9.58  130   125985    21.6728 ug/L    98
  36) Tetrahydrofuran              9.61   42   155127    90.7443 ug/L    91
  38) 1,1,1-Trichloroethane        9.87   97   339816    21.1626 ug/L    92
  39) Cyclohexane                  9.91   56   333179    19.8263 ug/L    93
  40) 1,1-Dichloropropene         10.06   75   276762    20.5059 ug/L    99
  41) Carbon Tetrachloride        10.19  117   312052    21.1330 ug/L    98
  42) Tert-Amyl-Methyl ether      10.15   73  2116734    90.3591 ug/L    91
 -------------------------------------------------------------------------
 (#) = qualifier out of range (m) = manual integration
 11M96673.D  8260_WT.M      Wed Nov 06 14:52:48 2013                                    Page 1
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                         Quantitation Report    (Not Reviewed)

Data File : C:\MSDCHEM\1\DATA\110513\11M96673.D          Vial: 13
Acq On    :  5 Nov 2013  22:42                       Operator: FJB
Sample    : WG451178-12 20ug/L ALT SRC 8260          Inst    : hpms11
Misc      : 1,1 STD61121                             Multiplr: 1.00
MS Integration Params: rteint.p
Quant Time: Nov 06 14:52:47 2013          Quant Results File: 8260_WT.RES

Quant Method : C:\MSDCHEM\1\METHODS\8260_WT.M (RTE Integrator)
Title        : 8260B/624 (SOP: OVL MSV01) Water 11/05/13 HPMS11
Last Update  : Wed Nov 06 14:52:21 2013
Response via : Initial Calibration
DataAcq Meth : 8260_WT


      Compound                     R.T. QIon  Response  Conc Unit   Qvalue
 ---------------------------------------------------------------------------
  44) 1,2-Dichloroethane          10.36   62   266481    20.6675 ug/L    96
  45) Benzene                     10.40   78   766848    20.6009 ug/L    98
  46) Trichloroethene             11.10  130   209514    20.5025 ug/L    97
  47) Methylcyclohexane           11.19   83   295669    20.9102 ug/L    89
  48) 1,2-Dichloropropane         11.31   63   198039    20.4525 ug/L    85
  49) 1,4-Dioxane                 11.58   88    10866   171.6745 ug/L    88
  50) Bromodichloromethane        11.59   83   271858    20.2049 ug/L    98
  51) Dibromomethane              11.67   93   113250    21.3803 ug/L    91
  52) 2-Chloroethyl Vinyl Ether   11.86   63    96562    21.4498 ug/L    98
  53) 4-Methyl-2-Pentanone        11.89   58    52464    22.3688 ug/L    99
  54) cis-1,3-Dichloropropene     12.18   75   328819    21.2932 ug/L   100
  55) Dimethyl Disulfide          12.44   79   184671    21.7517 ug/L    90
  58) Toluene                     12.58   91   802122    21.4422 ug/L   100
  59) Ethyl Methacrylate          12.66   69   212460    23.0578 ug/L    88
  60) trans-1,3-Dichloropropene   12.74   75   271735    20.1677 ug/L    95
  61) 1,1,2-Trichloroethane       12.95   97   142526    21.0026 ug/L    97
  62) 2-Hexanone                  12.87   43    96157    22.5574 ug/L    82
  63) 1,3-Dichloropropane         13.23   76   257007    20.7241 ug/L    92
  64) Tetrachloroethene           13.35  164   160890    20.3642 ug/L    99
  65) Dibromochloromethane        13.60  129   190794    20.9817 ug/L    99
  66) 1,2-Dibromoethane           13.84  107   146418    21.1213 ug/L    99
  67) 1-Chlorohexane              13.91   91   274489    21.7372 ug/L    85
  68) Chlorobenzene               14.31  112   562617    21.3292 ug/L   100
  69) 1,1,1,2-Tetrachloroethane   14.33  131   200016    20.3351 ug/L    98
  70) Ethylbenzene                14.33  106   294821    20.1851 ug/L    95
  71) m-,p-Xylene                 14.41  106   734255    43.3541 ug/L    92
  72) o-Xylene                    14.94  106   367894    21.2558 ug/L    88
  73) Styrene                     14.97  104   595444    21.6105 ug/L    91
  74) Bromoform                   15.45  173   115032    21.6997 ug/L    96
  75) Isopropylbenzene            15.32  105   899855    22.5367 ug/L    96
  77) 1,1,2,2-Tetrachloroethane   15.53   83   169139    20.6199 ug/L    97
  79) 1,2,3-Trichloropropane      15.72  110    50038    20.5066 ug/L #  56
  80) trans-1,4-Dichloro-2-Buten  15.75   53    40258    13.6946 ug/L #   1
  81) n-Propylbenzene             15.80   91  1066280    21.3479 ug/L    99
  82) Bromobenzene                15.93  156   227334    20.6400 ug/L    55
  83) 1,3,5-Trimethylbenzene      15.97  105   756510    21.4092 ug/L    93
  84) 2-Chlorotoluene             16.06   91   693399    21.2573 ug/L    91
  85) 4-Chlorotoluene             16.10   91   695478    20.8441 ug/L   100
  86) a-Methylstyrene             16.35  118   438144    23.1797 ug/L    88
  87) tert-Butylbenzene           16.41  134   160529    21.4416 ug/L    82
  88) 1,2,4-Trimethylbenzene      16.45  105   760133    21.1907 ug/L    93
  89) sec-Butylbenzene            16.66  105   897942    22.1684 ug/L   100
  90) p-Isopropyltoluene          16.80  119   746085    21.5540 ug/L    98
  91) 1,3-Dichlorobenzene         17.00  146   440175    21.3720 ug/L    99
  92) 1,4-Dichlorobenzene         17.11  146   433926    20.0544 ug/L    98
  93) n-Butylbenzene              17.29   91   662897    21.5001 ug/L    99
  94) 1,2-Dichlorobenzene         17.58  146   421672    21.7611 ug/L   100
  95) 1,2-Dibromo-3-Chloropropan  18.50   75    33521    22.1062 ug/L    99
  96) 1,2,4-Trichlorobenzene      19.56  180   275602    21.0381 ug/L    99
  97) Hexachlorobutadiene         19.70  225   102819    20.3172 ug/L    97
  98) Naphthalene                 19.91  128   568263    22.4353 ug/L    97
  99) 1,2,3-Trichlorobenzene      20.20  180   251794    20.8748 ug/L    98


 ---------------------------------------------------------------------------
 (#) = qualifier out of range (m) = manual integration
 11M96673.D  8260_WT.M      Wed Nov 06 14:52:48 2013                             Page 2
```
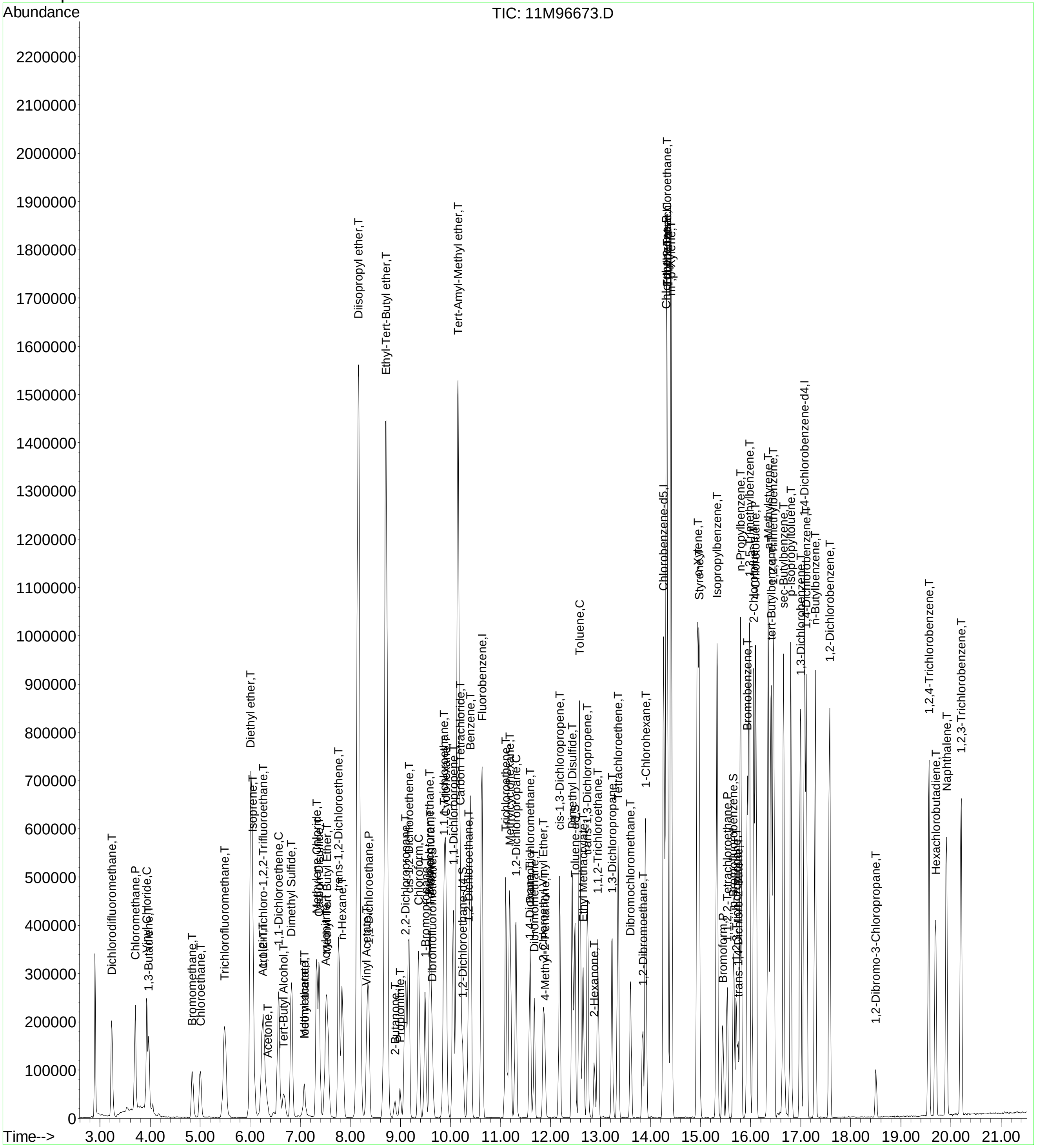

```
                        Quantitation Report    (Not Reviewed)

  Data File : C:\MSDCHEM\1\DATA\110513\11M96673.D           Vial: 13
  Acq On    :  5 Nov 2013  22:42                         Operator: FJB
  Sample    : WG451178-12 20ug/L ALT SRC 8260            Inst    : hpms11
  Misc      : 1,1 STD61121                               Multiplr: 1.00
  MS Integration Params: rteint.p
  Quant Time: Nov  6 14:52 2013            Quant Results File: 8260_WT.RES

  Method       : C:\MSDCHEM\1\METHODS\8260_WT.M (RTE Integrator)
  Title        : 8260B/624 (SOP: OVL MSV01) Water 11/05/13 HPMS11
  Last Update  : Wed Nov 06 14:52:21 2013
  Response via : Initial Calibration
```

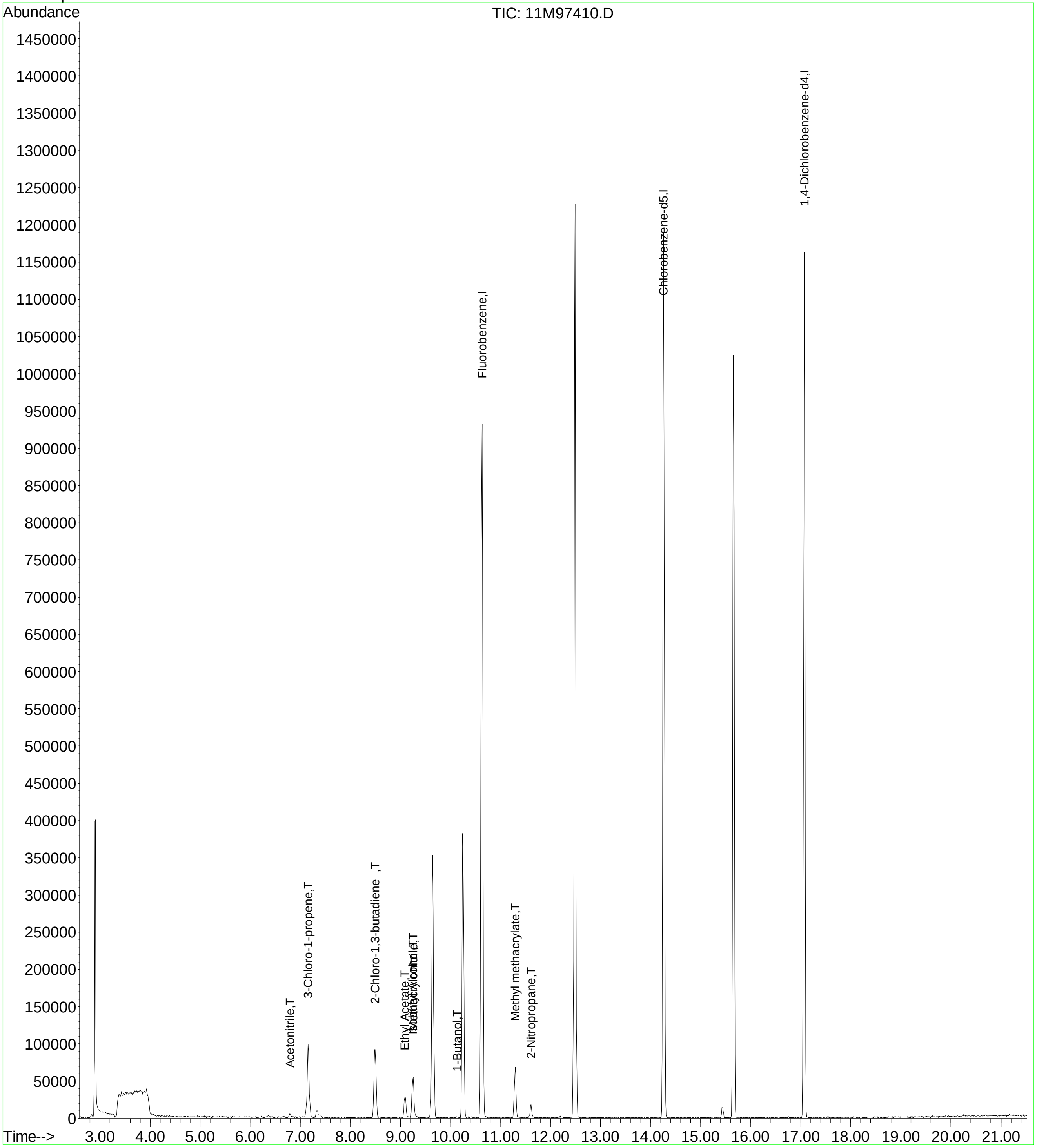


```
                            Evaluate Continuing Calibration Report
   Data File : C:\MSDCHEM\1\DATA\110513\11M96673.D         Vial: 13
   Acq On    :  5 Nov 2013  22:42                      Operator: FJB
   Sample    : WG451178-12 20ug/L ALT SRC 8260         Inst    : hpms11
   Misc      : 1,1 STD61121                            Multiplr: 1.00
   MS Integration Params: rteint.p

   Method       : C:\MSDCHEM\1\METHODS\8260_WT.M (RTE Integrator)
   Title        : 8260B/624 (SOP: OVL MSV01) Water 11/05/13 HPMS11
   Last Update  : Wed Nov 06 14:52:21 2013
   Response via : Multiple Level Calibration

   Min. RRF     :   0.000  Min. Rel. Area :  50%  Max. R.T. Dev  0.50min
   Max. RRF Dev :  25%     Max. Rel. Area : 150%

        Compound                      Amount  Calc.      %Dev Area% Dev(min)
  --------------------------------------------------------------------------
 1 I    Fluorobenzene                25.0000  25.0000       0.0   96   0.00
 2 T    Dichlorodifluoromethane      20.0000  30.9006     -54.5# 136   0.00
 3 P    Chloromethane                20.0000  23.1880     -15.9  109   0.00
 4 C    Vinyl Chloride               20.0000  23.7626     -18.8  107  -0.01
 5 T    1,3-Butadiene                20.0000   7.8349      60.8#  39  -0.01
 6 T    Bromomethane                 20.0000  20.5140      -2.6  107  -0.01
 7 T    Chloroethane                 20.0000  21.0128      -5.1   99   0.00
 8 T    Trichlorofluoromethane       20.0000  23.1575     -15.8  109   0.00
 9 T    Diethyl ether                80.0000  94.0690     -17.6  117   0.00
10 T    Isoprene                     20.0000  21.9865      -9.9  105   0.00
11 T    Acrolein                     40.0000 221.9320     -454.8# 861   0.00
12 T    1,1,2-Trichloro-1,2,2-Trifl  20.0000  22.8509     -14.3  109  -0.01
13 T    Acetone                      20.0000  23.7705     -18.9  136   0.01
14 C    1,1-Dichloroethene           20.0000  19.6499       1.8   93   0.00
15 T    Tert-Butyl Alcohol          160.0000 188.5514     -17.8  124   0.00
16 T    Dimethyl Sulfide             20.0000  25.2361     -26.2# 118   0.00
17 T    Iodomethane                  20.0000  11.4083      43.0#  46   0.01
18 T    Methyl acetate               20.0000  21.2297      -6.1  111   0.00
19 T    Methylene Chloride           20.0000  19.5472       2.3   99   0.00
20 T    Carbon Disulfide             20.0000  21.5339      -7.7   98  -0.01
21 T    Acrylonitrile                40.0000  22.0796      44.8#  56   0.01
22 T    Methyl Tert Butyl Ether      20.0000  22.3614     -11.8  110   0.01
23 T    trans-1,2-Dichloroethene     20.0000  20.0158      -0.1   96   0.00
24 T    n-Hexane                     20.0000  19.1797       4.1   90   0.00
25 T    Diisopropyl ether            80.0000  88.2745     -10.3  107   0.00
26 T    Vinyl Acetate                20.0000  26.4727     -32.4# 121   0.00
27 P    1,1-Dichloroethane           20.0000  20.7599      -3.8   99   0.00
28 T    Ethyl-Tert-Butyl ether       80.0000  88.4852     -10.6  109   0.01
29 T    2-Butanone                   20.0000  21.1322      -5.7  119   0.00
30 T    Propionitrile                80.0000  94.0922     -17.6  119   0.00
31 T    2,2-Dichloropropane          20.0000  18.9195       5.4   92  -0.01
32 T    cis-1,2-Dichloroethene       20.0000  20.5335      -2.7   98   0.00
33 C    Chloroform                   20.0000  20.7805      -3.9  101   0.00
34 T    1-Bromopropane               20.0000  22.4735     -12.4  104   0.00
35 T    Bromochloromethane           20.0000  21.6729      -8.4  100   0.00
36 T    Tetrahydrofuran              80.0000  90.7443     -13.4  120   0.00
37 S    Dibromofluoromethane         10.0000   9.7575       2.4   98   0.00
38 T    1,1,1-Trichloroethane        20.0000  21.1626      -5.8  101   0.00
39 T    Cyclohexane                  20.0000  19.8263       0.9   97   0.00
40 T    1,1-Dichloropropene          20.0000  20.5059      -2.5   96   0.00
41 T    Carbon Tetrachloride         20.0000  21.1330      -5.7  101   0.00
42 T    Tert-Amyl-Methyl ether       80.0000  90.3591     -12.9  111   0.00
43 S    1,2-Dichloroethane-d4        10.0000   9.5754       4.2   97   0.00
44 T    1,2-Dichloroethane           20.0000  20.6675      -3.3   98   0.00
45 T    Benzene                      20.0000  20.6009      -3.0   98   0.00
46 T    Trichloroethene              20.0000  20.5025      -2.5   99   0.00
47 T    Methylcyclohexane            20.0000  20.9102      -4.6   97   0.00
48 C    1,2-Dichloropropane          20.0000  20.4525      -2.3   98   0.00
49 T    1,4-Dioxane                 160.0000 171.6745      -7.3  115   0.00
50 T    Bromodichloromethane         20.0000  20.2049      -1.0   97   0.00
51 T    Dibromomethane               20.0000  21.3803      -6.9  104   0.00
52 T    2-Chloroethyl Vinyl Ether    20.0000  21.4498      -7.2  103   0.00
53 T    4-Methyl-2-Pentanone         20.0000  22.3688     -11.8  116   0.00
54 T    cis-1,3-Dichloropropene      20.0000  21.2932      -6.5  100   0.00
--------------------------------------------------------------------------
 (#) = Out of Range
 11M96673.D  8260_WT.M      Wed Nov 06 14:53:59 2013                           Page 1
```

```
                        Evaluate Continuing Calibration Report

   Data File : C:\MSDCHEM\1\DATA\110513\11M96673.D         Vial: 13
   Acq On    :  5 Nov 2013  22:42                       Operator: FJB
   Sample    : WG451178-12 20ug/L ALT SRC 8260          Inst    : hpms11
   Misc      : 1,1 STD61121                             Multiplr: 1.00
   MS Integration Params: rteint.p

   Method       : C:\MSDCHEM\1\METHODS\8260_WT.M (RTE Integrator)
   Title        : 8260B/624 (SOP: OVL MSV01) Water 11/05/13 HPMS11
   Last Update  : Wed Nov 06 14:52:21 2013
   Response via : Multiple Level Calibration

   Min. RRF     :   0.000  Min. Rel. Area :  50%  Max. R.T. Dev  0.50min
   Max. RRF Dev :  25%     Max. Rel. Area : 150%

        Compound                      Amount  Calc.      %Dev Area% Dev(min)
  ----------------------------------------------------------------------------
55 T    Dimethyl Disulfide           20.0000  21.7517      -8.8  103   0.00
56 I    Chlorobenzene-d5             25.0000  25.0000       0.0   96   0.00
57 S    Toluene-d8                   10.0000  10.4046      -4.0   99   0.00
58 C    Toluene                      20.0000  21.4422      -7.2   98   0.00
59 T    Ethyl Methacrylate           20.0000  23.0578     -15.3  113   0.00
60 T    trans-1,3-Dichloropropene    20.0000  20.1677      -0.8   95   0.00
61 T    1,1,2-Trichloroethane        20.0000  21.0026      -5.0  100   0.00
62 T    2-Hexanone                   20.0000  22.5574     -12.8  120   0.00
63 T    1,3-Dichloropropane          20.0000  20.7241      -3.6  100   0.00
64 T    Tetrachloroethene            20.0000  20.3642      -1.8   97   0.00
65 T    Dibromochloromethane         20.0000  20.9817      -4.9  101   0.00
66 T    1,2-Dibromoethane            20.0000  21.1213      -5.6  101   0.00
67 T    1-Chlorohexane               20.0000  21.7372      -8.7   99   0.00
68 P    Chlorobenzene                20.0000  21.3292      -6.6  101   0.00
69 T    1,1,1,2-Tetrachloroethane    20.0000  20.3350      -1.7   99   0.00
70 C    Ethylbenzene                 20.0000  20.1851      -0.9   97   0.00
71 T    m-,p-Xylene                  40.0000  43.3541      -8.4  101   0.01
72 T    o-Xylene                     20.0000  21.2558      -6.3  101   0.00
73 T    Styrene                      20.0000  21.6105      -8.1  100   0.00
74 P    Bromoform                    20.0000  21.6997      -8.5  106   0.01
75 T    Isopropylbenzene             20.0000  22.5367     -12.7  102   0.00

76 I    1,4-Dichlorobenzene-d4       25.0000  25.0000       0.0  100   0.00
77 P    1,1,2,2-Tetrachloroethane    20.0000  20.6199      -3.1  101   0.00
78 S    p-Bromofluorobenzene         10.0000   9.9335       0.7   99   0.00
79 T    1,2,3-Trichloropropane       20.0000  20.5066      -2.5  105   0.01
80 T    trans-1,4-Dichloro-2-Butene  20.0000  13.6946      31.5#  74   0.00
81 T    n-Propylbenzene              20.0000  21.3479      -6.7  100   0.00
82 T    Bromobenzene                 20.0000  20.6400      -3.2  102   0.00
83 T    1,3,5-Trimethylbenzene       20.0000  21.4093      -7.0  101   0.00
84 T    2-Chlorotoluene              20.0000  21.2573      -6.3  106   0.00
85 T    4-Chlorotoluene              20.0000  20.8441      -4.2  101   0.00
86 T    a-Methylstyrene              20.0000  23.1797     -15.9  107   0.00
87 T    tert-Butylbenzene            20.0000  21.4416      -7.2  105   0.00
88 T    1,2,4-Trimethylbenzene       20.0000  21.1907      -6.0   99   0.00
89 T    sec-Butylbenzene             20.0000  22.1684     -10.8  103   0.00
90 T    p-Isopropyltoluene           20.0000  21.5540      -7.8   99   0.00
91 T    1,3-Dichlorobenzene          20.0000  21.3720      -6.9  103   0.00
92 T    1,4-Dichlorobenzene          20.0000  20.0544      -0.3  100   0.00
93 T    n-Butylbenzene               20.0000  21.5001      -7.5   99   0.00
94 T    1,2-Dichlorobenzene          20.0000  21.7611      -8.8  106   0.00
95 T    1,2-Dibromo-3-Chloropropane  20.0000  22.1062     -10.5  114   0.00
96 T    1,2,4-Trichlorobenzene       20.0000  21.0381      -5.2  102   0.00
97 T    Hexachlorobutadiene          20.0000  20.3172      -1.6   98   0.00
98 T    Naphthalene                  20.0000  22.4353     -12.2  108   0.00
99 T    1,2,3-Trichlorobenzene       20.0000  20.8747      -4.4  105   0.00

--------------------------------------------------------------------------
 (#) = Out of Range            SPCC's out = 0  CCC's out = 0
 11M96673.D  8260_WT.M      Wed Nov 06 14:53:59 2013                     Page 2
```

```
                          Quantitation Report    (Not Reviewed)
Data File : C:\MSDCHEM\1\DATA\120413\11M97410.D         Vial: 3
Acq On    :  4 Dec 2013  16:06                      Operator: FJB
Sample    : WG455130-02 5ug/L STD A9FOO             Inst    : hpms11
Misc      : 1,1 STD61356                            Multiplr: 1.00
MS Integration Params: rteint.p
Quant Time: Dec 18 14:24:48 2013          Quant Results File: A9WTR.RES

Quant Method : C:\MSDCHEM\1\METHODS\A9WTR.M (RTE Integrator)
Title        : Appendix IX (SOP:OVL MSV01) Water 09/11/13 HPMS11
Last Update  : Wed Dec 18 14:24:41 2013
Response via : Initial Calibration
DataAcq Meth : 8260_WT

 Internal Standards                R.T. QIon  Response  Conc Units Dev(Min)
 -------------------------------------------------------------------------
   1) Fluorobenzene               10.63   96  1015273    25.00 ug/L    0.00
  12) Chlorobenzene-d5            14.26  117   744134    25.00 ug/L    0.00
  13) 1,4-Dichlorobenzene-d4      17.07  152   339002    25.00 ug/L    0.00

 Target Compounds                                                    Qvalue
   2) Acetonitrile                 6.79   41     7380     6.1273 ug/L    96
   3) 3-Chloro-1-propene           7.16   41    97016     4.9218 ug/L    92
   4) 2-Chloro-1,3-butadiene       8.50   53    92907     4.5683 ug/L    89
   5) Methacrylonitrile            9.25   41    39802     5.4732 ug/L    84
   6) Isobutyl Alcohol             9.24   43     5282    14.0774 ug/L    87
   7) 1-Butanol                   10.13   56      746    17.3202 ug/L #  51
   8) Cyclohexanone               15.44   55     8875    Below Cal     93
   9) 2-Nitropropane              11.61   43    14809     4.4591 ug/L    84
  10) Ethyl Acetate                9.09   43    49960     5.2522 ug/L    98
  11) Methyl methacrylate         11.29   41    47778     4.9682 ug/L    91

 -------------------------------------------------------------------------
 (#) = qualifier out of range (m) = manual integration
 11M97410.D  A9WTR.M      Wed Dec 18 14:51:22 2013                 Page 1
```

```
                          Quantitation Report    (Not Reviewed)

Data File : C:\MSDCHEM\1\DATA\120413\11M97410.D          Vial: 3
Acq On    :  4 Dec 2013  16:06                        Operator: FJB
Sample    : WG455130-02 5ug/L STD A9FOO               Inst    : hpms11
Misc      : 1,1 STD61356                              Multiplr: 1.00
MS Integration Params: rteint.p
Quant Time: Dec 18 14:24 2013            Quant Results File: A9WTR.RES

Method       : C:\MSDCHEM\1\METHODS\A9WTR.M (RTE Integrator)
Title        : Appendix IX (SOP:OVL MSV01) Water 12/04/13 HPMS11
Last Update  : Wed Dec 18 14:24:41 2013
Response via : Initial Calibration
```



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11M97410.D  A9WTR.M      Wed Dec 18 14:51:22 2013                         Page 2
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                          Quantitation Report    (Not Reviewed)

Data File : C:\MSDCHEM\1\DATA\120413\11M97411.D          Vial: 4
Acq On    :  4 Dec 2013  16:38                       Operator: FJB
Sample    : WG455130-03 20ug/L STD A9FOO             Inst    : hpms11
Misc      : 1,1 STD61356                             Multiplr: 1.00
MS Integration Params: rteint.p
Quant Time: Dec 18 14:25:11 2013           Quant Results File: A9WTR.RES

Quant Method : C:\MSDCHEM\1\METHODS\A9WTR.M (RTE Integrator)
Title        : Appendix IX (SOP:OVL MSV01) Water 09/11/13 HPMS11
Last Update  : Wed Dec 18 14:24:41 2013
Response via : Initial Calibration
DataAcq Meth : 8260_WT

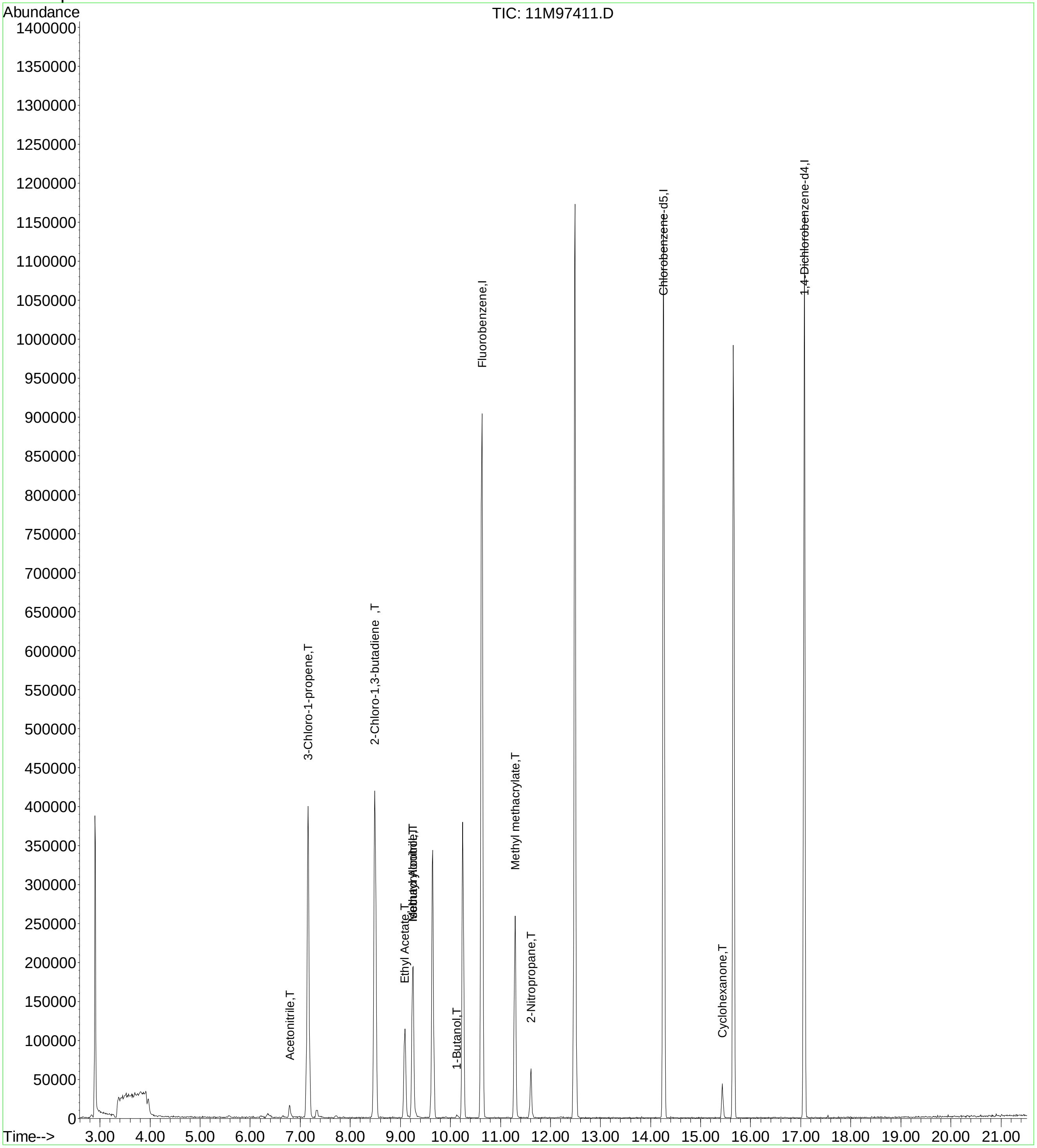
 Internal Standards                 R.T. QIon  Response  Conc Units Dev(Min)
-------------------------------------------------------------------------
  1) Fluorobenzene                 10.63   96  1003605    25.00 ug/L    0.00
 12) Chlorobenzene-d5              14.26  117   728788    25.00 ug/L    0.00
 13) 1,4-Dichlorobenzene-d4        17.07  152   329987    25.00 ug/L    0.00

 Target Compounds                                                    Qvalue
  2) Acetonitrile                   6.79   41    22406    18.8189 ug/L    92
  3) 3-Chloro-1-propene             7.16   41   399253    20.4904 ug/L    94
  4) 2-Chloro-1,3-butadiene         8.49   53   403129    20.0527 ug/L    94
  5) Methacrylonitrile              9.24   41   142627    19.8409 ug/L    91
  6) Isobutyl Alcohol               9.24   43    15458    41.6772 ug/L    75
  7) 1-Butanol                     10.12   56     2376    26.2341 ug/L #  77
  8) Cyclohexanone                 15.44   55    22478    19.9644 ug/L    93
  9) 2-Nitropropane                11.61   43    56939    17.3441 ug/L    92
 10) Ethyl Acetate                  9.09   43   189706    20.1753 ug/L    99
 11) Methyl methacrylate           11.29   41   175887    18.5022 ug/L    91

-------------------------------------------------------------------------
 (#) = qualifier out of range (m) = manual integration
 11M97411.D  A9WTR.M      Wed Dec 18 14:51:23 2013                        Page 1
```

```
Data File : C:\MSDCHEM\1\DATA\120413\11M97411.D          Vial: 4
Acq On    :  4 Dec 2013  16:38                        Operator: FJB
Sample    : WG455130-03 20ug/L STD A9FOO              Inst    : hpms11
Misc      : 1,1 STD61356                              Multiplr: 1.00
MS Integration Params: rteint.p
Quant Time: Dec 18 14:25 2013             Quant Results File: A9WTR.RES

Method       : C:\MSDCHEM\1\METHODS\A9WTR.M (RTE Integrator)
Title        : Appendix IX (SOP:OVL MSV01) Water 12/04/13 HPMS11
Last Update  : Wed Dec 18 14:24:41 2013
Response via : Initial Calibration
```



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                          Quantitation Report    (Not Reviewed)

Data File : C:\MSDCHEM\1\DATA\120413\11M97412.D          Vial: 5
Acq On    :  4 Dec 2013  17:10                       Operator: FJB
Sample    : WG455130-04 50ug/L STD A9FOO             Inst    : hpms11
Misc      : 1,1 STD61356                             Multiplr: 1.00
MS Integration Params: rteint.p
Quant Time: Dec 18 14:25:33 2013          Quant Results File: A9WTR.RES

Quant Method : C:\MSDCHEM\1\METHODS\A9WTR.M (RTE Integrator)
Title        : Appendix IX (SOP:OVL MSV01) Water 09/11/13 HPMS11
Last Update  : Wed Dec 18 14:24:41 2013
Response via : Initial Calibration
DataAcq Meth : 8260_WT

 Internal Standards                R.T. QIon  Response  Conc Units Dev(Min)
 -------------------------------------------------------------------------
   1) Fluorobenzene               10.63   96    994696    25.00 ug/L    0.00
  12) Chlorobenzene-d5            14.26  117    723608    25.00 ug/L    0.00
  13) 1,4-Dichlorobenzene-d4      17.07  152    327750    25.00 ug/L    0.00

 Target Compounds                                                     Qvalue
   2) Acetonitrile                 6.78   41     52946    44.8679 ug/L    93
   3) 3-Chloro-1-propene           7.16   41   1024766    53.0638 ug/L    93
   4) 2-Chloro-1,3-butadiene       8.49   53   1044277    52.4105 ug/L    93
   5) Methacrylonitrile            9.24   41    333698    46.8367 ug/L    90
   6) Isobutyl Alcohol             9.24   43     31085    84.5608 ug/L    91
   7) 1-Butanol                   10.12   56      5344    42.6407 ug/L #  90
   8) Cyclohexanone               15.44   55     41078    52.0175 ug/L    94
   9) 2-Nitropropane              11.61   43    146743    45.0996 ug/L    96
  10) Ethyl Acetate                9.09   43    445242    47.7758 ug/L    99
  11) Methyl methacrylate         11.29   41    444001    47.1244 ug/L    91

 -------------------------------------------------------------------------
 (#) = qualifier out of range (m) = manual integration
 11M97412.D  A9WTR.M      Wed Dec 18 14:51:24 2013                         Page 1
```
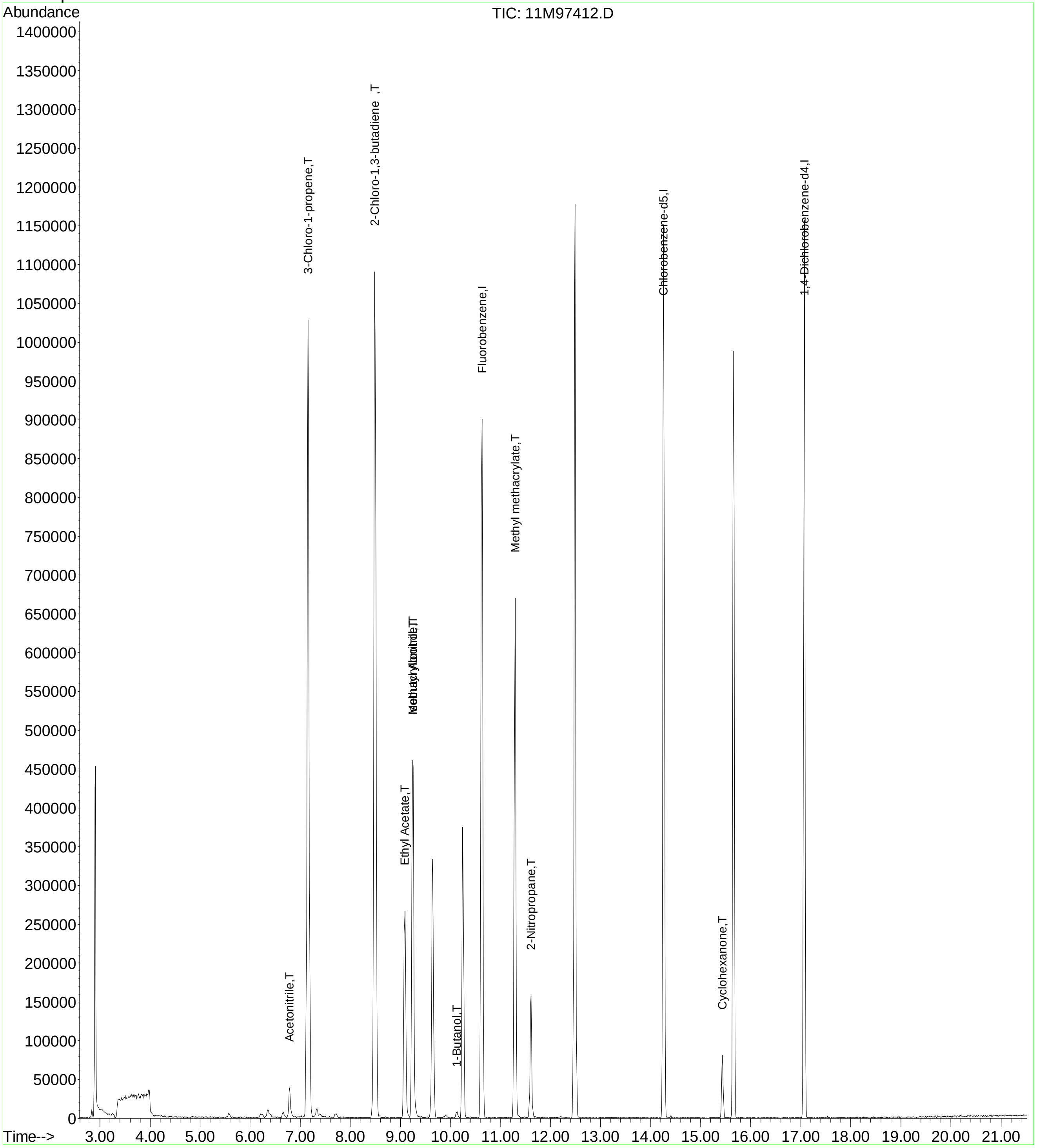

```
                                 Quantitation Report    (Not Reviewed)

  Data File : C:\MSDCHEM\1\DATA\120413\11M97412.D          Vial: 5
  Acq On    :  4 Dec 2013  17:10                       Operator: FJB
  Sample    : WG455130-04 50ug/L STD A9FOO             Inst    : hpms11
  Misc      : 1,1 STD61356                             Multiplr: 1.00
  MS Integration Params: rteint.p
  Quant Time: Dec 18 14:25 2013             Quant Results File: A9WTR.RES

  Method       : C:\MSDCHEM\1\METHODS\A9WTR.M (RTE Integrator)
  Title        : Appendix IX (SOP:OVL MSV01) Water 12/04/13 HPMS11
  Last Update  : Wed Dec 18 14:24:41 2013
  Response via : Initial Calibration
```



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11M97412.D  A9WTR.M      Wed Dec 18 14:51:24 2013                        Page 2
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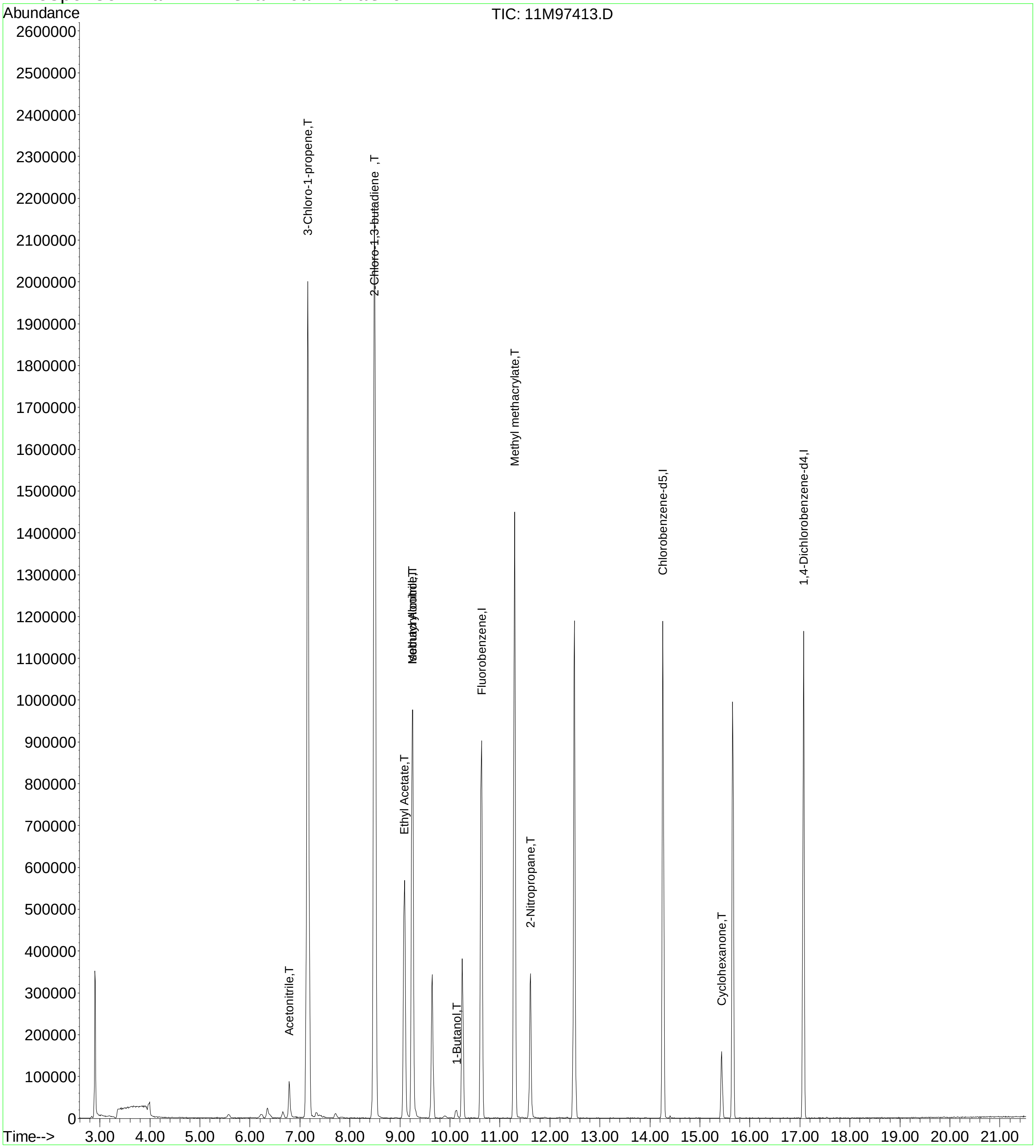
```
                               Quantitation Report    (Not Reviewed)

Data File : C:\MSDCHEM\1\DATA\120413\11M97413.D          Vial: 6
Acq On    :  4 Dec 2013  17:41                       Operator: FJB
Sample    : WG455130-05 100ug/L STD A9FOO            Inst    : hpms11
Misc      : 1,1 STD61356                             Multiplr: 1.00
MS Integration Params: rteint.p
Quant Time: Dec 18 14:12:22 2013           Quant Results File: A9WTR.RES

Quant Method : C:\MSDCHEM\1\METHODS\A9WTR.M (RTE Integrator)
Title        : Appendix IX (SOP:OVL MSV01) Water 09/11/13 HPMS11
Last Update  : Wed Dec 04 15:12:01 2013
Response via : Initial Calibration
DataAcq Meth : 8260_WT

 Internal Standards                  R.T. QIon  Response  Conc Units Dev(Min)
 -------------------------------------------------------------------------
   1) Fluorobenzene                 10.63   96   992538    25.00 ug/L    0.00
  12) Chlorobenzene-d5              14.26  117   731142    25.00 ug/L    0.00
  13) 1,4-Dichlorobenzene-d4        17.07  152   335229    25.00 ug/L    0.00

 Target Compounds                                                     Qvalue
   2) Acetonitrile                   6.78   41   115266   135.6734 ug/L    96
   3) 3-Chloro-1-propene             7.16   41  1991273   120.7010 ug/L    95
   4) 2-Chloro-1,3-butadiene         8.49   53  2078232   118.9967 ug/L    94
   5) Methacrylonitrile              9.24   41   699121   132.9800 ug/L    91
   6) Isobutyl Alcohol               9.24   43    71429   349.3734 ug/L    88
   7) 1-Butanol                     10.13   56    14832   232.5307 ug/L    91
   8) Cyclohexanone                 15.44   55    84641    66.1657 ug/L    93
   9) 2-Nitropropane                11.61   43   326350   139.3861 ug/L   100
  10) Ethyl Acetate                  9.09   43   937224   140.6538 ug/L    98
  11) Methyl methacrylate           11.29   41   964144   136.2275 ug/L    90

 -------------------------------------------------------------------------
 (#) = qualifier out of range (m) = manual integration
 11M97413.D  A9WTR.M      Wed Dec 18 14:51:25 2013                            Page 1
```

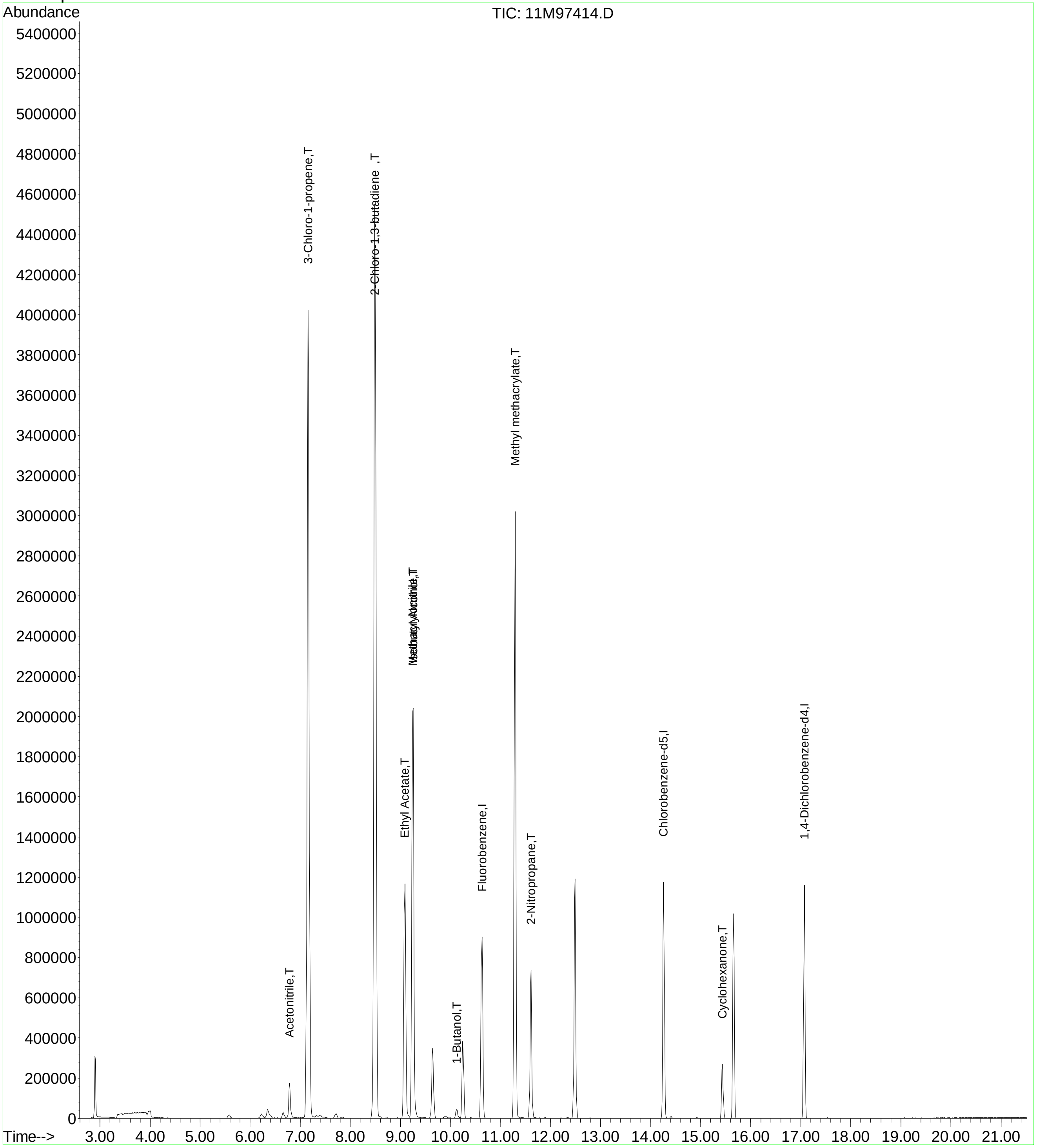
```
                              Quantitation Report    (Not Reviewed)

  Data File : C:\MSDCHEM\1\DATA\120413\11M97413.D          Vial: 6
  Acq On    :  4 Dec 2013  17:41                        Operator: FJB
  Sample    : WG455130-05 100ug/L STD A9FOO             Inst    : hpms11
  Misc      : 1,1 STD61356                              Multiplr: 1.00
  MS Integration Params: rteint.p
  Quant Time: Dec 18 14:12 2013            Quant Results File: A9WTR.RES

  Method       : C:\MSDCHEM\1\METHODS\A9WTR.M (RTE Integrator)
  Title        : Appendix IX (SOP:OVL MSV01) Water 12/04/13 HPMS11
  Last Update  : Wed Dec 18 14:24:41 2013
  Response via : Initial Calibration
```



```
                              Quantitation Report    (Not Reviewed)

Data File : C:\MSDCHEM\1\DATA\120413\11M97414.D          Vial: 7
Acq On    :  4 Dec 2013  18:13                       Operator: FJB
Sample    : WG455130-06 200ug/L STD A9FOO            Inst    : hpms11
Misc      : 1,1 STD61356                             Multiplr: 1.00
MS Integration Params: rteint.p
Quant Time: Dec 18 14:12:23 2013          Quant Results File: A9WTR.RES

Quant Method : C:\MSDCHEM\1\METHODS\A9WTR.M (RTE Integrator)
Title        : Appendix IX (SOP:OVL MSV01) Water 09/11/13 HPMS11
Last Update  : Wed Dec 04 15:12:01 2013
Response via : Initial Calibration
DataAcq Meth : 8260_WT

 Internal Standards                 R.T. QIon  Response  Conc Units Dev(Min)
 -------------------------------------------------------------------------
   1) Fluorobenzene                10.63   96   988807    25.00 ug/L    0.00
  12) Chlorobenzene-d5             14.26  117   731619    25.00 ug/L    0.00
  13) 1,4-Dichlorobenzene-d4       17.07  152   334379    25.00 ug/L    0.00

 Target Compounds                                                    Qvalue
   2) Acetonitrile                  6.78   41   232790   275.0384 ug/L    94
   3) 3-Chloro-1-propene            7.15   41  3995107   243.0771 ug/L    96
   4) 2-Chloro-1,3-butadiene        8.49   53  4217979   242.4270 ug/L    96
   5) Methacrylonitrile             9.24   41  1449357   276.7229 ug/L    90
   6) Isobutyl Alcohol              9.25   43   147277   723.0792 ug/L    93
   7) 1-Butanol                    10.12   56    32681   514.2940 ug/L    94
   8) Cyclohexanone                15.44   55   142369   111.7129 ug/L    95
   9) 2-Nitropropane               11.61   43   691892   296.6263 ug/L   100
  10) Ethyl Acetate                 9.09   43  1915002   288.4782 ug/L   100
  11) Methyl methacrylate          11.29   41  1981916   281.0888 ug/L    92
```

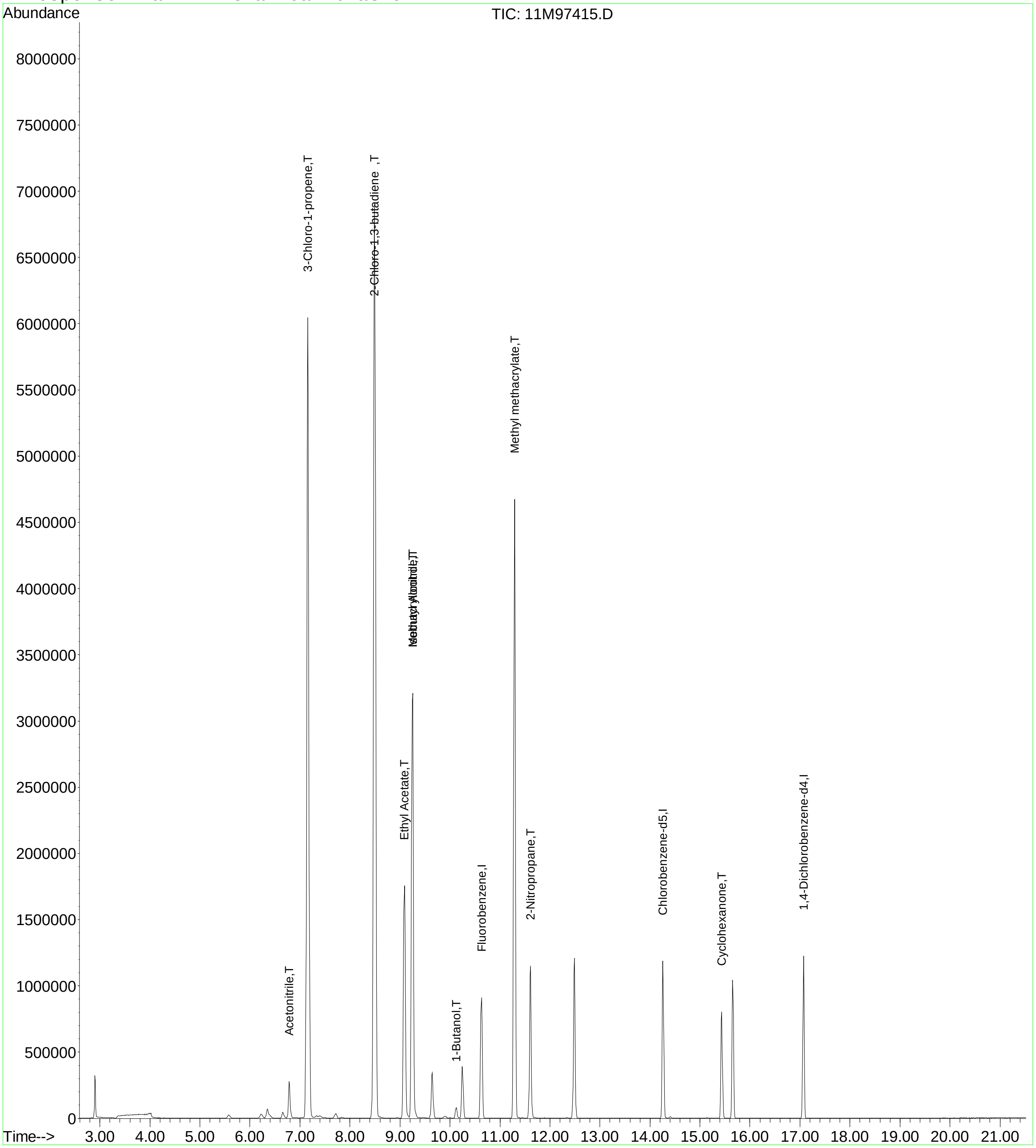
```
 -------------------------------------------------------------------------
 (#) = qualifier out of range (m) = manual integration
 11M97414.D  A9WTR.M      Wed Dec 18 14:51:26 2013                             Page 1
```

```
                          Quantitation Report    (Not Reviewed)

  Data File : C:\MSDCHEM\1\DATA\120413\11M97414.D          Vial: 7
  Acq On    :  4 Dec 2013  18:13                       Operator: FJB
  Sample    : WG455130-06 200ug/L STD A9FOO            Inst    : hpms11
  Misc      : 1,1 STD61356                             Multiplr: 1.00
  MS Integration Params: rteint.p
  Quant Time: Dec 18 14:12 2013             Quant Results File: A9WTR.RES

  Method       : C:\MSDCHEM\1\METHODS\A9WTR.M (RTE Integrator)
  Title        : Appendix IX (SOP:OVL MSV01) Water 12/04/13 HPMS11
  Last Update  : Wed Dec 18 14:24:41 2013
  Response via : Initial Calibration
```



```
                              Quantitation Report    (Not Reviewed)

Data File : C:\MSDCHEM\1\DATA\120413\11M97415.D          Vial: 8
Acq On    :  4 Dec 2013  18:44                       Operator: FJB
Sample    : WG455130-07 300ug/L STD A9FOO            Inst    : hpms11
Misc      : 1,1 STD61356                             Multiplr: 1.00
MS Integration Params: rteint.p
Quant Time: Dec 18 14:12:25 2013          Quant Results File: A9WTR.RES

Quant Method : C:\MSDCHEM\1\METHODS\A9WTR.M (RTE Integrator)
Title        : Appendix IX (SOP:OVL MSV01) Water 09/11/13 HPMS11
Last Update  : Wed Dec 04 15:12:01 2013
Response via : Initial Calibration
DataAcq Meth : 8260_WT

 Internal Standards                 R.T. QIon  Response  Conc Units Dev(Min)
-------------------------------------------------------------------------
   1) Fluorobenzene               10.63   96  1005971    25.00 ug/L    0.00
  12) Chlorobenzene-d5            14.26  117   746913    25.00 ug/L    0.00
  13) 1,4-Dichlorobenzene-d4      17.07  152   350321    25.00 ug/L    0.00

 Target Compounds                                                   Qvalue
   2) Acetonitrile                 6.78   41   366399   425.5096 ug/L    95
   3) 3-Chloro-1-propene           7.16   41  5950898   355.8968 ug/L    98
   4) 2-Chloro-1,3-butadiene       8.49   53  6283126   354.9591 ug/L    98
   5) Methacrylonitrile            9.25   41  2223559   417.2962 ug/L    92
   6) Isobutyl Alcohol             9.25   43   239192  1154.3132 ug/L    91
   7) 1-Butanol                   10.12   56    54835   848.2035 ug/L    94
   8) Cyclohexanone               15.44   55   430971   332.4007 ug/L    96
   9) 2-Nitropropane              11.61   43  1097748   462.5941 ug/L    99
  10) Ethyl Acetate                9.09   43  2909827   430.8608 ug/L   100
  11) Methyl methacrylate         11.29   41  3028050   422.1312 ug/L    93

-------------------------------------------------------------------------
(#) = qualifier out of range (m) = manual integration
11M97415.D  A9WTR.M      Wed Dec 18 14:51:27 2013                          Page 1
```

```
                              Quantitation Report    (Not Reviewed)

  Data File : C:\MSDCHEM\1\DATA\120413\11M97415.D         Vial: 8
  Acq On    :  4 Dec 2013  18:44                       Operator: FJB
  Sample    : WG455130-07 300ug/L STD A9FOO            Inst    : hpms11
  Misc      : 1,1 STD61356                             Multiplr: 1.00
  MS Integration Params: rteint.p
  Quant Time: Dec 18 14:12 2013            Quant Results File: A9WTR.RES

  Method       : C:\MSDCHEM\1\METHODS\A9WTR.M (RTE Integrator)
  Title        : Appendix IX (SOP:OVL MSV01) Water 12/04/13 HPMS11
  Last Update  : Wed Dec 18 14:24:41 2013
  Response via : Initial Calibration
```

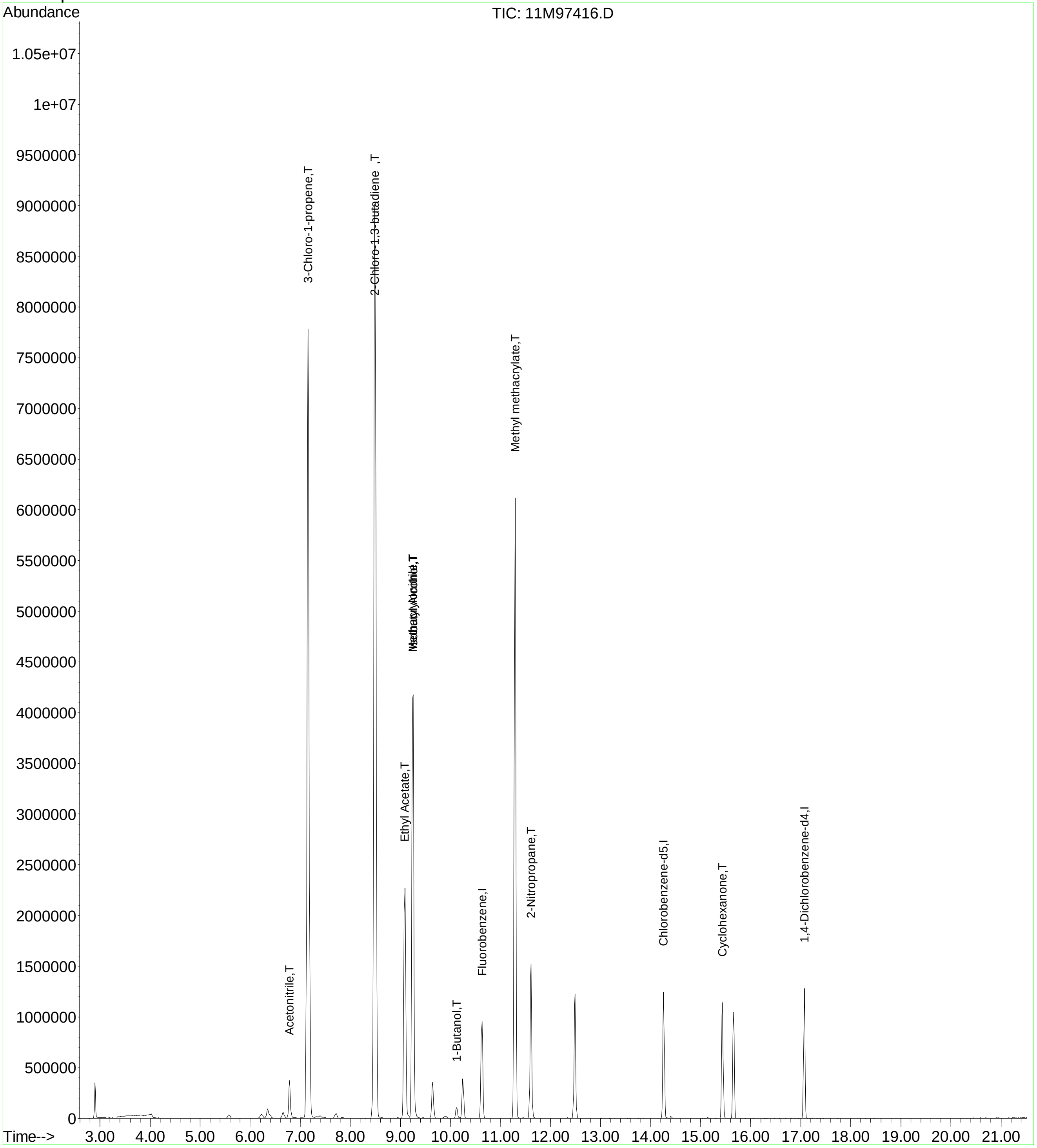


```
11M97415.D  A9WTR.M      Wed Dec 18 14:51:27 2013                          Page 2
```

```
                        Quantitation Report    (Not Reviewed)

Data File : C:\MSDCHEM\1\DATA\120413\11M97416.D          Vial: 9
Acq On    :  4 Dec 2013  19:15                       Operator: FJB
Sample    : WG455130-08 400ug/L STD A9FOO            Inst    : hpms11
Misc      : 1,1 STD61356                             Multiplr: 1.00
MS Integration Params: rteint.p
Quant Time: Dec 18 14:12:27 2013           Quant Results File: A9WTR.RES

Quant Method : C:\MSDCHEM\1\METHODS\A9WTR.M (RTE Integrator)
Title        : Appendix IX (SOP:OVL MSV01) Water 09/11/13 HPMS11
Last Update  : Wed Dec 04 15:12:01 2013
Response via : Initial Calibration
DataAcq Meth : 8260_WT

 Internal Standards                 R.T. QIon  Response  Conc Units Dev(Min)
-------------------------------------------------------------------------
  1) Fluorobenzene                 10.63   96  1041152    25.00 ug/L    0.00
 12) Chlorobenzene-d5              14.26  117   772014    25.00 ug/L    0.00
 13) 1,4-Dichlorobenzene-d4        17.07  152   363960    25.00 ug/L    0.00

 Target Compounds                                                  Qvalue
  2) Acetonitrile                   6.78   41   483561   542.5974 ug/L    97
  3) 3-Chloro-1-propene             7.15   41  7560842   436.9011 ug/L    99
  4) 2-Chloro-1,3-butadiene         8.49   53  7997132   436.5240 ug/L    99
  5) Methacrylonitrile              9.24   41  2900753   525.9905 ug/L    92
  6) Isobutyl Alcohol               9.25   43   315186  1469.6545 ug/L    90
  7) 1-Butanol                     10.12   56    77653  1160.5712 ug/L    95
  8) Cyclohexanone                 15.44   55   600146   447.2416 ug/L    96
  9) 2-Nitropropane                11.61   43  1468309   597.8417 ug/L    97
 10) Ethyl Acetate                  9.09   43  3750892   536.6309 ug/L   100
 11) Methyl methacrylate           11.29   41  3948233   531.8125 ug/L    93
```

```
-------------------------------------------------------------------------
(#) = qualifier out of range (m) = manual integration
11M97416.D  A9WTR.M      Wed Dec 18 14:51:28 2013                  Page 1
```

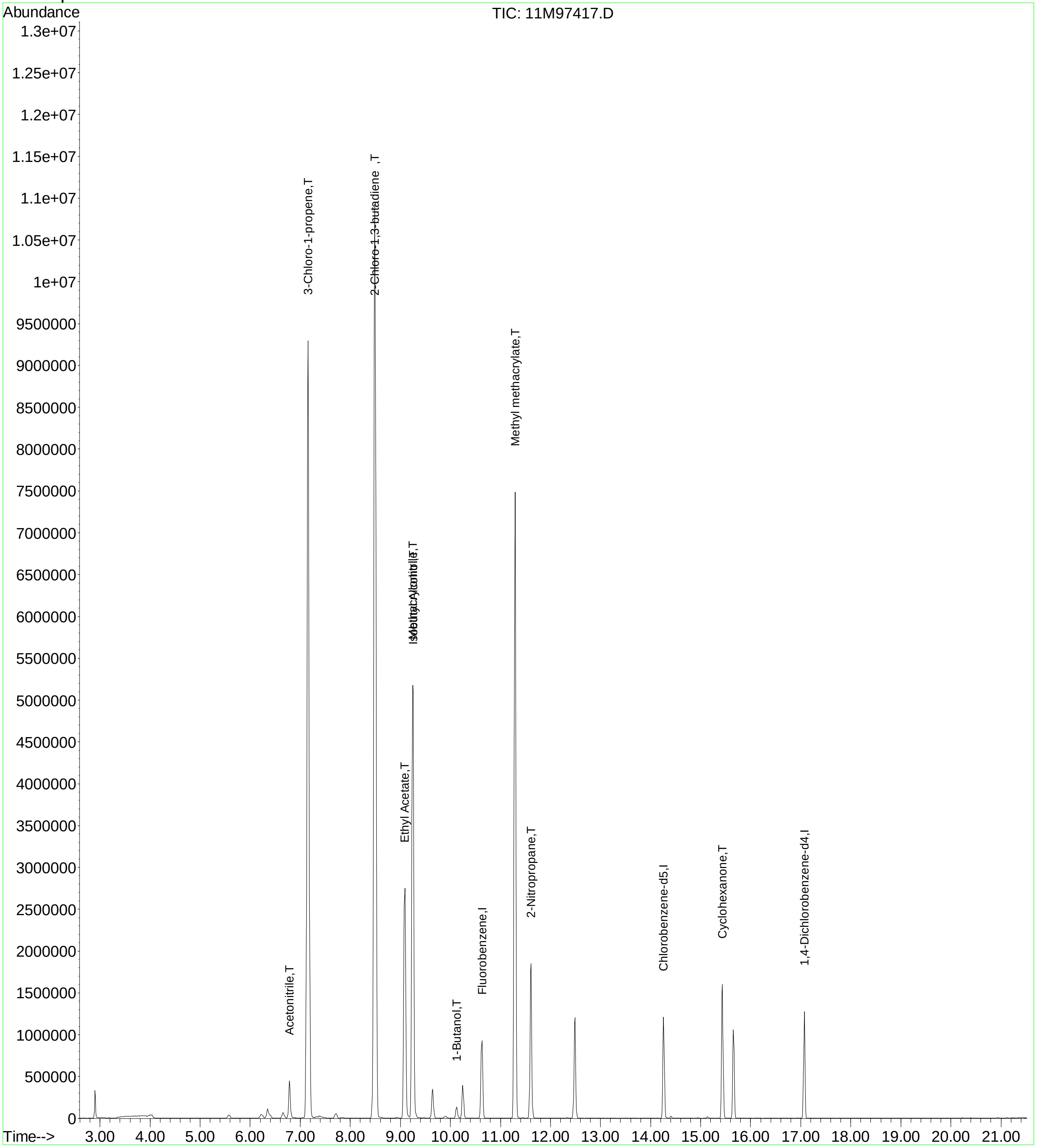
```
                         Quantitation Report    (Not Reviewed)

  Data File : C:\MSDCHEM\1\DATA\120413\11M97416.D         Vial: 9
  Acq On    :  4 Dec 2013  19:15                       Operator: FJB
  Sample    : WG455130-08 400ug/L STD A9FOO            Inst    : hpms11
  Misc      : 1,1 STD61356                             Multiplr: 1.00
  MS Integration Params: rteint.p
  Quant Time: Dec 18 14:12 2013             Quant Results File: A9WTR.RES

  Method       : C:\MSDCHEM\1\METHODS\A9WTR.M (RTE Integrator)
  Title        : Appendix IX (SOP:OVL MSV01) Water 12/04/13 HPMS11
  Last Update  : Wed Dec 18 14:24:41 2013
  Response via : Initial Calibration
```

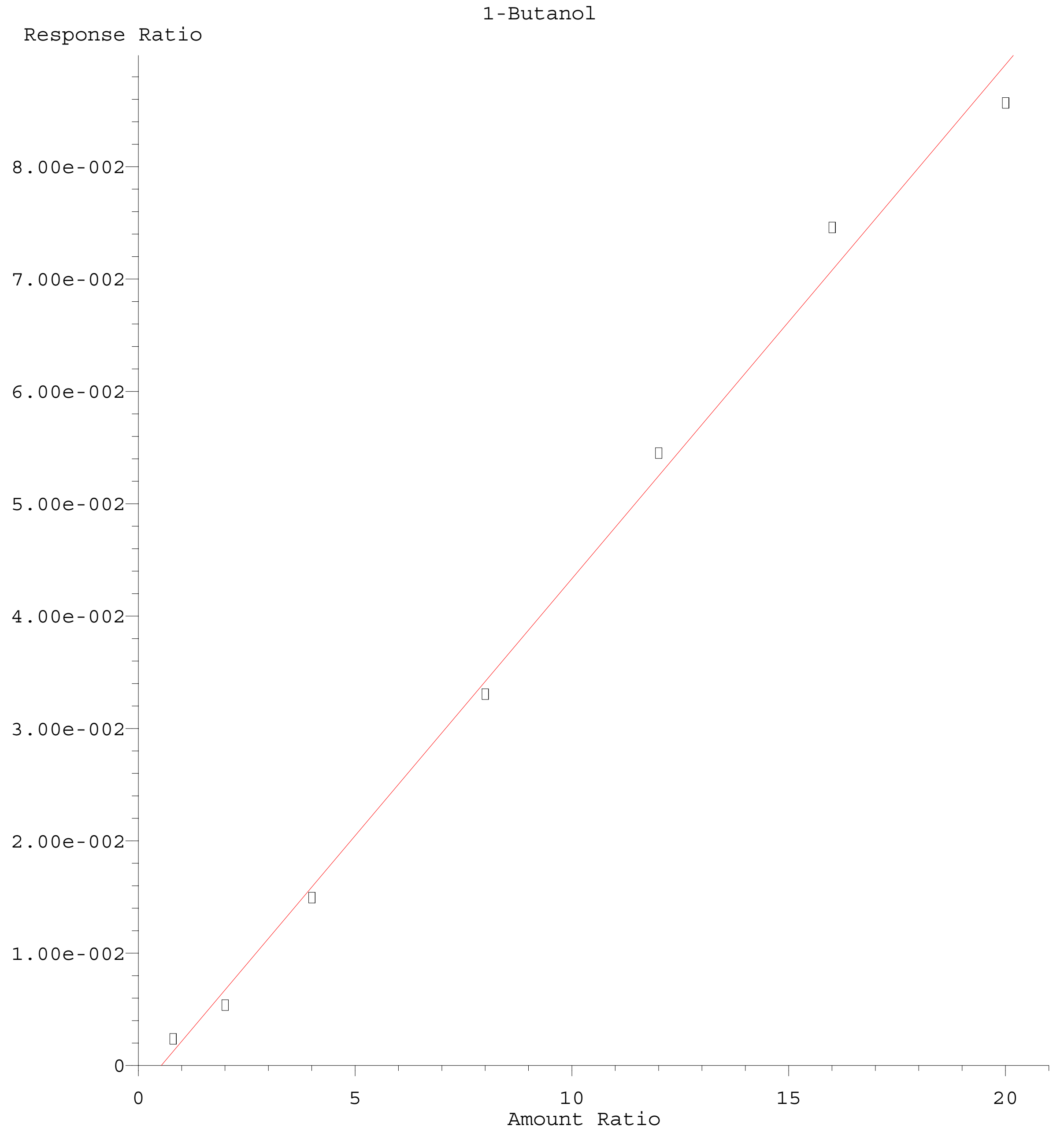


```
                              Quantitation Report    (Not Reviewed)

Data File : C:\MSDCHEM\1\DATA\120413\11M97417.D          Vial: 10
Acq On    :  4 Dec 2013  19:47                       Operator: FJB
Sample    : WG455130-09 500ug/L STD A9FOO            Inst    : hpms11
Misc      : 1,1 STD61356                             Multiplr: 1.00
MS Integration Params: rteint.p
Quant Time: Dec 18 14:12:29 2013           Quant Results File: A9WTR.RES

Quant Method : C:\MSDCHEM\1\METHODS\A9WTR.M (RTE Integrator)
Title        : Appendix IX (SOP:OVL MSV01) Water 09/11/13 HPMS11
Last Update  : Wed Dec 04 15:12:01 2013
Response via : Initial Calibration
DataAcq Meth : 8260_WT

 Internal Standards                 R.T. QIon  Response  Conc Units Dev(Min)
 ------------------------------------------------------------------------
   1) Fluorobenzene                10.63   96  1021128    25.00 ug/L    0.00
  12) Chlorobenzene-d5             14.26  117   757413    25.00 ug/L    0.00
  13) 1,4-Dichlorobenzene-d4       17.07  152   366136    25.00 ug/L    0.00

 Target Compounds                                                   Qvalue
   2) Acetonitrile                  6.78   41   583255   667.2965 ug/L    96
   3) 3-Chloro-1-propene            7.16   41  8973136   528.6779 ug/L    96
   4) 2-Chloro-1,3-butadiene        8.49   53  9485105   527.8980 ug/L    96
   5) Methacrylonitrile             9.24   41  3543333   655.1082 ug/L    93
   6) Isobutyl Alcohol              9.25   43   390584  1856.9351 ug/L    88
   7) 1-Butanol                    10.12   56    87481  1333.0955 ug/L    95
   8) Cyclohexanone                15.44   55   850844   646.5009 ug/L    96
   9) 2-Nitropropane               11.61   43  1794414   744.9469 ug/L    98
  10) Ethyl Acetate                 9.09   43  4560891   665.3111 ug/L    99
  11) Methyl methacrylate          11.29   41  4812232   660.9007 ug/L    94

 ------------------------------------------------------------------------
 (#) = qualifier out of range (m) = manual integration
 11M97417.D  A9WTR.M      Wed Dec 18 14:51:28 2013                        Page 1
```

Quantitation Report   (Not Reviewed)

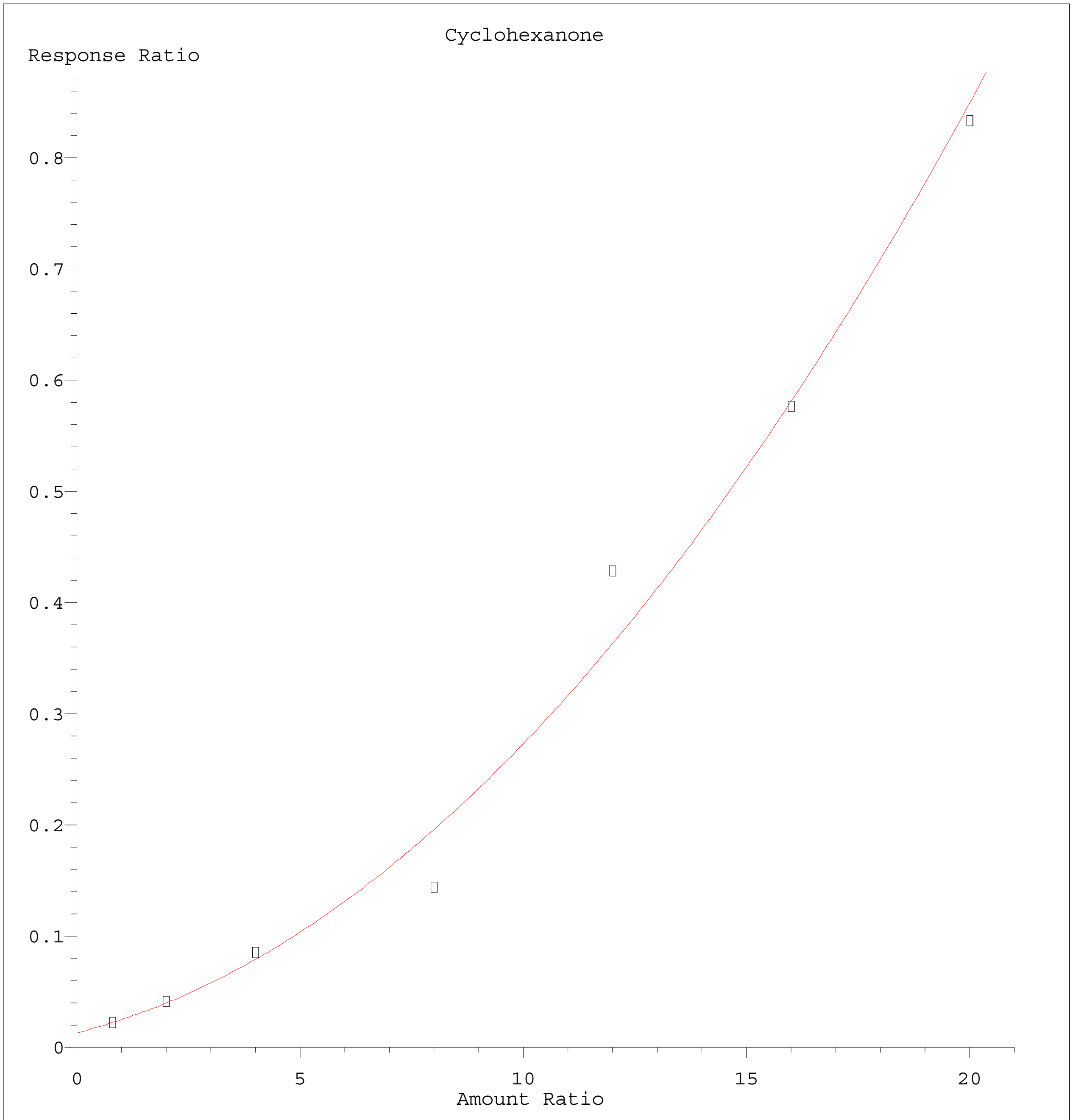
```
Data File : C:\MSDCHEM\1\DATA\120413\11M97417.D          Vial: 10
Acq On    :  4 Dec 2013  19:47                        Operator: FJB
Sample    : WG455130-09 500ug/L STD A9FOO              Inst    : hpms11
Misc      : 1,1 STD61356                              Multiplr: 1.00
MS Integration Params: rteint.p
Quant Time: Dec 18 14:12 2013            Quant Results File: A9WTR.RES

Method       : C:\MSDCHEM\1\METHODS\A9WTR.M (RTE Integrator)
Title        : Appendix IX (SOP:OVL MSV01) Water 12/04/13 HPMS11
Last Update  : Wed Dec 18 14:24:41 2013
Response via : Initial Calibration
```





Resp Ratio = 4.58e-003 * Amt - 2.44e-003
Coef of Det (r^2) = 0.995 Curve Fit: Linear

Method Name: C:\MSDCHEM\1\METHODS\A9WTR.M
Calibration Table Last Updated: Wed Dec 18 14:24:41 2013

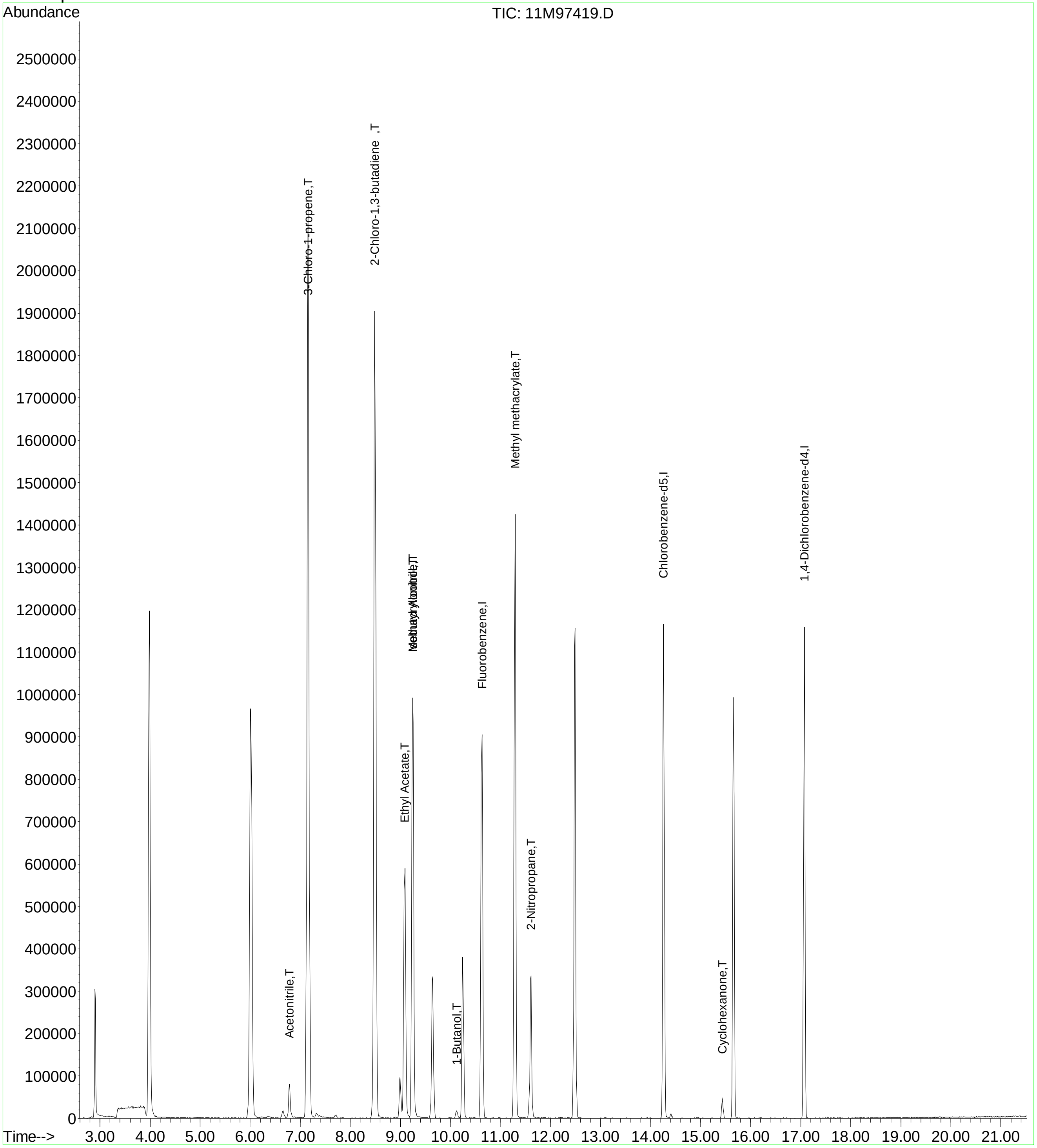


R = 1.58e-003 A*A + 1.02e-002 A + 1.33e-002
Coef of Det (r^2) = 0.991   Curve Fit: Quadratic w(1/a)

Method Name: C:\MSDCHEM\1\METHODS\A9WTR.M
Calibration Table Last Updated: Wed Dec 18 14:24:41 2013

```
                         Quantitation Report    (Not Reviewed)

Data File : C:\MSDCHEM\1\DATA\120413\11M97419.D          Vial: 12
Acq On    :  4 Dec 2013  20:50                       Operator: FJB
Sample    : WG455130-10 100ug/L ALT SRC A9FOO        Inst    : hpms11
Misc      : 1,1 STD61663                             Multiplr: 1.00
MS Integration Params: rteint.p
Quant Time: Dec 18 14:25:51 2013           Quant Results File: A9WTR.RES

Quant Method : C:\MSDCHEM\1\METHODS\A9WTR.M (RTE Integrator)
Title        : Appendix IX (SOP:OVL MSV01) Water 09/11/13 HPMS11
Last Update  : Wed Dec 18 14:24:41 2013
Response via : Initial Calibration
DataAcq Meth : 8260_WT

 Internal Standards                 R.T. QIon  Response  Conc Units Dev(Min)
-------------------------------------------------------------------------
   1) Fluorobenzene                10.63   96  1010748    25.00 ug/L    0.00
  12) Chlorobenzene-d5             14.26  117   728819    25.00 ug/L    0.00
  13) 1,4-Dichlorobenzene-d4       17.07  152   337646    25.00 ug/L    0.00

 Target Compounds                                                   Qvalue
   2) Acetonitrile                  6.78   41   112063    93.4572 ug/L    95
   3) 3-Chloro-1-propene            7.16   41  2129126   108.4982 ug/L    95
   4) 2-Chloro-1,3-butadiene        8.49   53  1772195    87.5309 ug/L    94
   5) Methacrylonitrile             9.24   41   693783    95.8304 ug/L    92
   6) Isobutyl Alcohol              9.24   43    65597   175.6101 ug/L    93
   7) 1-Butanol                    10.12   56    11451    75.1627 ug/L #  84
   8) Cyclohexanone                15.44   55    23296    21.2365 ug/L    93
   9) 2-Nitropropane               11.61   43   320485    96.9327 ug/L    99
  10) Ethyl Acetate                 9.09   43   982423   103.7427 ug/L    99
  11) Methyl methacrylate          11.29   41   942345    98.4282 ug/L    92

-------------------------------------------------------------------------
(#) = qualifier out of range (m) = manual integration
11M97419.D  A9WTR.M      Wed Dec 18 14:51:29 2013                         Page 1
```

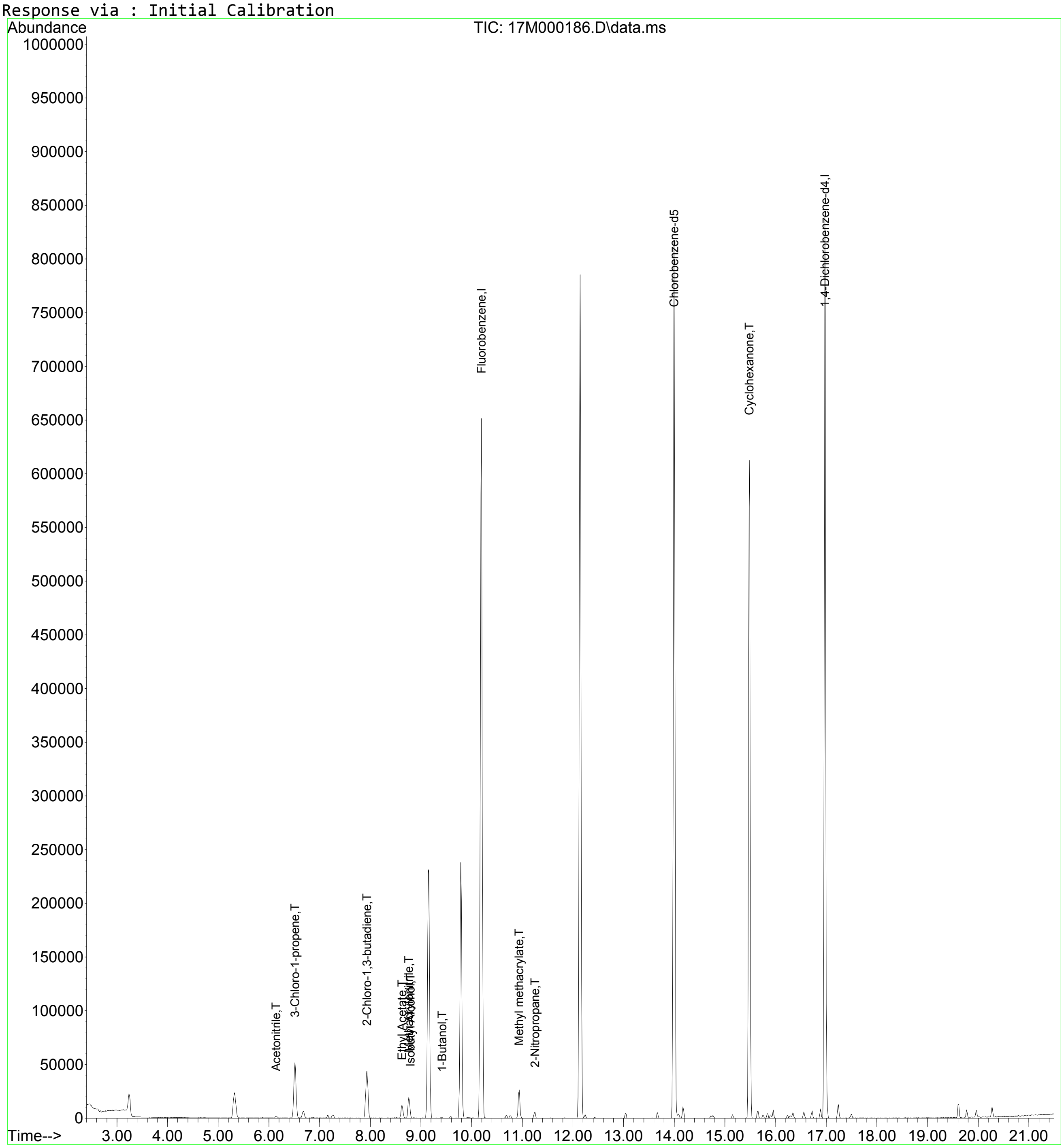
```
Data File : C:\MSDCHEM\1\DATA\120413\11M97419.D          Vial: 12
Acq On    :  4 Dec 2013  20:50                       Operator: FJB
Sample    : WG455130-10 100ug/L ALT SRC A9FOO        Inst    : hpms11
Misc      : 1,1 STD61663                             Multiplr: 1.00
MS Integration Params: rteint.p
Quant Time: Dec 18 14:25 2013            Quant Results File: A9WTR.RES

Method       : C:\MSDCHEM\1\METHODS\A9WTR.M (RTE Integrator)
Title        : Appendix IX (SOP:OVL MSV01) Water 12/04/13 HPMS11
Last Update  : Wed Dec 18 14:24:41 2013
Response via : Initial Calibration
```



```
                          Evaluate Continuing Calibration Report
   Data File : C:\MSDCHEM\1\DATA\120413\11M97419.D          Vial: 12
   Acq On    :  4 Dec 2013  20:50                       Operator: FJB
   Sample    : WG455130-10 100ug/L ALT SRC A9FOO        Inst    : hpms11
   Misc      : 1,1 STD61663                             Multiplr: 1.00
   MS Integration Params: rteint.p

   Method       : C:\MSDCHEM\1\METHODS\A9WTR.M (RTE Integrator)
   Title        : Appendix IX (SOP:OVL MSV01) Water 09/11/13 HPMS11
   Last Update  : Wed Dec 18 14:24:41 2013
   Response via : Multiple Level Calibration

   Min. RRF     :   0.000  Min. Rel. Area :   1%  Max. R.T. Dev  0.50min
   Max. RRF Dev :  75%     Max. Rel. Area : 200%

        Compound                        Amount  Calc.      %Dev Area% Dev(min)
  ---------------------------------------------------------------------------
 1 I    Fluorobenzene                  25.0000  25.0000       0.0  102   0.00
 2 T    Acetonitrile                  100.0000  93.4572       6.5   97   0.00
 3 T    3-Chloro-1-propene            100.0000 108.4982      -8.5  107   0.00
 4 T    2-Chloro-1,3-butadiene        100.0000  87.5309      12.5   85   0.00
 5 T    Methacrylonitrile             100.0000  95.8304       4.2   99   0.00
 6 T    Isobutyl Alcohol              200.0000 175.6101      12.2   92   0.00
 7 T    1-Butanol                     100.0000  75.1627      24.8   77  -0.01
 8 T    Cyclohexanone                 100.0000  21.2365      78.8#  28   0.00
 9 T    2-Nitropropane                100.0000  96.9327       3.1   98   0.00
10 T    Ethyl Acetate                 100.0000 103.7427      -3.7  105   0.00
11 T    Methyl methacrylate           100.0000  98.4282       1.6   98   0.00

12 I    Chlorobenzene-d5               25.0000  25.0000       0.0  100   0.00

13 I    1,4-Dichlorobenzene-d4         25.0000  25.0000       0.0  101   0.00

--------------------------------------------------------------------------
 (#) = Out of Range            SPCC's out = 0  CCC's out = 0
 11M97419.D  A9WTR.M      Wed Dec 18 14:25:58 2013                            Page 1
```

```
                          Quantitation Report    (Not Reviewed)

Data Path : D:\MassHunter\GCMS\1\data\101313\
Data File : 17M000186.D
Acq On    : 13 Oct 2013  17:48
Operator  : MES
Sample    : WG448462-02 5ug/L APPIX STD
Misc      : 1,1 STD60752
ALS Vial  : 3   Sample Multiplier: 1

Quant Time: Oct 17 17:42:57 2013
Quant Method : D:\MassHunter\GCMS\1\methods\A9FOOWT.M
Quant Title  : Appendix IX (SOP:OVL MSV01) WATER 10/13/13 HPMS17
QLast Update : Thu Oct 17 17:39:37 2013
Response via : Initial Calibration

        Compound                   R.T. QIon  Response  Conc Units Dev(Min)
 --------------------------------------------------------------------------
 Internal Standards
   1) Fluorobenzene              10.192   96   834735    25.0000 ug/L     0.00
  11) Chlorobenzene-d5           13.996  117   596678    25.0000 ug/L     0.00
  13) 1,4-Dichlorobenzene-d4     16.971  152   298748    25.0000 ug/L     0.00

 Target Compounds                                                   Qvalue
   2) Acetonitrile                6.139   41     2125     3.70 ug/L #    72
   3) 3-Chloro-1-propene          6.513   41    56439     4.88 ug/L #    87
   4) 2-Chloro-1,3-butadiene      7.933   53    47335     4.42 ug/L      98
   5) Methacrylonitrile           8.762   67     9230     4.25 ug/L      98
   6) Ethyl Acetate               8.627   43    20657     4.25 ug/L #    87
   7) Isobutyl Alcohol            8.793   43      984     6.08 ug/L #    48
   8) 1-Butanol                   9.415   56     1024    34.64 ug/L #    16
   9) Methyl methacrylate        10.939   41    18354     4.00 ug/L      99
  10) 2-Nitropropane             11.249   43     5280     3.08 ug/L      90
  12) Cyclohexanone              15.479   55      199    17.31 ug/L #    23
 --------------------------------------------------------------------------

 (#) = qualifier out of range (m) = manual integration (+) = signals summed
```

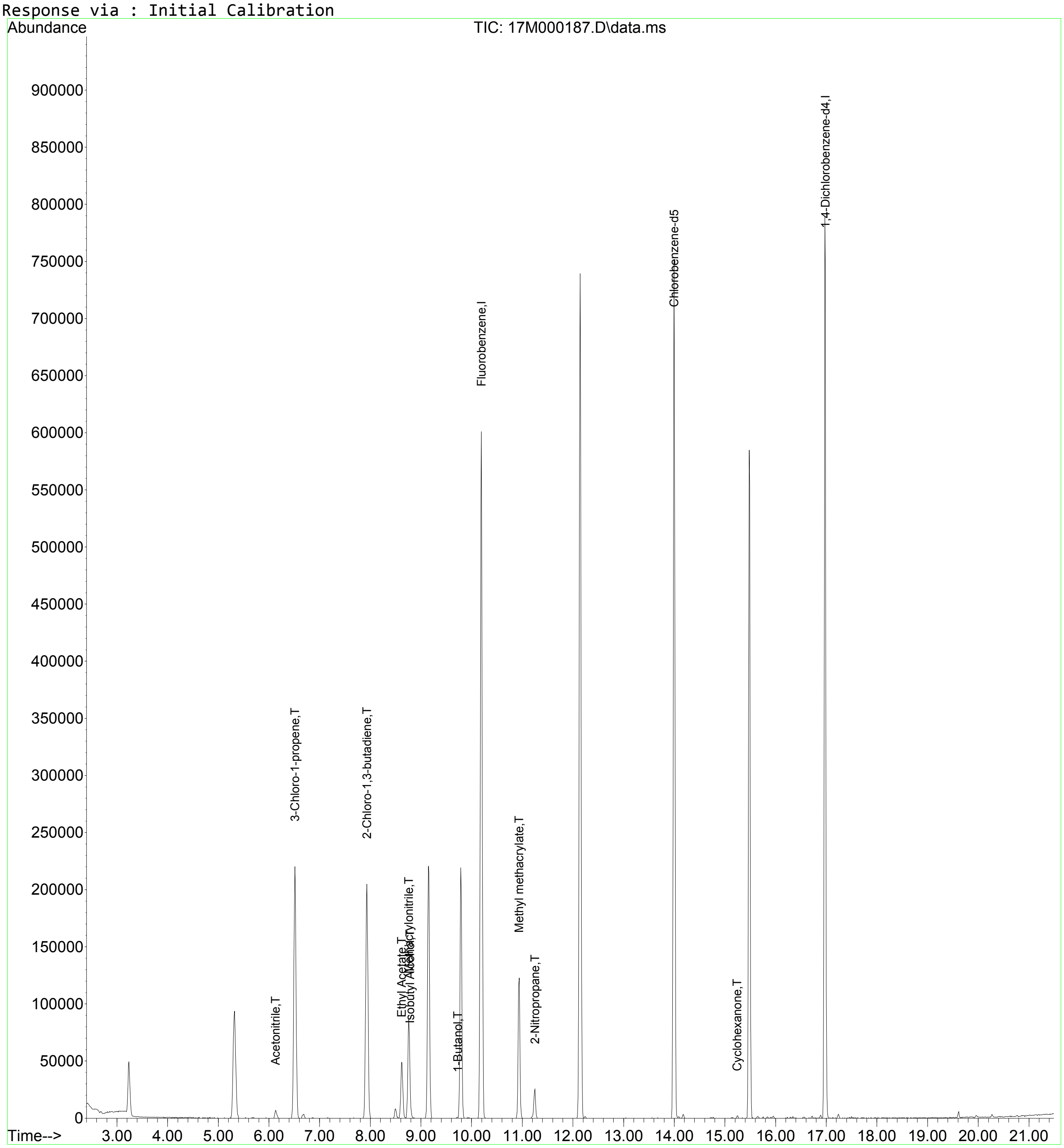
```
Data Path : D:\MassHunter\GCMS\1\data\101313\
Data File : 17M000186.D
Acq On    : 13 Oct 2013  17:48
Operator  : MES
Sample    : WG448462-02 5ug/L APPIX STD
Misc      : 1,1 STD60752
ALS Vial  : 3   Sample Multiplier: 1

Quant Time: Oct 17 17:42:57 2013
Quant Method : D:\MassHunter\GCMS\1\methods\A9FOOWT.M
Quant Title  : Appendix IX (SOP:OVL MSV01) WATER 10/13/13 HPMS17
QLast Update : Thu Oct 17 17:39:37 2013
Response via : Initial Calibration
```



```
                         Evaluate Continuing Calibration Report

 Data Path : D:\MassHunter\GCMS\1\data\101313\
 Data File : 17M000186.D
 Acq On    : 13 Oct 2013  17:48
 Operator  : MES
 Sample    : WG448462-02 5ug/L APPIX STD
 Misc      : 1,1 STD60752
 ALS Vial  : 3   Sample Multiplier: 1

 Quant Time: Oct 17 17:43:35 2013
 Quant Method : D:\MassHunter\GCMS\1\methods\A9FOOWT.M
 Quant Title  : Appendix IX (SOP:OVL MSV01) WATER 10/13/13 HPMS17
 QLast Update : Thu Oct 17 17:39:37 2013
 Response via : Initial Calibration


 Min. RRF     :   0.000  Min. Rel. Area :  50%  Max. R.T. Dev  0.50min
 Max. RRF Dev :  25%     Max. Rel. Area : 150%

        Compound                       Amount  Calc.     %Dev Area% Dev(min)
 -----------------------------------------------------------------------------
 1 I    Fluorobenzene                 25.000  25.000       0.0  100   0.00
 2 T    Acetonitrile                   5.000   3.703      25.9#   0   0.01
 3 T    3-Chloro-1-propene             5.000   4.880       2.4  100   0.00
 4 T    2-Chloro-1,3-butadiene         5.000   4.424      11.5  100   0.00
 5 T    Methacrylonitrile              5.000   4.254      14.9  100   0.00
 6 T    Ethyl Acetate                  5.000   4.247      15.1  100   0.01
 7 T    Isobutyl Alcohol               5.000   6.076     -21.5    0   0.01
 8 T    1-Butanol                     -1.000  34.643       0.0    0  -0.30
 9 T    Methyl methacrylate            5.000   4.002      20.0  100   0.01
10 T    2-Nitropropane                -1.000   3.076       0.0    0   0.00

11      Chlorobenzene-d5              25.000  25.000       0.0  100   0.00
12 T    Cyclohexanone                 -1.000  17.312       0.0    0   0.23

13 I    1,4-Dichlorobenzene-d4        25.000  25.000       0.0  100   0.00
 -----------------------------------------------------------------------------

   (#) = Out of Range               SPCC's out = 0  CCC's out = 0
```

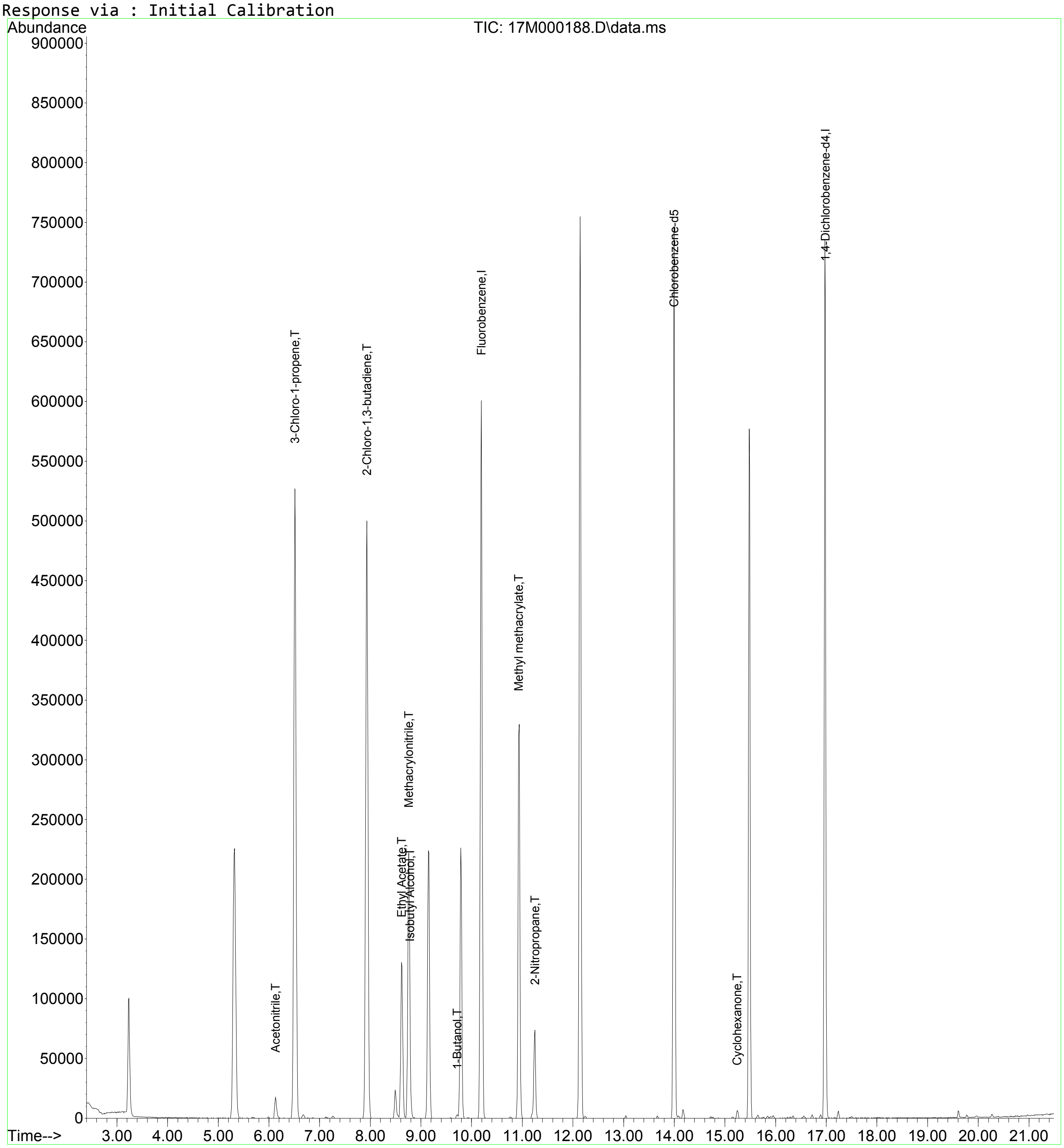
```
                              Quantitation Report    (Not Reviewed)

  Data Path : D:\MassHunter\GCMS\1\data\101313\
  Data File : 17M000187.D
  Acq On    : 13 Oct 2013  18:15
  Operator  : MES
  Sample    : WG448462-03 20ug/L APPIX STD
  Misc      : 1,1 STD60752
  ALS Vial  : 4   Sample Multiplier: 1

  Quant Time: Oct 17 17:43:00 2013
  Quant Method : D:\MassHunter\GCMS\1\methods\A9FOOWT.M
  Quant Title  : Appendix IX (SOP:OVL MSV01) WATER 10/13/13 HPMS17
  QLast Update : Thu Oct 17 17:39:37 2013
  Response via : Initial Calibration

          Compound                   R.T. QIon  Response  Conc Units Dev(Min)
   --------------------------------------------------------------------------
   Internal Standards
     1) Fluorobenzene              10.192   96   769796    25.0000 ug/L     0.00
    11) Chlorobenzene-d5           13.996  117   542862    25.0000 ug/L     0.00
    13) 1,4-Dichlorobenzene-d4     16.981  152   283988    25.0000 ug/L     0.01

   Target Compounds                                                    Qvalue
     2) Acetonitrile                6.129   41     9431    17.82 ug/L #    91
     3) 3-Chloro-1-propene          6.512   41   236510    22.18 ug/L      99
     4) 2-Chloro-1,3-butadiene      7.932   53   212042    21.49 ug/L      99
     5) Methacrylonitrile           8.761   67    39753    19.87 ug/L      99
     6) Ethyl Acetate               8.616   43    87278    19.46 ug/L     100
     7) Isobutyl Alcohol            8.782   43     5450    36.49 ug/L #    97
     8) 1-Butanol                   9.725   56      885    33.83 ug/L #    48
     9) Methyl methacrylate        10.938   41    81246    19.21 ug/L     100
    10) 2-Nitropropane             11.249   43    24099    15.23 ug/L      93
    12) Cyclohexanone              15.240   55     1683    31.57 ug/L #    89
   --------------------------------------------------------------------------

   (#) = qualifier out of range (m) = manual integration (+) = signals summed
```

```
                    Quantitation Report    (Not Reviewed)

Data Path : D:\MassHunter\GCMS\1\data\101313\
Data File : 17M000187.D
Acq On    : 13 Oct 2013  18:15
Operator  : MES
Sample    : WG448462-03 20ug/L APPIX STD
Misc      : 1,1 STD60752
ALS Vial  : 4   Sample Multiplier: 1

Quant Time: Oct 17 17:43:00 2013
Quant Method : D:\MassHunter\GCMS\1\methods\A9FOOWT.M
Quant Title  : Appendix IX (SOP:OVL MSV01) WATER 10/13/13 HPMS17
QLast Update : Thu Oct 17 17:39:37 2013
Response via : Initial Calibration
```



```
                              Quantitation Report    (Not Reviewed)

Data Path : D:\MassHunter\GCMS\1\data\101313\
Data File : 17M000188.D
Acq On    : 13 Oct 2013  18:43
Operator  : MES
Sample    : WG448462-04 50ug/L APPIX STD
Misc      : 1,1 STD60752
ALS Vial  : 5   Sample Multiplier: 1

Quant Time: Oct 17 17:43:02 2013
Quant Method : D:\MassHunter\GCMS\1\methods\A9FOOWT.M
Quant Title  : Appendix IX (SOP:OVL MSV01) WATER 10/13/13 HPMS17
QLast Update : Thu Oct 17 17:39:37 2013
Response via : Initial Calibration

        Compound                   R.T. QIon  Response  Conc Units Dev(Min)
 --------------------------------------------------------------------------
 Internal Standards
   1) Fluorobenzene              10.192   96   764083    25.0000 ug/L     0.00
  11) Chlorobenzene-d5           13.996  117   535993    25.0000 ug/L     0.00
  13) 1,4-Dichlorobenzene-d4     16.981  152   263764    25.0000 ug/L     0.01

 Target Compounds                                                   Qvalue
   2) Acetonitrile                6.129   41    25091    47.77 ug/L #    99
   3) 3-Chloro-1-propene          6.512   41   571105    53.95 ug/L     100
   4) 2-Chloro-1,3-butadiene      7.932   53   517543    52.84 ug/L     100
   5) Methacrylonitrile           8.762   67   103271    52.00 ug/L      99
   6) Ethyl Acetate               8.616   43   227233    51.04 ug/L     100
   7) Isobutyl Alcohol            8.782   43    14258    96.18 ug/L #    96
   8) 1-Butanol                   9.715   56     2582    56.98 ug/L      98
   9) Methyl methacrylate        10.928   41   217667    51.85 ug/L      99
  10) 2-Nitropropane             11.249   43    72850    46.37 ug/L      97
  12) Cyclohexanone              15.240   55     4463    57.76 ug/L      98
 --------------------------------------------------------------------------

 (#) = qualifier out of range (m) = manual integration (+) = signals summed
```

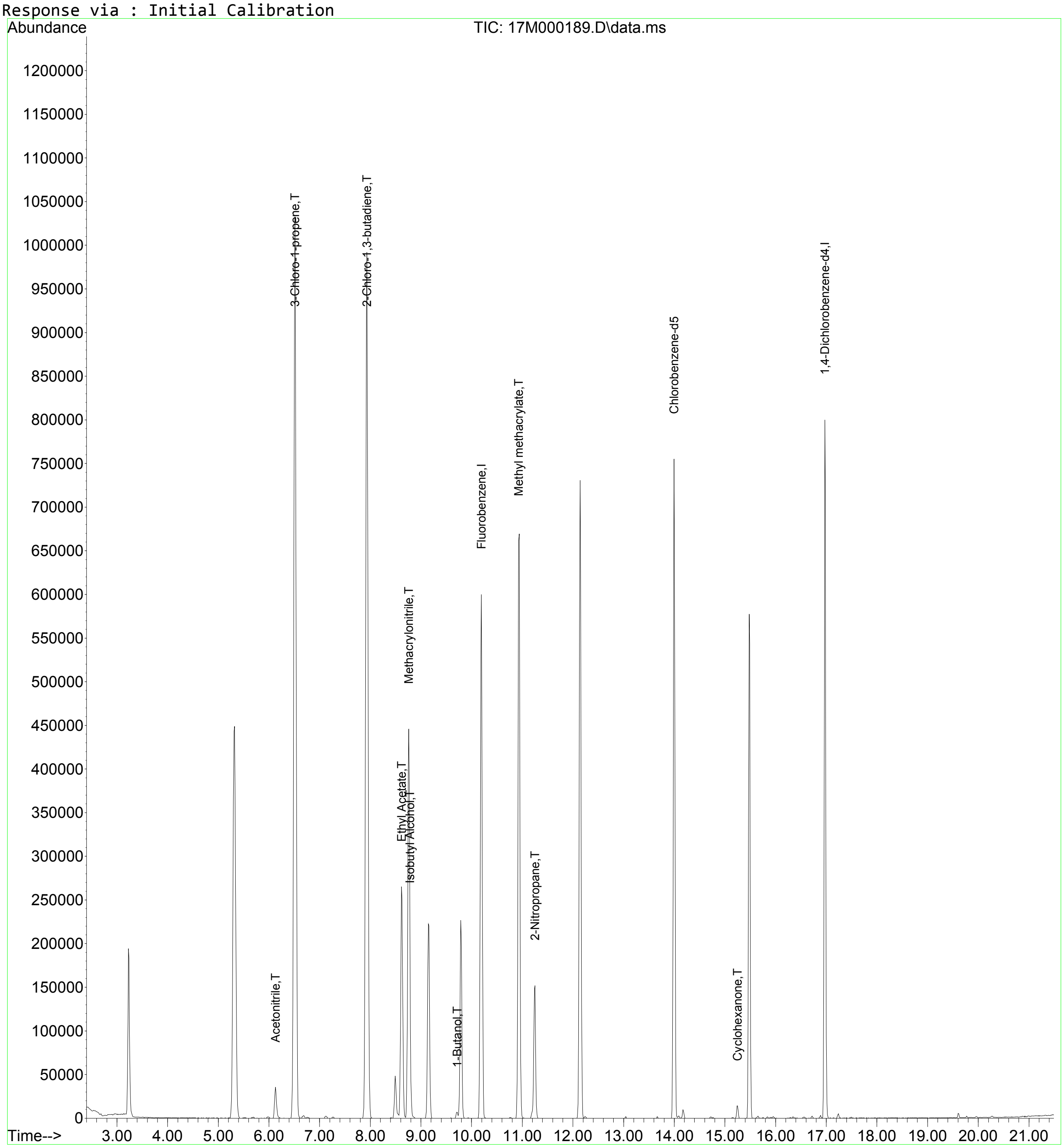
```
                              Quantitation Report    (Not Reviewed)

Data Path : D:\MassHunter\GCMS\1\data\101313\
Data File : 17M000188.D
Acq On    : 13 Oct 2013  18:43
Operator  : MES
Sample    : WG448462-04 50ug/L APPIX STD
Misc      : 1,1 STD60752
ALS Vial  : 5   Sample Multiplier: 1

Quant Time: Oct 17 17:43:02 2013
Quant Method : D:\MassHunter\GCMS\1\methods\A9FOOWT.M
Quant Title  : Appendix IX (SOP:OVL MSV01) WATER 10/13/13 HPMS17
QLast Update : Thu Oct 17 17:39:37 2013
Response via : Initial Calibration
```



00193005

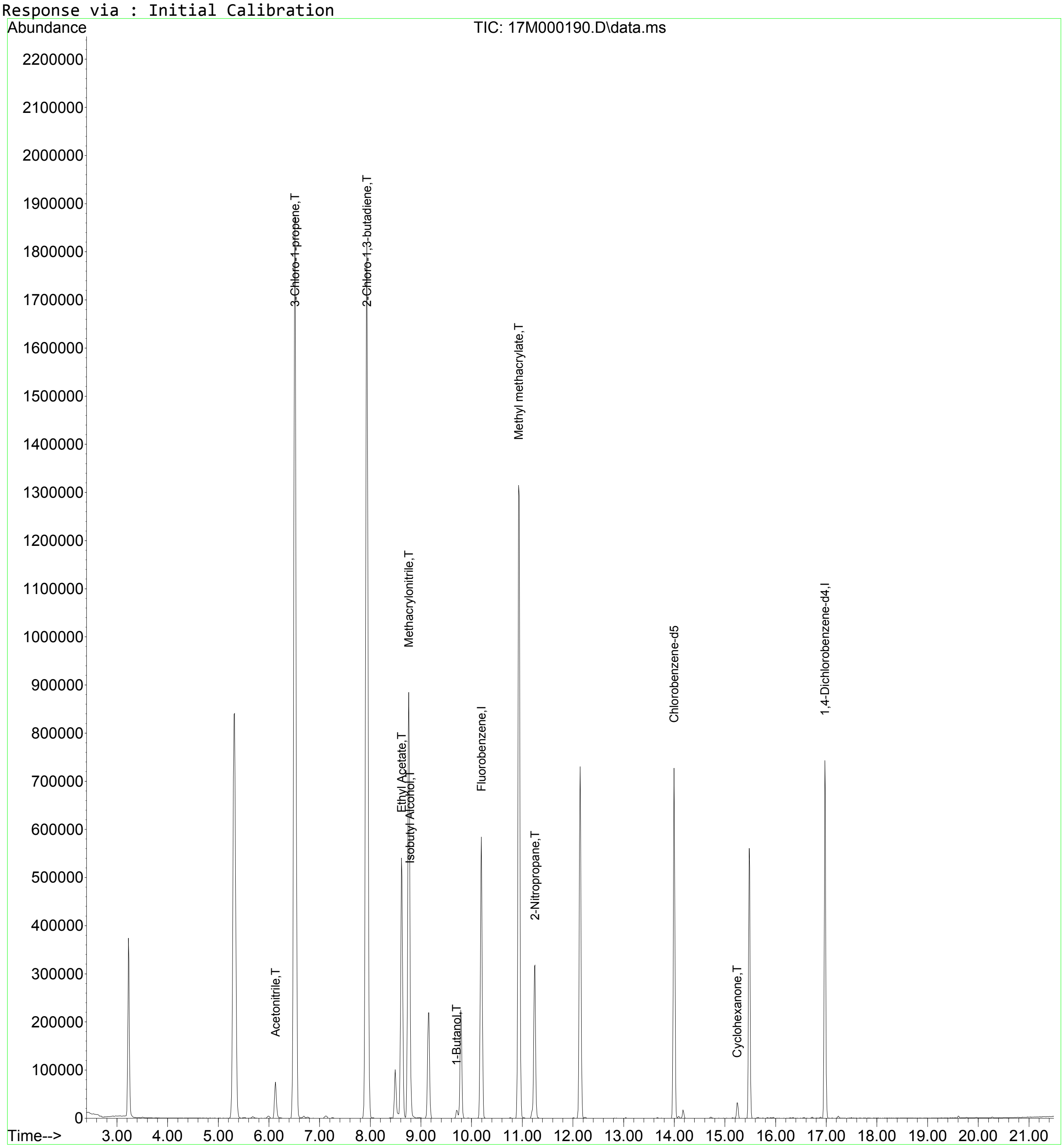
```
                                 Quantitation Report    (Not Reviewed)

Data Path : D:\MassHunter\GCMS\1\data\101313\
Data File : 17M000189.D
Acq On    : 13 Oct 2013  19:11
Operator  : MES
Sample    : WG448462-05 100ug/L APPIX STD
Misc      : 1,1 STD60752
ALS Vial  : 6   Sample Multiplier: 1

Quant Time: Oct 17 17:43:04 2013
Quant Method : D:\MassHunter\GCMS\1\methods\A9FOOWT.M
Quant Title  : Appendix IX (SOP:OVL MSV01) WATER 10/13/13 HPMS17
QLast Update : Thu Oct 17 17:39:37 2013
Response via : Initial Calibration

        Compound                   R.T. QIon  Response  Conc Units Dev(Min)
 ---------------------------------------------------------------------------
 Internal Standards
   1) Fluorobenzene              10.192   96   762819    25.0000 ug/L     0.00
  11) Chlorobenzene-d5           13.996  117   543994    25.0000 ug/L     0.00
  13) 1,4-Dichlorobenzene-d4     16.971  152   279020    25.0000 ug/L     0.00

 Target Compounds                                                  Qvalue
   2) Acetonitrile                6.129   41    49660    94.69 ug/L #   100
   3) 3-Chloro-1-propene          6.512   41  1123358   106.29 ug/L     100
   4) 2-Chloro-1,3-butadiene      7.932   53  1036798   106.03 ug/L     100
   5) Methacrylonitrile           8.762   67   205353   103.57 ug/L     100
   6) Ethyl Acetate               8.616   43   457591   102.95 ug/L     100
   7) Isobutyl Alcohol            8.782   43    27086   183.01 ug/L     100
   8) 1-Butanol                   9.715   56     5648    96.66 ug/L     100
   9) Methyl methacrylate        10.928   41   448267   106.96 ug/L     100
  10) 2-Nitropropane             11.249   43   155172    98.94 ug/L     100
  12) Cyclohexanone              15.250   55     9042    97.58 ug/L     100
 ---------------------------------------------------------------------------

 (#) = qualifier out of range (m) = manual integration (+) = signals summed

A9FOOWT.M Thu Oct 17 17:43:04 2013                                        Page:  1
```

```
Data Path : D:\MassHunter\GCMS\1\data\101313\
Data File : 17M000189.D
Acq On    : 13 Oct 2013  19:11
Operator  : MES
Sample    : WG448462-05 100ug/L APPIX STD
Misc      : 1,1 STD60752
ALS Vial  : 6   Sample Multiplier: 1

Quant Time: Oct 17 17:43:04 2013
Quant Method : D:\MassHunter\GCMS\1\methods\A9FOOWT.M
Quant Title  : Appendix IX (SOP:OVL MSV01) WATER 10/13/13 HPMS17
QLast Update : Thu Oct 17 17:39:37 2013
Response via : Initial Calibration
```



```
                          Quantitation Report    (Not Reviewed)

Data Path : D:\MassHunter\GCMS\1\data\101313\
Data File : 17M000190.D
Acq On    : 13 Oct 2013  19:39
Operator  : MES
Sample    : WG448462-06 200ug/L APPIX STD
Misc      : 1,1 STD60752
ALS Vial  : 7   Sample Multiplier: 1

Quant Time: Oct 17 17:43:06 2013
Quant Method : D:\MassHunter\GCMS\1\methods\A9FOOWT.M
Quant Title  : Appendix IX (SOP:OVL MSV01) WATER 10/13/13 HPMS17
QLast Update : Thu Oct 17 17:39:37 2013
Response via : Initial Calibration

        Compound                   R.T. QIon  Response  Conc Units Dev(Min)
 ---------------------------------------------------------------------------
 Internal Standards
   1) Fluorobenzene              10.192   96   735626    25.0000 ug/L     0.00
  11) Chlorobenzene-d5           13.996  117   520486    25.0000 ug/L     0.00
  13) 1,4-Dichlorobenzene-d4     16.971  152   259787    25.0000 ug/L     0.00

 Target Compounds                                                    Qvalue
   2) Acetonitrile                6.129   41   104743   207.11 ug/L #    98
   3) 3-Chloro-1-propene          6.512   41  2062227   202.34 ug/L     100
   4) 2-Chloro-1,3-butadiene      7.932   53  1943243   206.08 ug/L     100
   5) Methacrylonitrile           8.762   67   410090   214.48 ug/L     100
   6) Ethyl Acetate               8.616   43   919702   214.56 ug/L     100
   7) Isobutyl Alcohol            8.782   43    57001   399.37 ug/L      98
   8) 1-Butanol                   9.705   56    13539   194.38 ug/L      98
   9) Methyl methacrylate        10.928   41   887601   219.62 ug/L     100
  10) 2-Nitropropane             11.249   43   329942   218.15 ug/L     100
  12) Cyclohexanone              15.240   55    19663   191.13 ug/L      98
 ---------------------------------------------------------------------------

 (#) = qualifier out of range (m) = manual integration (+) = signals summed
```

```
Data Path : D:\MassHunter\GCMS\1\data\101313\
Data File : 17M000190.D
Acq On    : 13 Oct 2013  19:39
Operator  : MES
Sample    : WG448462-06 200ug/L APPIX STD
Misc      : 1,1 STD60752
ALS Vial  : 7   Sample Multiplier: 1

Quant Time: Oct 17 17:43:06 2013
Quant Method : D:\MassHunter\GCMS\1\methods\A9FOOWT.M
Quant Title  : Appendix IX (SOP:OVL MSV01) WATER 10/13/13 HPMS17
QLast Update : Thu Oct 17 17:39:37 2013
Response via : Initial Calibration
```

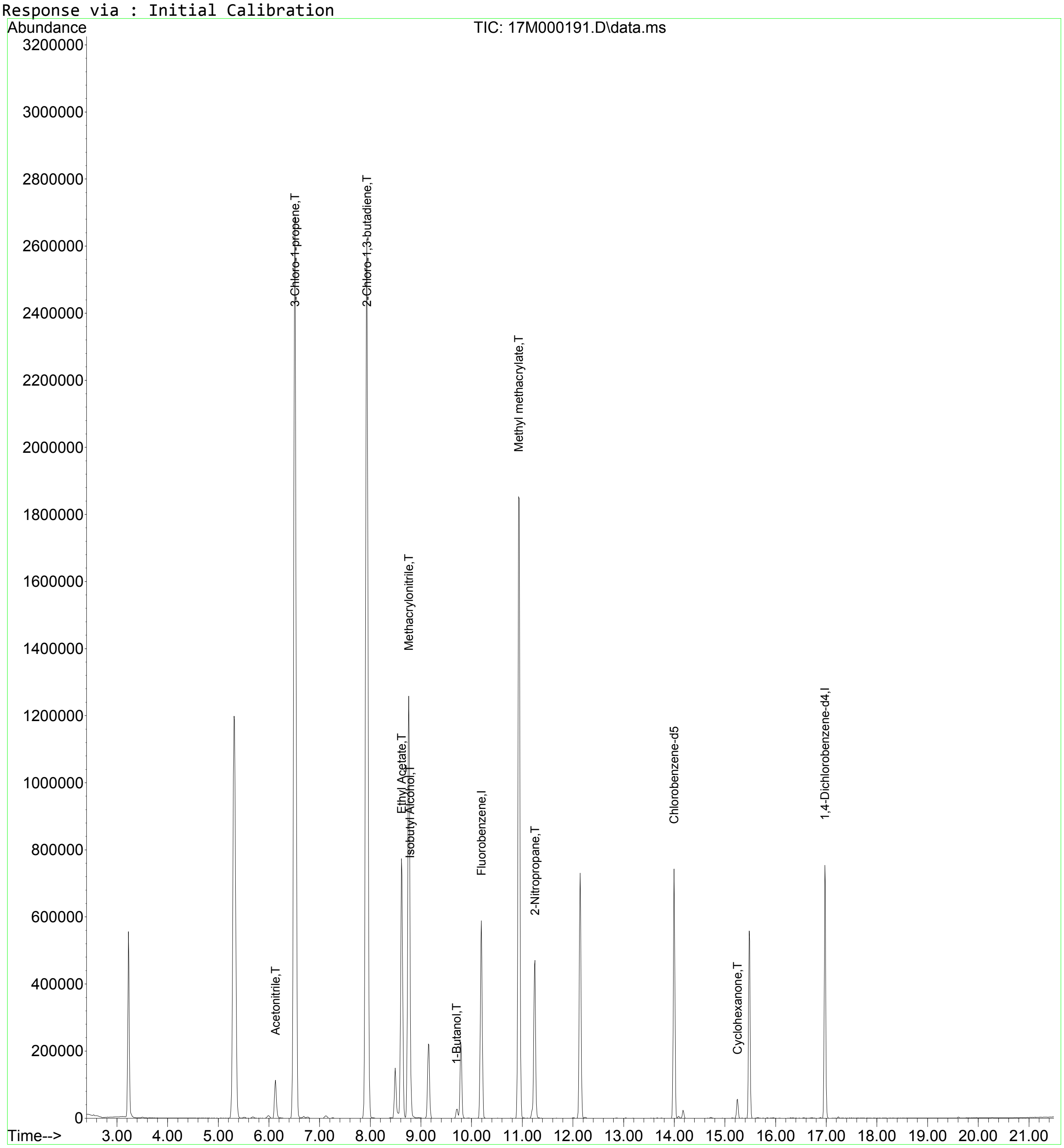


```
                                 Quantitation Report    (Not Reviewed)

  Data Path : D:\MassHunter\GCMS\1\data\101313\
  Data File : 17M000191.D
  Acq On    : 13 Oct 2013  20:07
  Operator  : MES
  Sample    : WG448462-07 300ug/L APPIX STD
  Misc      : 1,1 STD60752
  ALS Vial  : 8   Sample Multiplier: 1

  Quant Time: Oct 17 17:43:08 2013
  Quant Method : D:\MassHunter\GCMS\1\methods\A9FOOWT.M
  Quant Title  : Appendix IX (SOP:OVL MSV01) WATER 10/13/13 HPMS17
  QLast Update : Thu Oct 17 17:39:37 2013
  Response via : Initial Calibration

          Compound                   R.T. QIon  Response  Conc Units Dev(Min)
   --------------------------------------------------------------------------
   Internal Standards
     1) Fluorobenzene             10.192   96   745118    25.0000 ug/L     0.00
    11) Chlorobenzene-d5          13.996  117   526334    25.0000 ug/L     0.00
    13) 1,4-Dichlorobenzene-d4    16.971  152   266080    25.0000 ug/L     0.00

   Target Compounds                                                  Qvalue
     2) Acetonitrile               6.129   41   157466   307.40 ug/L #    99
     3) 3-Chloro-1-propene         6.512   41  2977166   288.39 ug/L     100
     4) 2-Chloro-1,3-butadiene     7.932   53  2856242   299.04 ug/L     100
     5) Methacrylonitrile          8.762   67   587249   303.22 ug/L     100
     6) Ethyl Acetate              8.616   43  1333314   307.09 ug/L     100
     7) Isobutyl Alcohol           8.782   43    87294   603.83 ug/L      98
     8) 1-Butanol                  9.705   56    22963   291.08 ug/L      96
     9) Methyl methacrylate       10.928   41  1264197   308.82 ug/L      99
    10) 2-Nitropropane            11.249   43   491384   320.75 ug/L      99
    12) Cyclohexanone             15.250   55    32886   289.25 ug/L      99
   --------------------------------------------------------------------------

   (#) = qualifier out of range (m) = manual integration (+) = signals summed
```

Quantitation Report   (Not Reviewed)

00193010

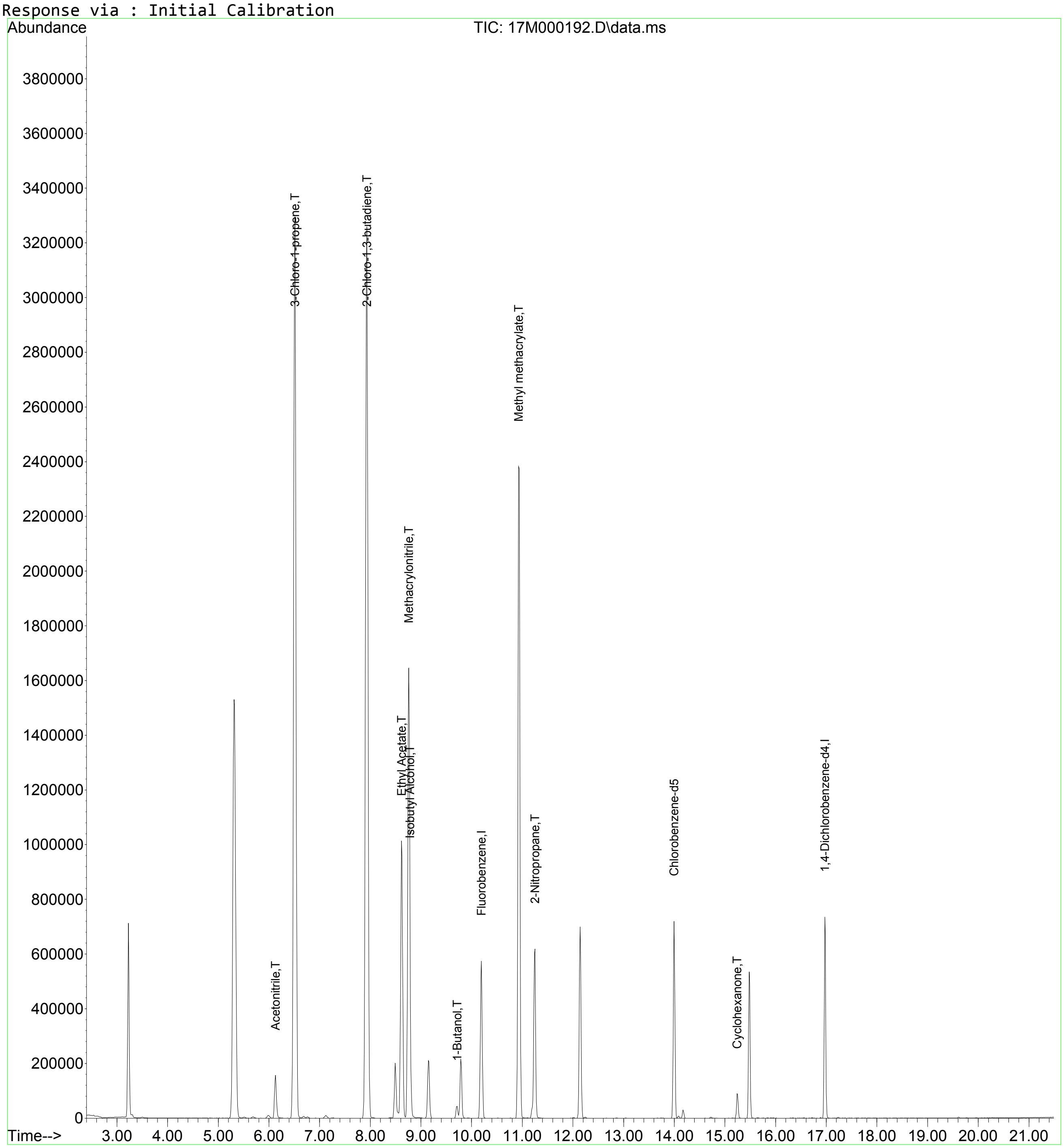
```
Data Path : D:\MassHunter\GCMS\1\data\101313\
Data File : 17M000191.D
Acq On    : 13 Oct 2013  20:07
Operator  : MES
Sample    : WG448462-07 300ug/L APPIX STD
Misc      : 1,1 STD60752
ALS Vial  : 8   Sample Multiplier: 1

Quant Time: Oct 17 17:43:08 2013
Quant Method : D:\MassHunter\GCMS\1\methods\A9FOOWT.M
Quant Title  : Appendix IX (SOP:OVL MSV01) WATER 10/13/13 HPMS17
QLast Update : Thu Oct 17 17:39:37 2013
Response via : Initial Calibration
```



A9FOOWT.M Thu Oct 17 17:43:08 2013   Page: 2

```
                    Quantitation Report    (Not Reviewed)

Data Path : D:\MassHunter\GCMS\1\data\101313\
Data File : 17M000192.D
Acq On    : 13 Oct 2013  20:35
Operator  : MES
Sample    : WG448462-08 400ug/L APPIX STD
Misc      : 1,1 STD60752
ALS Vial  : 9   Sample Multiplier: 1

Quant Time: Oct 17 17:43:10 2013
Quant Method : D:\MassHunter\GCMS\1\methods\A9FOOWT.M
Quant Title  : Appendix IX (SOP:OVL MSV01) WATER 10/13/13 HPMS17
QLast Update : Thu Oct 17 17:39:37 2013
Response via : Initial Calibration

        Compound                   R.T. QIon  Response  Conc Units Dev(Min)
 --------------------------------------------------------------------------
 Internal Standards
   1) Fluorobenzene              10.192   96   728958    25.0000 ug/L     0.00
  11) Chlorobenzene-d5           13.996  117   513477    25.0000 ug/L     0.00
  13) 1,4-Dichlorobenzene-d4     16.971  152   258316    25.0000 ug/L     0.00

 Target Compounds                                                   Qvalue
   2) Acetonitrile                6.129   41   215922   430.86 ug/L #    98
   3) 3-Chloro-1-propene          6.512   41  3707052   367.06 ug/L     100
   4) 2-Chloro-1,3-butadiene      7.932   53  3605435   385.84 ug/L      99
   5) Methacrylonitrile           8.762   67   767786   405.22 ug/L      99
   6) Ethyl Acetate               8.616   43  1747197   411.34 ug/L     100
   7) Isobutyl Alcohol            8.782   43   125947   890.51 ug/L #    95
   8) 1-Butanol                   9.715   56    36038   418.14 ug/L      96
   9) Methyl methacrylate        10.928   41  1636030   408.51 ug/L      99
  10) 2-Nitropropane             11.249   43   653312   435.90 ug/L      99
  12) Cyclohexanone              15.240   55    51645   423.92 ug/L      98
 --------------------------------------------------------------------------

 (#) = qualifier out of range (m) = manual integration (+) = signals summed
```

```
                         Quantitation Report    (Not Reviewed)

Data Path : D:\MassHunter\GCMS\1\data\101313\
Data File : 17M000192.D
Acq On    : 13 Oct 2013  20:35
Operator  : MES
Sample    : WG448462-08 400ug/L APPIX STD
Misc      : 1,1 STD60752
ALS Vial  : 9   Sample Multiplier: 1

Quant Time: Oct 17 17:43:10 2013
Quant Method : D:\MassHunter\GCMS\1\methods\A9FOOWT.M
Quant Title  : Appendix IX (SOP:OVL MSV01) WATER 10/13/13 HPMS17
QLast Update : Thu Oct 17 17:39:37 2013
Response via : Initial Calibration
```

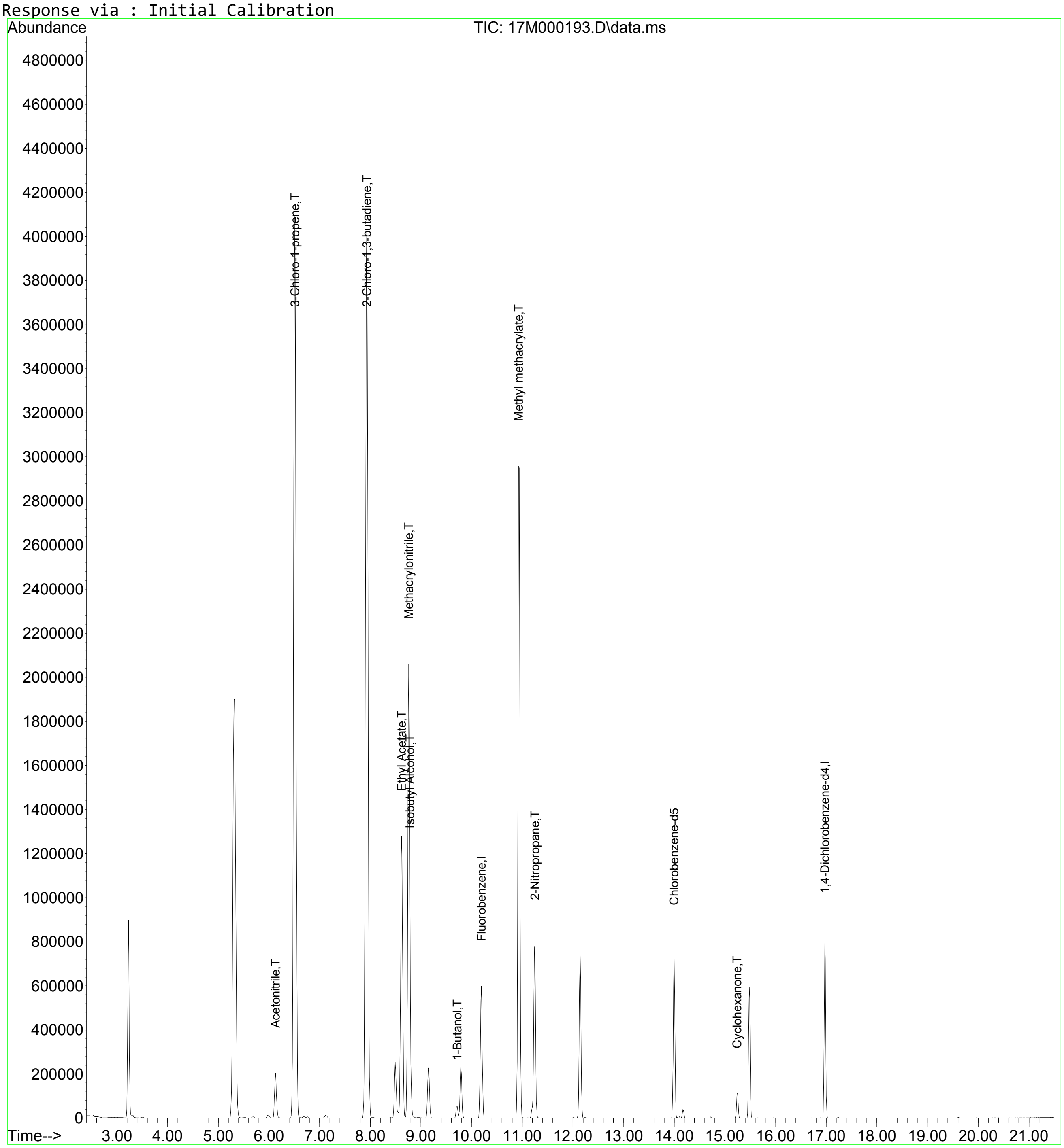


```
A9FOOWT.M Thu Oct 17 17:43:10 2013                                          Page: 2
```

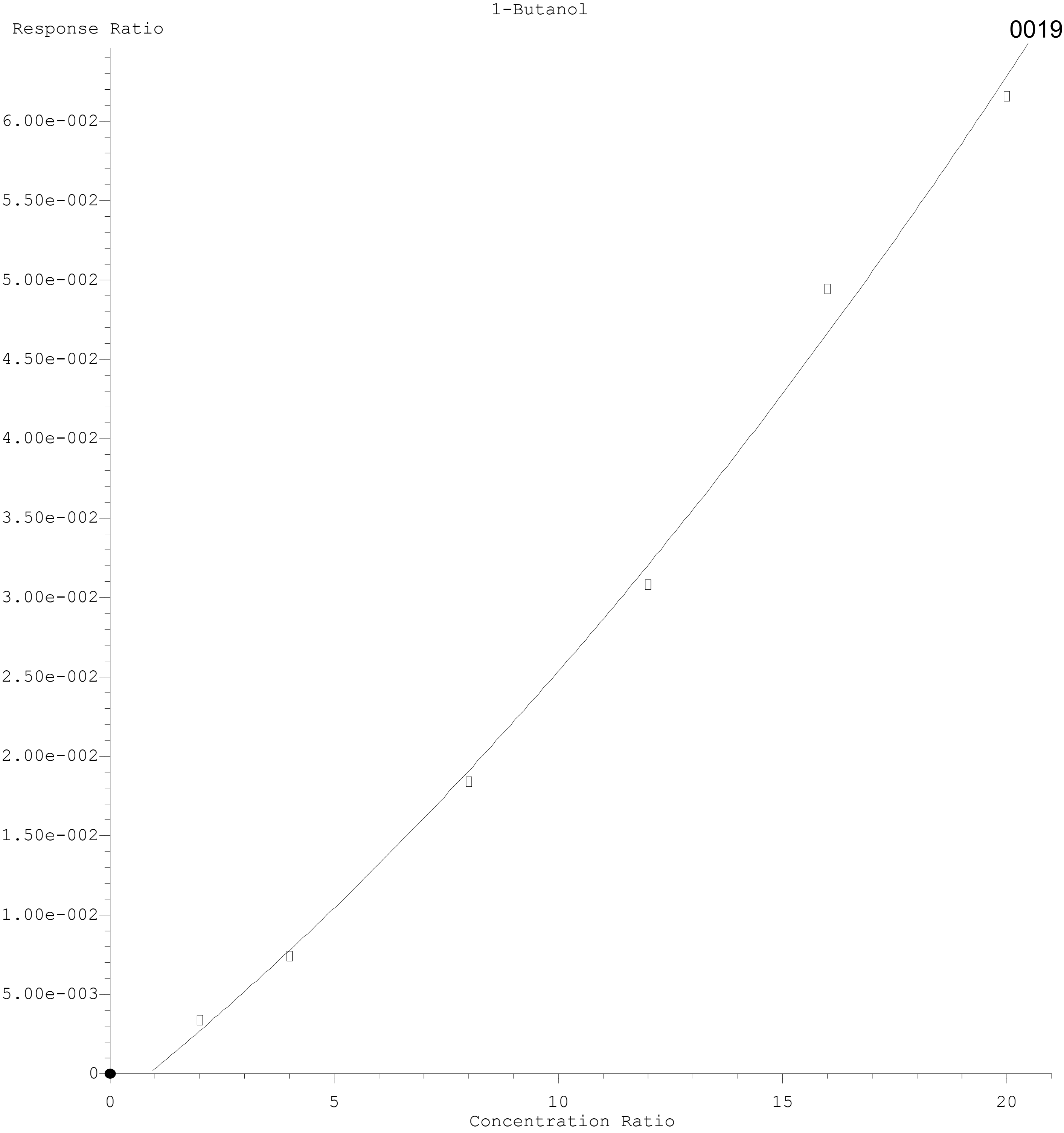
```
                         Quantitation Report    (Not Reviewed)

Data Path : D:\MassHunter\GCMS\1\data\101313\
Data File : 17M000193.D
Acq On    : 13 Oct 2013  21:03
Operator  : MES
Sample    : WG448462-09 500ug/L APPIX STD
Misc      : 1,1 STD60752
ALS Vial  : 10   Sample Multiplier: 1

Quant Time: Oct 17 17:43:12 2013
Quant Method : D:\MassHunter\GCMS\1\methods\A9FOOWT.M
Quant Title  : Appendix IX (SOP:OVL MSV01) WATER 10/13/13 HPMS17
QLast Update : Thu Oct 17 17:39:37 2013
Response via : Initial Calibration

       Compound                   R.T. QIon  Response  Conc Units Dev(Min)
 --------------------------------------------------------------------------
 Internal Standards
   1) Fluorobenzene             10.192   96   759233    25.0000 ug/L     0.00
  11) Chlorobenzene-d5          13.996  117   544729    25.0000 ug/L     0.00
  13) 1,4-Dichlorobenzene-d4    16.971  152   285472    25.0000 ug/L     0.00

 Target Compounds                                                  Qvalue
   2) Acetonitrile               6.129   41   279066   534.65 ug/L #    99
   3) 3-Chloro-1-propene         6.512   41  4641883   441.29 ug/L      99
   4) 2-Chloro-1,3-butadiene     7.932   53  4534980   465.97 ug/L     100
   5) Methacrylonitrile          8.761   67   970860   491.97 ug/L     100
   6) Ethyl Acetate              8.616   43  2217784   501.31 ug/L     100
   7) Isobutyl Alcohol           8.782   43   161004  1092.99 ug/L #    96
   8) 1-Butanol                  9.715   56    46748   492.64 ug/L      96
   9) Methyl methacrylate       10.928   41  2051591   491.84 ug/L      98
  10) 2-Nitropropane            11.249   43   836858   536.10 ug/L      99
  12) Cyclohexanone             15.240   55    65947   490.06 ug/L      99
 --------------------------------------------------------------------------

 (#) = qualifier out of range (m) = manual integration (+) = signals summed
```

Quantitation Report (Not Reviewed)

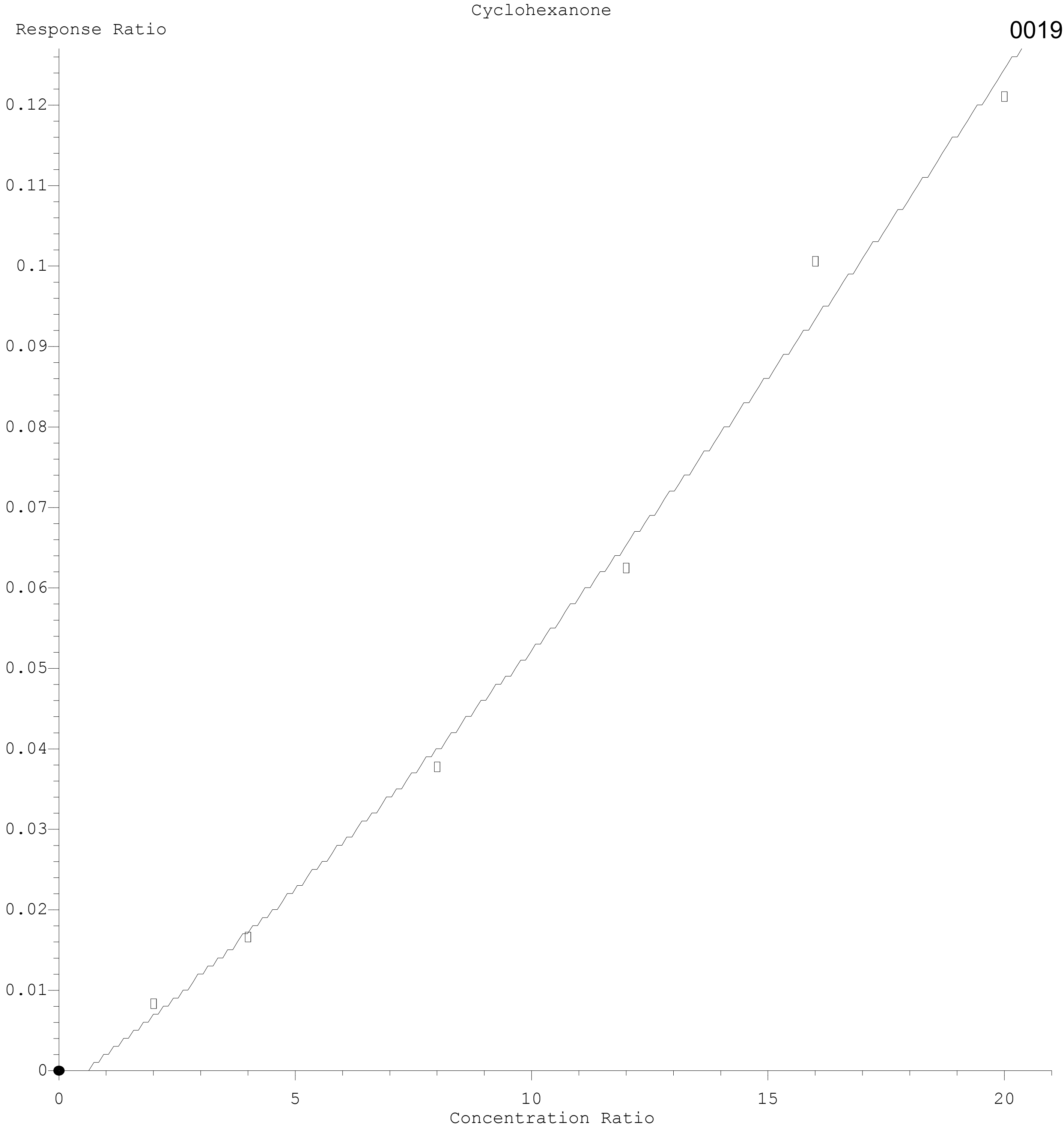
```
Data Path : D:\MassHunter\GCMS\1\data\101313\
Data File : 17M000193.D
Acq On    : 13 Oct 2013  21:03
Operator  : MES
Sample    : WG448462-09 500ug/L APPIX STD
Misc      : 1,1 STD60752
ALS Vial  : 10   Sample Multiplier: 1

Quant Time: Oct 17 17:43:12 2013
Quant Method : D:\MassHunter\GCMS\1\methods\A9FOOWT.M
Quant Title  : Appendix IX (SOP:OVL MSV01) WATER 10/13/13 HPMS17
QLast Update : Thu Oct 17 17:39:37 2013
Response via : Initial Calibration
```



A9FOOWT.M Thu Oct 17 17:43:12 2013 Page: 2



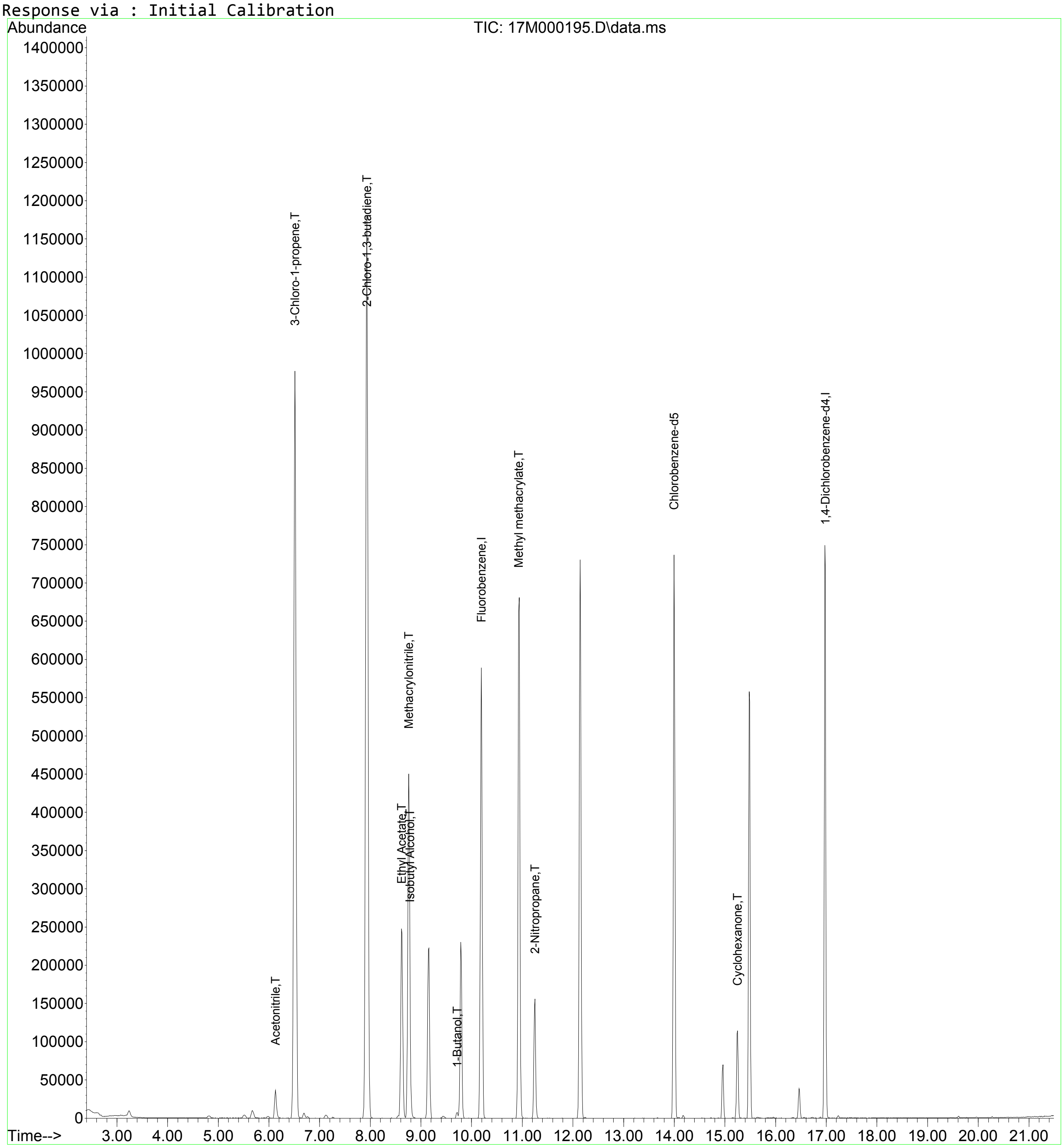
R = 5.08e-005 A*A + 2.22e-003 A - 1.95e-003
Coef of Det (r^2) = 0.995563   Curve Fit: Quadratic
Method Name: D:\MassHunter\GCMS\1\methods\A9FOOWT.M
Calibration Table Last Updated: Thu Oct 17 17:48:22 2013



R = 8.36e-005 A*A + 4.69e-003 A - 2.95e-003
Coef of Det (r^2) = 0.992665   Curve Fit: Quadratic
Method Name: D:\MassHunter\GCMS\1\methods\A9FOOWT.M
Calibration Table Last Updated: Thu Oct 17 17:48:22 2013

```
                                   Quantitation Report    (Not Reviewed)

Data Path : D:\MassHunter\GCMS\1\data\101313\
Data File : 17M000195.D
Acq On    : 13 Oct 2013  22:00
Operator  : MES
Sample    : WG448462-10 100ug/L APPIX ALT SRC
Misc      : 1,1 STD60749
ALS Vial  : 12   Sample Multiplier: 1

Quant Time: Oct 17 17:44:26 2013
Quant Method : D:\MassHunter\GCMS\1\methods\A9FOOWT.M
Quant Title  : Appendix IX (SOP:OVL MSV01) WATER 10/13/13 HPMS17
QLast Update : Thu Oct 17 17:39:37 2013
Response via : Initial Calibration

        Compound                   R.T. QIon  Response  Conc Units Dev(Min)
 --------------------------------------------------------------------------
 Internal Standards
   1) Fluorobenzene             10.192   96   737303    25.0000 ug/L     0.00
  11) Chlorobenzene-d5          13.996  117   523223    25.0000 ug/L     0.00
  13) 1,4-Dichlorobenzene-d4    16.981  152   266615    25.0000 ug/L     0.01

 Target Compounds                                                 Qvalue
   2) Acetonitrile               6.129   41    50664    99.95 ug/L #   100
   3) 3-Chloro-1-propene         6.512   41  1059147   103.69 ug/L     100
   4) 2-Chloro-1,3-butadiene     7.932   53  1242553   131.47 ug/L      99
   5) Methacrylonitrile          8.761   67   206460   107.73 ug/L     100
   6) Ethyl Acetate              8.616   43   431934   100.54 ug/L     100
   7) Isobutyl Alcohol           8.782   43    27315   190.94 ug/L      99
   8) 1-Butanol                  9.715   56     5884   102.15 ug/L      97
   9) Methyl methacrylate       10.928   41   453602   111.98 ug/L      99
  10) 2-Nitropropane            11.249   43   153443   101.22 ug/L      99
  12) Cyclohexanone             15.250   55    65010   500.01 ug/L      98
 --------------------------------------------------------------------------

 (#) = qualifier out of range (m) = manual integration (+) = signals summed
```

```
Data Path : D:\MassHunter\GCMS\1\data\101313\
Data File : 17M000195.D
Acq On    : 13 Oct 2013  22:00
Operator  : MES
Sample    : WG448462-10 100ug/L APPIX ALT SRC
Misc      : 1,1 STD60749
ALS Vial  : 12   Sample Multiplier: 1

Quant Time: Oct 17 17:44:26 2013
Quant Method : D:\MassHunter\GCMS\1\methods\A9FOOWT.M
Quant Title  : Appendix IX (SOP:OVL MSV01) WATER 10/13/13 HPMS17
QLast Update : Thu Oct 17 17:39:37 2013
Response via : Initial Calibration
```



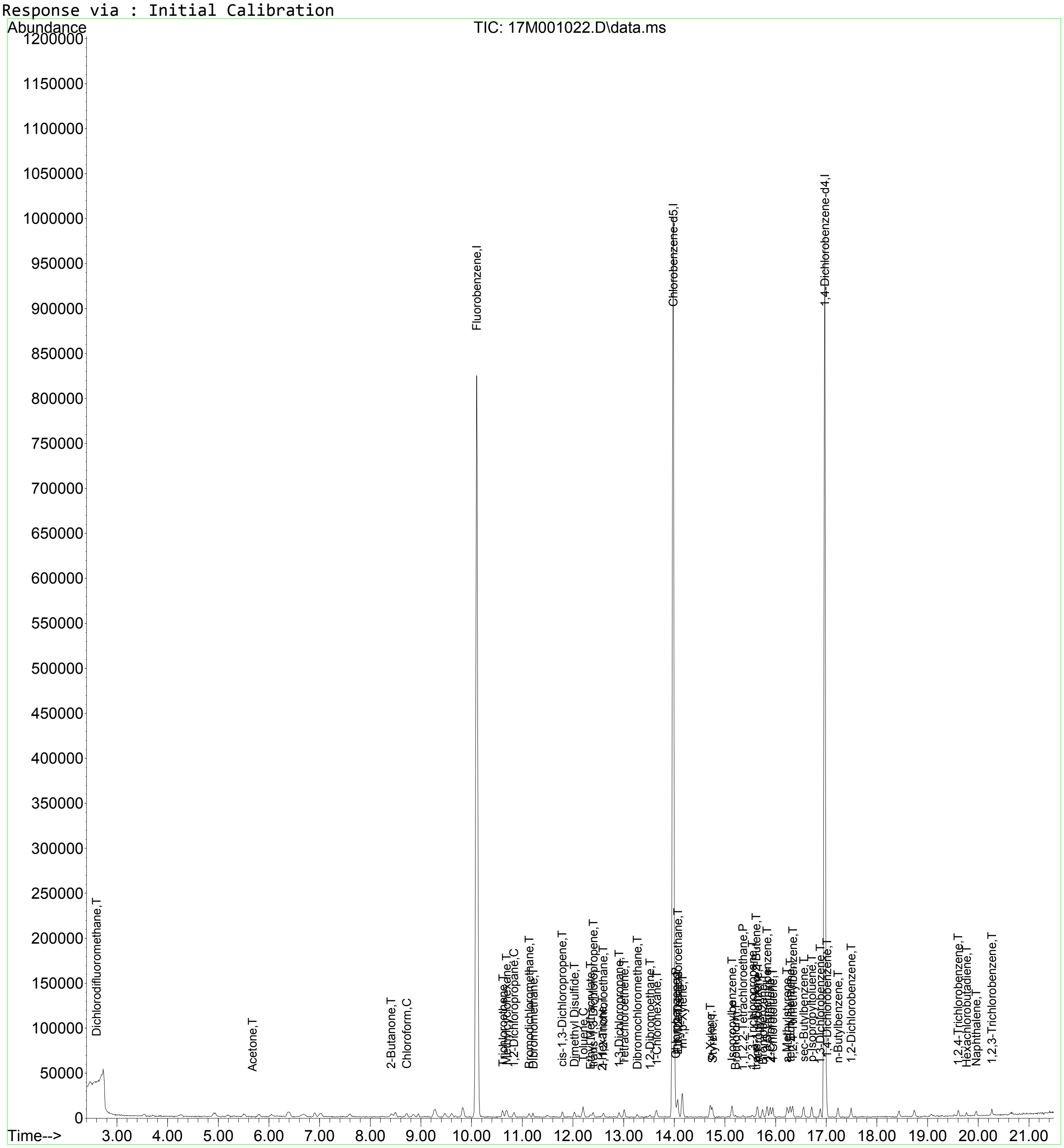
```
                          Evaluate Continuing Calibration Report

Data Path : D:\MassHunter\GCMS\1\data\101313\
Data File : 17M000195.D
Acq On    : 13 Oct 2013  22:00
Operator  : MES
Sample    : WG448462-10 100ug/L APPIX ALT SRC
Misc      : 1,1 STD60749
ALS Vial  : 12   Sample Multiplier: 1

Quant Time: Oct 17 17:44:26 2013
Quant Method : D:\MassHunter\GCMS\1\methods\A9FOOWT.M
Quant Title  : Appendix IX (SOP:OVL MSV01) WATER 10/13/13 HPMS17
QLast Update : Thu Oct 17 17:39:37 2013
Response via : Initial Calibration


Min. RRF     :   0.000  Min. Rel. Area :  50%  Max. R.T. Dev  0.50min
Max. RRF Dev :  25%     Max. Rel. Area : 150%

       Compound                      Amount  Calc.     %Dev Area% Dev(min)
-----------------------------------------------------------------------------
 1 I    Fluorobenzene                25.000  25.000       0.0   97   0.00
 2 T    Acetonitrile                100.000  99.953       0.0  102   0.00
 3 T    3-Chloro-1-propene          100.000 103.685      -3.7   94   0.00
 4 T    2-Chloro-1,3-butadiene      100.000 131.470     -31.5# 120   0.00
 5 T    Methacrylonitrile           100.000 107.732      -7.7  101   0.00
 6 T    Ethyl Acetate               100.000 100.539      -0.5   94   0.00
 7 T    Isobutyl Alcohol            200.000 190.945       4.5  101   0.00
 8 T    1-Butanol                   100.000 102.146      -2.1  104   0.00
 9 T    Methyl methacrylate         100.000 111.979     -12.0  101   0.00
10 T    2-Nitropropane              100.000 101.221      -1.2   99   0.00

11      Chlorobenzene-d5             25.000  25.000       0.0   96   0.00
12 T    Cyclohexanone               100.000 500.013    -400.0# 719   0.00

13 I    1,4-Dichlorobenzene-d4       25.000  25.000       0.0   96   0.01
-----------------------------------------------------------------------------

  (#) = Out of Range               SPCC's out = 0  CCC's out = 0
```

```
                              Quantitation Report    (QT Reviewed)

     Data Path : D:\MassHunter\GCMS\1\data\111513\
     Data File : 17M001022.D
     Acq On    : 15 Nov 2013  14:58
     Operator  : adc
     Sample    : WG453012-02 0.3ug/L STD 8260
     Misc      : 1,1 STD61183
     ALS Vial  : 1   Sample Multiplier: 1

     Quant Time: Nov 16 17:31:09 2013
     Quant Method : D:\MassHunter\GCMS\1\methods\8260WTR.M
     Quant Title  : 8260B/624 SOP:OVL MSV01 WATER 11/15/13 HPMS17
     QLast Update : Sat Nov 16 17:30:32 2013
     Response via : Initial Calibration

             Compound                   R.T. QIon  Response  Conc Units Dev(Min)
      --------------------------------------------------------------------------
      Internal Standards
        1) Fluorobenzene              10.098   96  1057733    25.00000 ug/L    -0.0936
       56) Chlorobenzene-d5           13.975  117   730642    25.00000 ug/L    -0.0209
       76) 1,4-Dichlorobenzene-d4     16.971  152   346593    25.00000 ug/L     0.0000

      System Monitoring Compounds
       37) Dibromofluoromethane        0.000  111        0     0.0000 ug/L
        Spiked Amount     25.000   Range  86 - 118    Recovery   =    0.000%#
       43) 1,2-Dichloroethane-d4       0.000   65        0     0.0000 ug/L
        Spiked Amount     25.000   Range  80 - 120    Recovery   =    0.000%#
       57) Toluene-d8                 12.109   98     1657     0.0372 ug/L   -0.0317
        Spiked Amount     25.000   Range  88 - 110    Recovery   =    0.149%#
       78) p-Bromofluorobenzene       15.468   95      433     0.0258 ug/L   -0.0103
        Spiked Amount     25.000   Range  86 - 115    Recovery   =    0.103%#

      Target Compounds                                                 Qvalue
        2) Dichlorodifluoromethane     2.594   85     1882     0.1918 ug/L #    69
       13) Acetone                     5.672   43      656     0.3097 ug/L #    43
       29) 2-Butanone                  8.409   43      632     0.1985 ug/L #    48
       33) Chloroform                  8.720   83     6117m    0.2796 ug/L
       46) Trichloroethene            10.617  130     3688     0.2638 ug/L      92
       47) Methylcyclohexane          10.689   83     5234     0.2717 ug/L      82
       48) 1,2-Dichloropropane        10.834   63     2751     0.2359 ug/L      99
       50) Bromodichloromethane       11.135   83     4229     0.2526 ug/L      94
       51) Dibromomethane             11.218   93     1597     0.2221 ug/L      99
       54) cis-1,3-Dichloropropene    11.788   75     4498     0.2399 ug/L #    87
       55) Dimethyl Disulfide         12.026   79     2682     0.2190 ug/L #    54
       58) Toluene                    12.203   91    13458     0.2722 ug/L      93
       59) Ethyl Methacrylate         12.348   69     2759     0.2229 ug/L      92
       60) trans-1,3-Dichloropropene  12.400   75     3569     0.2226 ug/L      88
       61) 1,1,2-Trichloroethane      12.596   97     2195     0.2386 ug/L      86
       62) 2-Hexanone                 12.576   43     2417     0.5001 ug/L #    22
       63) 1,3-Dichloropropane        12.907   76     3589     0.2274 ug/L #    13
       64) Tetrachloroethene          13.011  166     3173     0.2254 ug/L      97
       65) Dibromochloromethane       13.270  129     2606     0.2088 ug/L      96
       66) 1,2-Dibromoethane          13.519  107     2125     0.2214 ug/L      97
       67) 1-Chlorohexane             13.654   91     4080     0.2568 ug/L      78
       68) Chlorobenzene              14.027  112     8402     0.2469 ug/L      97
       69) 1,1,1,2-Tetrachloroethane  14.068  131     2802     0.2062 ug/L      96
       70) Ethylbenzene               14.068  106     4449     0.2390 ug/L      93
       71) m-,p-Xylene                14.162  106    11083     0.4953 ug/L      93
       72) o-Xylene                   14.711  106     5372     0.2411 ug/L      92
       73) Styrene                    14.752  104     7970     0.2222 ug/L      82
       74) Bromoform                  15.209  173     1526     0.5937 ug/L #    68
       75) Isopropylbenzene           15.136  105    13045     0.2400 ug/L      99
       77) 1,1,2,2-Tetrachloroethane  15.354   83     1952     0.1943 ug/L      76
       79) 1,2,3-Trichloropropane     15.540  110      614     0.1934 ug/L #    69
       80) trans-1,4-Dichloro-2-B...  15.613   53      450     0.1560 ug/L      95
       81) n-Propylbenzene            15.644   91    14765     0.2362 ug/L      95
       82) Bromobenzene               15.748  156     3725     0.2484 ug/L      91
       83) 1,3,5-Trimethylbenzene     15.830  105    10728     0.2310 ug/L      91
       84) 2-Chlorotoluene            15.893   91     9554     0.2431 ug/L      99
       85) 4-Chlorotoluene            15.944   91     9315     0.2489 ug/L      91
       86) a-Methylstyrene            16.224  118     5035     0.1798 ug/L      98
       87) tert-Butylbenzene          16.287  134     2093     0.2065 ug/L      88
       88) 1,2,4-Trimethylbenzene     16.338  105    10687     0.2275 ug/L      97
       89) sec-Butylbenzene           16.556  105    12513     0.2177 ug/L      97
       90) p-Isopropyltoluene         16.712  119    10170     0.2132 ug/L      93
       91) 1,3-Dichlorobenzene        16.877  146     6128     0.2235 ug/L      94
       92) 1,4-Dichlorobenzene        17.012  146     6122     0.2300 ug/L #     1

   8260WTR.M Sat Nov 16 17:32:51 2013                                          Page:  1
```

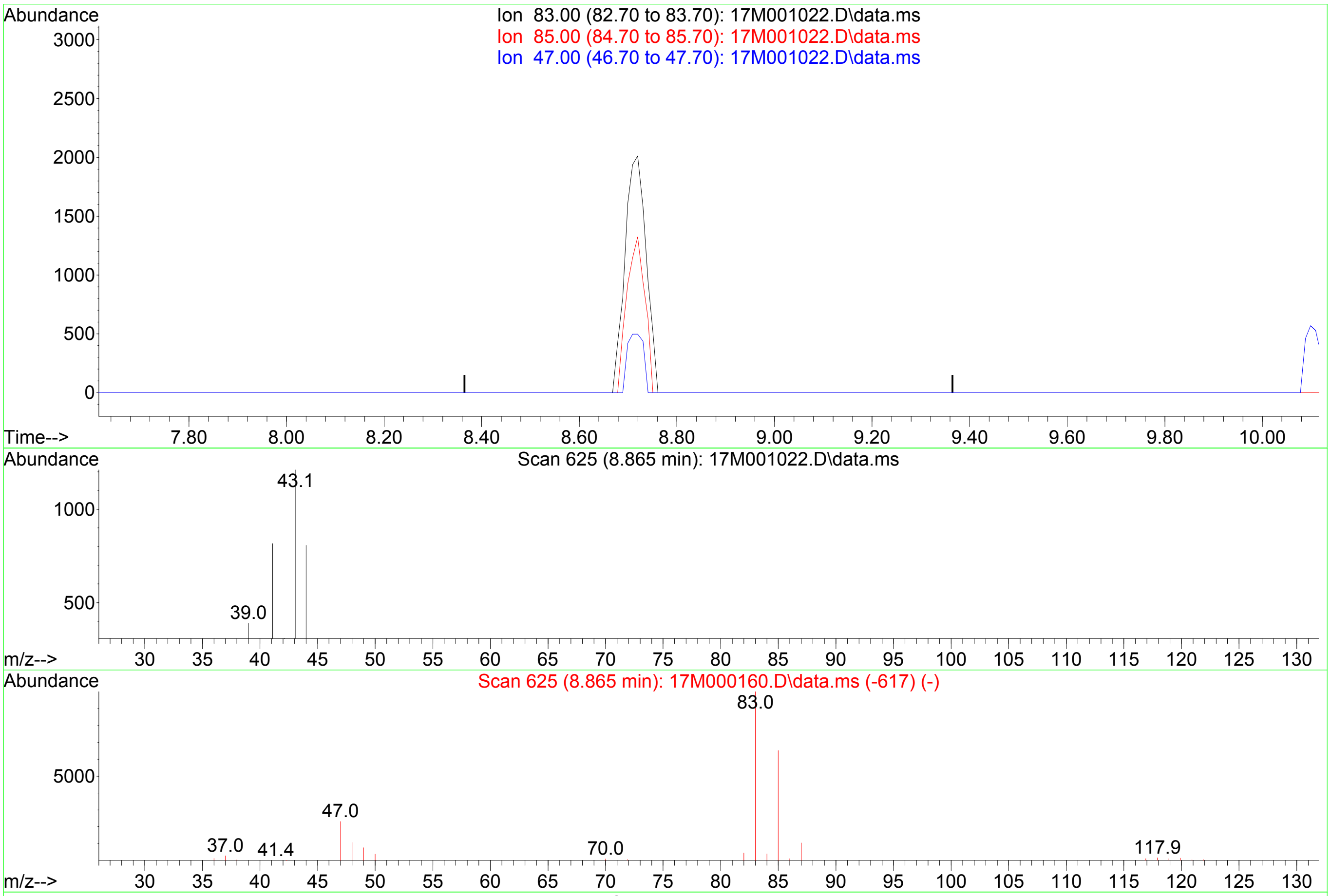
```
                         Quantitation Report    (QT Reviewed)

Data Path : D:\MassHunter\GCMS\1\data\111513\
Data File : 17M001022.D
Acq On    : 15 Nov 2013  14:58
Operator  : adc
Sample    : WG453012-02 0.3ug/L STD 8260
Misc      : 1,1 STD61183
ALS Vial  : 1   Sample Multiplier: 1

Quant Time: Nov 16 17:31:09 2013
Quant Method : D:\MassHunter\GCMS\1\methods\8260WTR.M
Quant Title  : 8260B/624 SOP:OVL MSV01 WATER 11/15/13 HPMS17
QLast Update : Sat Nov 16 17:30:32 2013
Response via : Initial Calibration

        Compound                   R.T. QIon  Response  Conc Units Dev(Min)
 --------------------------------------------------------------------------
  93) n-Butylbenzene             17.230   91     8847     0.3703 ug/L      88
  94) 1,2-Dichlorobenzene        17.489  146     5782     0.2220 ug/L      97
  96) 1,2,4-Trichlorobenzene     19.603  180     3570     0.4213 ug/L      94
  97) Hexachlorobutadiene        19.769  225     2085     0.4378 ug/L      80
  98) Naphthalene                19.956  128     6450     0.1902 ug/L #    85
  99) 1,2,3-Trichlorobenzene     20.267  180     3269     0.3319 ug/L      96
 --------------------------------------------------------------------------

 (#) = qualifier out of range (m) = manual integration (+) = signals summed
```

Quantitation Report   (QT Reviewed)

```
Data Path : D:\MassHunter\GCMS\1\data\111513\
Data File : 17M001022.D
Acq On    : 15 Nov 2013  14:58
Operator  : adc
Sample    : WG453012-02 0.3ug/L STD 8260
Misc      : 1,1 STD61183
ALS Vial  : 1   Sample Multiplier: 1

Quant Time: Nov 16 17:31:09 2013
Quant Method : D:\MassHunter\GCMS\1\methods\8260WTR.M
Quant Title  : 8260B/624 SOP:OVL MSV01 WATER 11/15/13 HPMS17
QLast Update : Sat Nov 16 17:30:32 2013
Response via : Initial Calibration
```



```
Data Path : D:\MassHunter\GCMS\1\data\111513\
Data File : 17M001022.D
Acq On    : 15 Nov 2013  14:58
Operator  : adc
Sample    : WG453012-02 0.3ug/L STD 8260
Misc      : 1,1 STD61183
ALS Vial  : 1   Sample Multiplier: 1

Quant Time: Nov 15 15:19:57 2013
Quant Method : D:\MassHunter\GCMS\1\methods\8260WTR.M
Quant Title  : 8260B/624 SOP:OVL MSV01 WATER 10/22/13 HPMS17
QLast Update : Wed Oct 23 12:29:01 2013
Response via : Initial Calibration
```

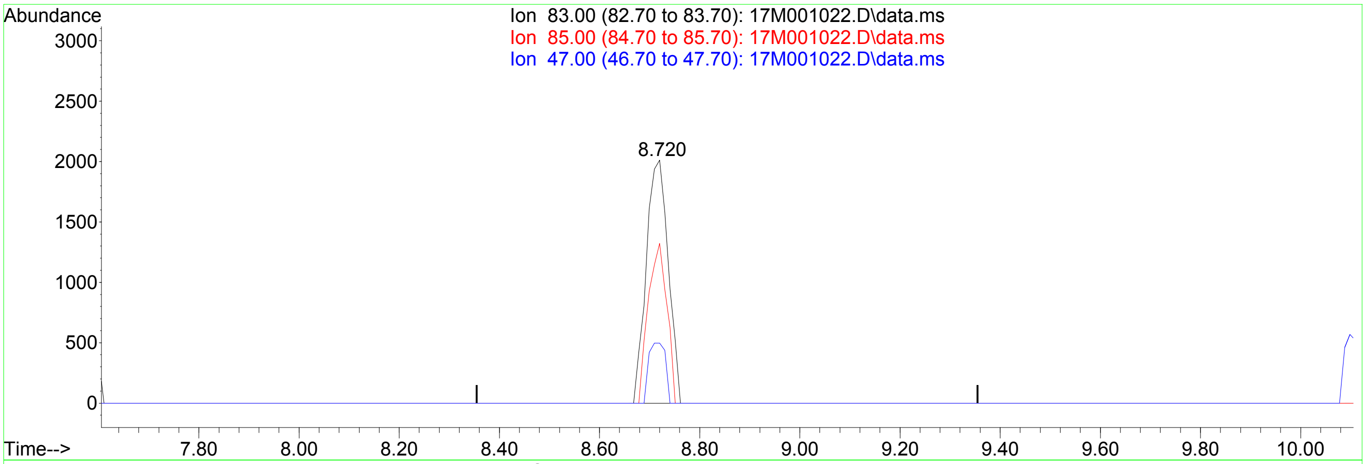


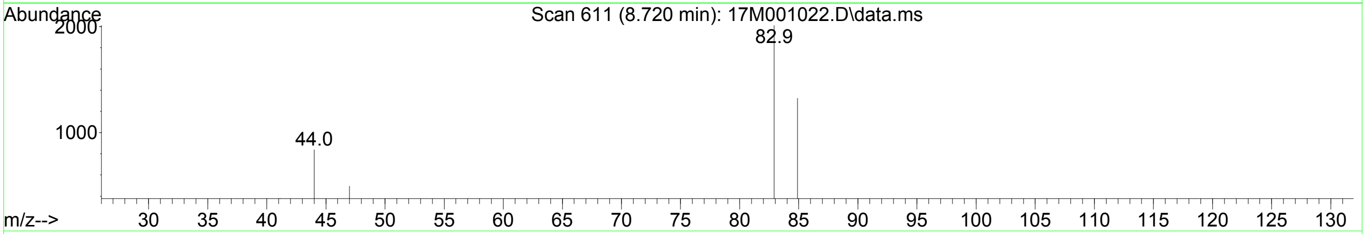
TIC: 17M001022.D\data.ms

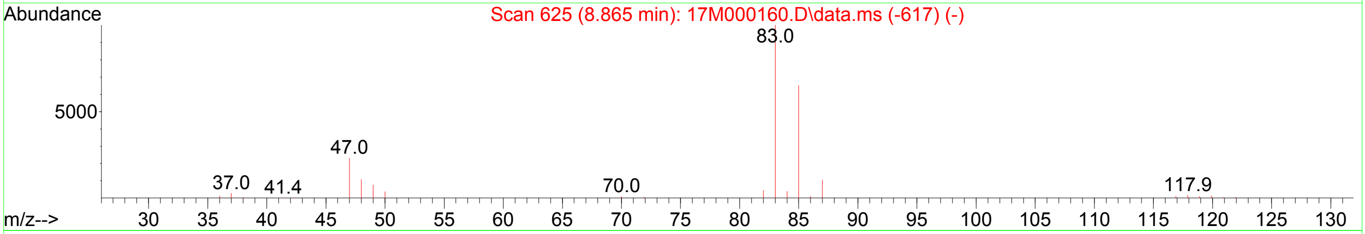
```
(33)  Chloroform (C)

8.865min (-8.865)  0.00 ug/L

response          0

  Ion        Exp%      Act%

 83.00      100.00     0.00

 85.00       65.10     0.00#

 47.00       23.80     0.00#

  0.00        0.00     0.00
```

Quantitation Report (Qedit)

```
Data Path : D:\MassHunter\GCMS\1\data\111513\
Data File : 17M001022.D
Acq On    : 15 Nov 2013  14:58
Operator  : adc
Sample    : WG453012-02 0.3ug/L STD 8260
Misc      : 1,1 STD61183
ALS Vial  : 1   Sample Multiplier: 1

Quant Time: Nov 16 17:31:09 2013
Quant Method : D:\MassHunter\GCMS\1\methods\8260WTR.M
Quant Title  : 8260B/624 SOP:OVL MSV01 WATER 11/15/13 HPMS17
QLast Update : Sat Nov 16 17:30:32 2013
Response via : Initial Calibration
```







TIC: 17M001022.D\data.ms

(33) Chloroform (C)

8.720min (-0.135) 0.28 ug/L mint

response 6117

Ion	Exp%	Act%
83.00	100.00	100.00
85.00	65.40	0.00#
47.00	23.90	0.00#
0.00	0.00	0.00

Analyst: 11/20/2013 11:05 Supervisor: 11/21/2013 14:12

#1 - Data system fails to select correct peak

```
                             Quantitation Report    (Not Reviewed)
  Data Path : D:\MassHunter\GCMS\1\data\111513\
  Data File : 17M001023.D
  Acq On    : 15 Nov 2013  15:26
  Operator  : adc
  Sample    : WG453012-03 0.4ug/L STD 8260
  Misc      : 1,1 STD61183
  ALS Vial  : 2   Sample Multiplier: 1

  Quant Time: Nov 16 17:31:12 2013
  Quant Method : D:\MassHunter\GCMS\1\methods\8260WTR.M
  Quant Title  : 8260B/624 SOP:OVL MSV01 WATER 11/15/13 HPMS17
  QLast Update : Sat Nov 16 17:30:32 2013
  Response via : Initial Calibration

          Compound                   R.T. QIon  Response  Conc Units Dev(Min)
   --------------------------------------------------------------------------
   Internal Standards
     1) Fluorobenzene              10.192   96    985523    25.00000 ug/L      0.0000
    56) Chlorobenzene-d5           13.996  117    654700    25.00000 ug/L      0.0000
    76) 1,4-Dichlorobenzene-d4     16.971  152    276067    25.00000 ug/L      0.0000

   System Monitoring Compounds
    37) Dibromofluoromethane        0.000  111         0     0.0000 ug/L
     Spiked Amount     25.000   Range  86 - 118    Recovery   =    0.000%#
    43) 1,2-Dichloroethane-d4       9.788   65       458     0.0379 ug/L    0.0000
     Spiked Amount     25.000   Range  80 - 120    Recovery   =    0.152%#
    57) Toluene-d8                 12.141   98      3330     0.0834 ug/L    0.0000
     Spiked Amount     25.000   Range  88 - 110    Recovery   =    0.334%#
    78) p-Bromofluorobenzene       15.478   95       459     0.0343 ug/L    0.0000
     Spiked Amount     25.000   Range  86 - 115    Recovery   =    0.137%#

   Target Compounds                                                   Qvalue
     2) Dichlorodifluoromethane     2.563   85      3058     0.3345 ug/L #    69
     3) Chloromethane               2.978   50      5995     0.3979 ug/L      79
     4) Vinyl Chloride              3.185   62      5764     0.3895 ug/L #    76
     5) 1,3-Butadiene               3.237   54      6612     0.9489 ug/L #    61
     6) Bromomethane                4.045   94      3299     0.3820 ug/L      89
     7) Chloroethane                4.221   64      2537     0.3423 ug/L #    49
     8) Trichlorofluoromethane      4.729  101      5635     0.3384 ug/L #    94
    10) Isoprene                    5.320   67      5503     0.3593 ug/L      93
    12) 1,1,2-Trichloro-1,2,2-...   5.569  101      2838     0.2811 ug/L      91
    13) Acetone                     5.683   43      3969     2.0112 ug/L #    43
    14) 1,1-Dichloroethene          5.859   61      5309     0.3435 ug/L      93
    16) Dimethyl Sulfide            6.139   62      3231     0.3189 ug/L      98
    17) Iodomethane                 6.377  142      4443     0.3142 ug/L      91
    18) Methyl acetate              6.460   43      3269     0.6277 ug/L #    57
    19) Methylene Chloride          6.688   84      4340     0.3760 ug/L      98
    20) Carbon Disulfide            6.668   76     12014     0.3578 ug/L      90
    22) Methyl Tert Butyl Ether     6.937   73      8698     0.3331 ug/L      84
    23) trans-1,2-Dichloroethene    7.155   96      3772     0.3485 ug/L      97
    24) n-Hexane                    7.259   57      4362     0.3795 ug/L #    52
    26) Vinyl Acetate               7.818   43      5888     0.4539 ug/L #    70
    27) 1,1-Dichloroethane          7.798   63      7128     0.3651 ug/L      98
    29) 2-Butanone                  8.399   43      2015     0.6794 ug/L #    48
    31) 2,2-Dichloropropane         8.585   77      6887     0.4019 ug/L #    46
    32) cis-1,2-Dichloroethene      8.658   96      4516     0.3597 ug/L      84
    33) Chloroform                  8.865   83      7481     0.3670 ug/L      93
    34) 1-Bromopropane              8.990  122       442     0.1797 ug/L      98
    35) Bromochloromethane          9.083  130      2665     0.3379 ug/L      99
    38) 1,1,1-Trichloroethane       9.383   97      6454     0.3452 ug/L      92
    39) Cyclohexane                 9.404   56      6475     0.3751 ug/L #    77
    40) 1,1-Dichloropropene         9.580   75      4534     0.3200 ug/L #    67
    42) Carbon Tetrachloride        9.715  117      5601     0.3262 ug/L      98
    44) 1,2-Dichloroethane          9.902   62      4672     0.3305 ug/L #    86
    45) Benzene                     9.933   78     15748     0.3666 ug/L      95
    46) Trichloroethene            10.689  130      4573     0.3510 ug/L     100
    47) Methylcyclohexane          10.762   83      6179     0.3443 ug/L      77
    48) 1,2-Dichloropropane        10.897   63      3864     0.3556 ug/L      88
    50) Bromodichloromethane       11.197   83      5165     0.3311 ug/L     100
    51) Dibromomethane             11.270   93      2311     0.3450 ug/L      94
    52) 2-Chloroethyl Vinyl Ether  11.529   63       926     0.2310 ug/L #    42
    53) 4-Methyl-2-Pentanone       11.560   58       682     0.2461 ug/L #    30
    54) cis-1,3-Dichloropropene    11.840   75      5629     0.3222 ug/L      96
    55) Dimethyl Disulfide         12.068   79      3281     0.2875 ug/L #    79
    58) Toluene                    12.244   91     16711     0.3772 ug/L      98
    59) Ethyl Methacrylate         12.369   69      3650     0.3291 ug/L #    16
```

```
                        Quantitation Report    (Not Reviewed)

Data Path : D:\MassHunter\GCMS\1\data\111513\
Data File : 17M001023.D
Acq On    : 15 Nov 2013  15:26
Operator  : adc
Sample    : WG453012-03 0.4ug/L STD 8260
Misc      : 1,1 STD61183
ALS Vial  : 2   Sample Multiplier: 1

Quant Time: Nov 16 17:31:12 2013
Quant Method : D:\MassHunter\GCMS\1\methods\8260WTR.M
Quant Title  : 8260B/624 SOP:OVL MSV01 WATER 11/15/13 HPMS17
QLast Update : Sat Nov 16 17:30:32 2013
Response via : Initial Calibration

        Compound                   R.T. QIon  Response  Conc Units Dev(Min)
 --------------------------------------------------------------------------
  60) trans-1,3-Dichloropropene  12.431   75     4569     0.3181 ug/L      90
  61) 1,1,2-Trichloroethane      12.638   97     3152     0.3824 ug/L      86
  62) 2-Hexanone                 12.597   43     2558     0.5907 ug/L #    44
  63) 1,3-Dichloropropane        12.939   76     4961     0.3507 ug/L #    58
  64) Tetrachloroethene          13.042  166     4314     0.3420 ug/L      98
  65) Dibromochloromethane       13.291  129     3678     0.3289 ug/L      93
  66) 1,2-Dibromoethane          13.540  107     2721     0.3163 ug/L      98
  67) 1-Chlorohexane             13.664   91     4998     0.3511 ug/L      88
  68) Chlorobenzene              14.048  112    10659     0.3495 ug/L      95
  69) 1,1,1,2-Tetrachloroethane  14.079  131     3856     0.3167 ug/L      93
  70) Ethylbenzene               14.079  106     5473     0.3281 ug/L      88
  71) m-,p-Xylene                14.172  106    14026     0.6995 ug/L      92
  72) o-Xylene                   14.722  106     6962     0.3488 ug/L      96
  73) Styrene                    14.763  104    10160     0.3161 ug/L      89
  74) Bromoform                  15.219  173     2030     0.6694 ug/L #    81
  75) Isopropylbenzene           15.147  105    16260     0.3339 ug/L      98
  77) 1,1,2,2-Tetrachloroethane  15.364   83     2665     0.3331 ug/L      90
  79) 1,2,3-Trichloropropane     15.551  110      776     0.3069 ug/L      65
  80) trans-1,4-Dichloro-2-B...  15.603   53      714     0.3108 ug/L #    50
  81) n-Propylbenzene            15.644   91    18264     0.3669 ug/L      98
  82) Bromobenzene               15.748  156     4088     0.3422 ug/L      89
  83) 1,3,5-Trimethylbenzene     15.831  105    13640     0.3687 ug/L      95
  84) 2-Chlorotoluene            15.903   91    12573     0.4017 ug/L      94
  85) 4-Chlorotoluene            15.945   91    10912     0.3661 ug/L      96
  86) a-Methylstyrene            16.235  118     6433     0.2883 ug/L      98
  87) tert-Butylbenzene          16.287  134     2623     0.3248 ug/L      79
  88) 1,2,4-Trimethylbenzene     16.339  105    13440     0.3593 ug/L      98
  89) sec-Butylbenzene           16.556  105    16146     0.3527 ug/L      97
  90) p-Isopropyltoluene         16.722  119    13077     0.3441 ug/L      99
  91) 1,3-Dichlorobenzene        16.888  146     7680     0.3516 ug/L      95
  92) 1,4-Dichlorobenzene        17.012  146     7236     0.3414 ug/L      80
  93) n-Butylbenzene             17.230   91    10023     0.4575 ug/L      96
  94) 1,2-Dichlorobenzene        17.499  146     7607     0.3667 ug/L      98
  96) 1,2,4-Trichlorobenzene     19.604  180     4517     0.5183 ug/L      95
  97) Hexachlorobutadiene        19.769  225     2448     0.5215 ug/L      93
  98) Naphthalene                19.956  128     8701     0.3220 ug/L      97
  99) 1,2,3-Trichlorobenzene     20.267  180     4366     0.4431 ug/L      96
 --------------------------------------------------------------------------

 (#) = qualifier out of range (m) = manual integration (+) = signals summed
```

Quantitation Report (Not Reviewed)

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Data Path : D:\MassHunter\GCMS\1\data\111513\
Data File : 17M001023.D
Acq On    : 15 Nov 2013  15:26
Operator  : adc
Sample    : WG453012-03 0.4ug/L STD 8260
Misc      : 1,1 STD61183
ALS Vial  : 2   Sample Multiplier: 1

Quant Time: Nov 16 17:31:12 2013
Quant Method : D:\MassHunter\GCMS\1\methods\8260WTR.M
Quant Title  : 8260B/624 SOP:OVL MSV01 WATER 11/15/13 HPMS17
QLast Update : Sat Nov 16 17:30:32 2013
Response via : Initial Calibration
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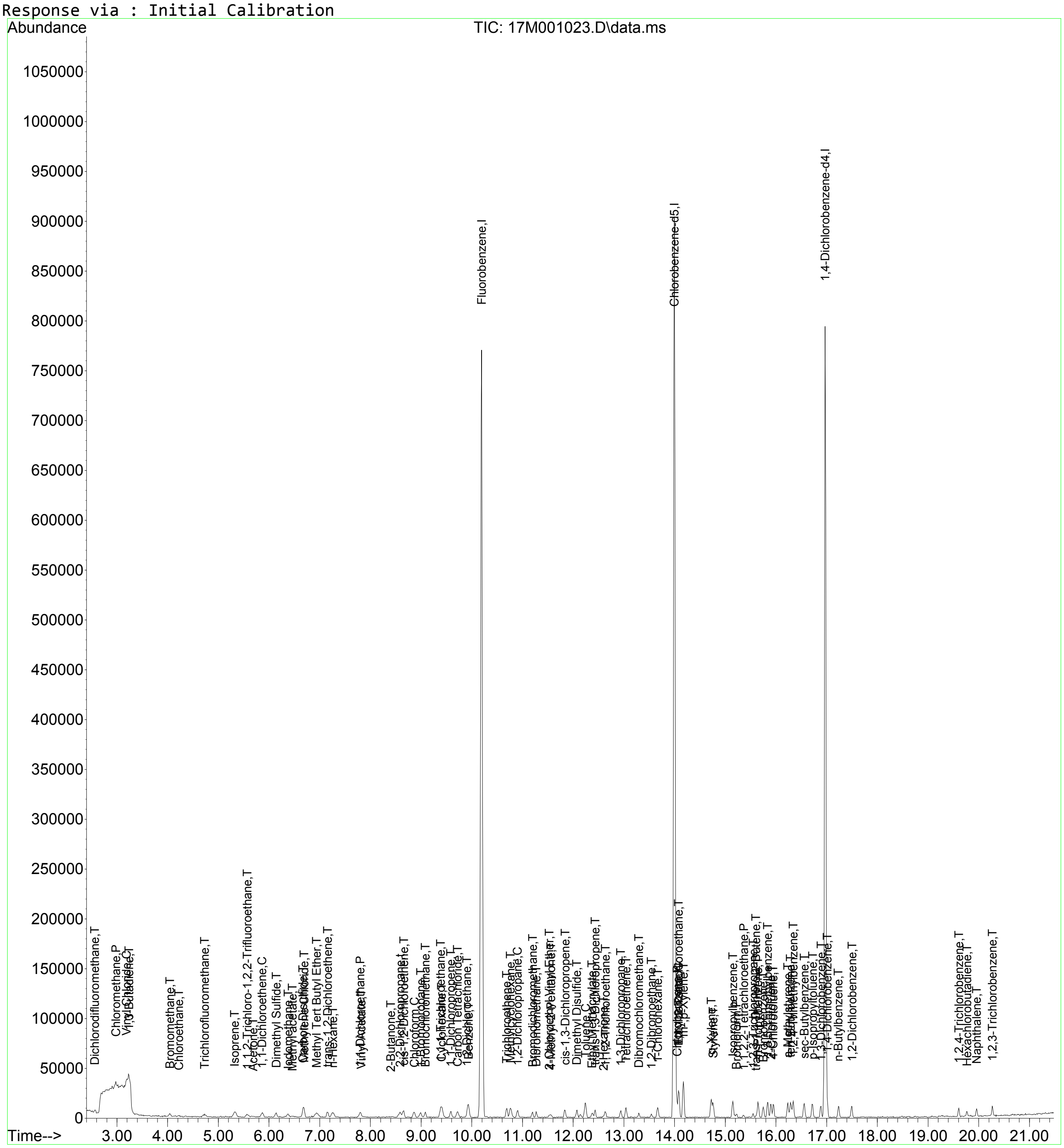

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                         Quantitation Report    (Not Reviewed)

Data Path : D:\MassHunter\GCMS\1\data\111513\
Data File : 17M001024.D
Acq On    : 15 Nov 2013  15:55
Operator  : adc
Sample    : WG453012-04 1.0ug/L STD 8260
Misc      : 1,1 STD61183
ALS Vial  : 3   Sample Multiplier: 1

Quant Time: Nov 16 17:31:14 2013
Quant Method : D:\MassHunter\GCMS\1\methods\8260WTR.M
Quant Title  : 8260B/624 SOP:OVL MSV01 WATER 11/15/13 HPMS17
QLast Update : Sat Nov 16 17:30:32 2013
Response via : Initial Calibration

        Compound                   R.T. QIon  Response  Conc Units Dev(Min)
 --------------------------------------------------------------------------
 Internal Standards
   1) Fluorobenzene              10.192   96   894593    25.00000 ug/L     0.0000
  56) Chlorobenzene-d5           13.996  117   607416    25.00000 ug/L     0.0000
  76) 1,4-Dichlorobenzene-d4     16.971  152   272611    25.00000 ug/L     0.0000

 System Monitoring Compounds
  37) Dibromofluoromethane        9.145  111     5267     0.4728 ug/L    0.0000
   Spiked Amount     25.000   Range  86 - 118    Recovery   =    1.891%#
  43) 1,2-Dichloroethane-d4       9.787   65     5804     0.5286 ug/L    0.0000
   Spiked Amount     25.000   Range  80 - 120    Recovery   =    2.114%#
  57) Toluene-d8                 12.140   98    20862     0.5629 ug/L    0.0000
   Spiked Amount     25.000   Range  88 - 110    Recovery   =    2.252%#
  78) p-Bromofluorobenzene       15.478   95     6806     0.5150 ug/L    0.0000
   Spiked Amount     25.000   Range  86 - 115    Recovery   =    2.060%#

 Target Compounds                                                Qvalue
   2) Dichlorodifluoromethane     2.563   85     7027     0.8468 ug/L      99
   3) Chloromethane               2.978   50    13566     0.9920 ug/L      95
   4) Vinyl Chloride              3.185   62    13237     0.9855 ug/L      89
   5) 1,3-Butadiene               3.237   54    12555     1.9849 ug/L #    66
   6) Bromomethane                4.045   94     7224     0.9216 ug/L      99
   7) Chloroethane                4.221   64     6034     0.8968 ug/L      90
   8) Trichlorofluoromethane      4.729  101    13918     0.9209 ug/L      95
   9) Diethyl ether               5.320   59    30590     4.5684 ug/L      98
  10) Isoprene                    5.330   67    12549     0.9026 ug/L      95
  12) 1,1,2-Trichloro-1,2,2-...   5.579  101     8621     0.9408 ug/L      91
  13) Acetone                     5.672   43     4245     2.3698 ug/L #    43
  14) 1,1-Dichloroethene          5.859   61    13012     0.9275 ug/L      99
  15) Tert-Butyl Alcohol          6.025   59     5181     8.4774 ug/L #    37
  16) Dimethyl Sulfide            6.139   62     8594     0.9345 ug/L      99
  17) Iodomethane                 6.367  142    10935     0.8520 ug/L      98
  18) Methyl acetate              6.460   43     6124     1.2955 ug/L #    67
  19) Methylene Chloride          6.688   84     9764     0.9320 ug/L      95
  20) Carbon Disulfide            6.668   76    27135     0.8904 ug/L      96
  21) Acrylonitrile               6.906   53     4671     2.0449 ug/L      97
  22) Methyl Tert Butyl Ether     6.937   73    22221     0.9374 ug/L      95
  23) trans-1,2-Dichloroethene    7.155   96     9189     0.9353 ug/L      98
  24) n-Hexane                    7.258   57     9501     0.9106 ug/L      82
  25) Diisopropyl ether           7.632   45   131936     4.6808 ug/L      97
  26) Vinyl Acetate               7.808   43    11768     0.9994 ug/L #    80
  27) 1,1-Dichloroethane          7.797   63    16798     0.9478 ug/L      98
  28) Ethyl-Tert-Butyl ether      8.222   59   132267     4.6042 ug/L      99
  29) 2-Butanone                  8.388   43     3763     1.3977 ug/L #    48
  30) Propionitrile               8.492   54     3313     4.2015 ug/L      84
  31) 2,2-Dichloropropane         8.585   77    15342     0.9863 ug/L      75
  32) cis-1,2-Dichloroethene      8.647   96    10755     0.9437 ug/L      99
  33) Chloroform                  8.865   83    17675     0.9553 ug/L      99
  34) 1-Bromopropane              9.000  122     1825     0.8173 ug/L      92
  35) Bromochloromethane          9.083  130     6673     0.9322 ug/L      98
  36) Tetrahydrofuran             9.124   42     7923     4.9551 ug/L      95
  38) 1,1,1-Trichloroethane       9.383   97    15845     0.9337 ug/L      96
  39) Cyclohexane                 9.404   56    15049     0.9604 ug/L      89
  40) 1,1-Dichloropropene         9.580   75    11765     0.9149 ug/L      87
  41) Tert-Amyl-Methyl ether      9.715   73   118107     4.4945 ug/L      97
  42) Carbon Tetrachloride        9.715  117    13771     0.8836 ug/L      99
  44) 1,2-Dichloroethane          9.902   62    12060     0.9397 ug/L      98
  45) Benzene                     9.933   78    36816     0.9443 ug/L      99
  46) Trichloroethene            10.689  130    10793     0.9127 ug/L     100
  47) Methylcyclohexane          10.762   83    14710     0.9029 ug/L      92
  48) 1,2-Dichloropropane        10.907   63     9352     0.9480 ug/L     100
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                         Quantitation Report    (Not Reviewed)

  Data Path : D:\MassHunter\GCMS\1\data\111513\
  Data File : 17M001024.D
  Acq On    : 15 Nov 2013  15:55
  Operator  : adc
  Sample    : WG453012-04 1.0ug/L STD 8260
  Misc      : 1,1 STD61183
  ALS Vial  : 3   Sample Multiplier: 1

  Quant Time: Nov 16 17:31:14 2013
  Quant Method : D:\MassHunter\GCMS\1\methods\8260WTR.M
  Quant Title  : 8260B/624 SOP:OVL MSV01 WATER 11/15/13 HPMS17
  QLast Update : Sat Nov 16 17:30:32 2013
  Response via : Initial Calibration

          Compound                   R.T. QIon  Response  Conc Units Dev(Min)
   -------------------------------------------------------------------------
    50) Bromodichloromethane       11.197   83    12798     0.9037 ug/L     100
    51) Dibromomethane             11.270   93     5622     0.9246 ug/L      93
    52) 2-Chloroethyl Vinyl Ether  11.519   63     2742     0.7535 ug/L #    76
    53) 4-Methyl-2-Pentanone       11.560   58     2173     0.8639 ug/L      77
    54) cis-1,3-Dichloropropene    11.840   75    13989     0.8820 ug/L      96
    55) Dimethyl Disulfide         12.068   79     8046     0.7767 ug/L      91
    58) Toluene                    12.244   91    39238     0.9547 ug/L      97
    59) Ethyl Methacrylate         12.379   69     9188     0.8928 ug/L      76
    60) trans-1,3-Dichloropropene  12.431   75    11807     0.8859 ug/L      98
    61) 1,1,2-Trichloroethane      12.638   97     7012     0.9169 ug/L      94
    62) 2-Hexanone                 12.607   43     4413     1.0984 ug/L      73
    63) 1,3-Dichloropropane        12.939   76    12420     0.9465 ug/L      81
    64) Tetrachloroethene          13.042  166    10621     0.9077 ug/L      98
    65) Dibromochloromethane       13.291  129     8493     0.8185 ug/L     100
    66) 1,2-Dibromoethane          13.540  107     7303     0.9151 ug/L      99
    67) 1-Chlorohexane             13.664   91    11424     0.8650 ug/L      90
    68) Chlorobenzene              14.048  112    24906     0.8803 ug/L #    65
    69) 1,1,1,2-Tetrachloroethane  14.079  131     9631     0.8525 ug/L      98
    70) Ethylbenzene               14.089  106    13088     0.8457 ug/L      90
    71) m-,p-Xylene                14.172  106    32538     1.7492 ug/L      95
    72) o-Xylene                   14.721  106    16057     0.8670 ug/L      93
    73) Styrene                    14.763  104    25107     0.8420 ug/L      95
    74) Bromoform                  15.229  173     5510     1.1158 ug/L      95
    75) Isopropylbenzene           15.146  105    40157     0.8888 ug/L      98
    77) 1,1,2,2-Tetrachloroethane  15.364   83     6713     0.8496 ug/L      98
    79) 1,2,3-Trichloropropane     15.551  110     2421     0.9695 ug/L      94
    80) trans-1,4-Dichloro-2-B...  15.613   53     1837     0.8098 ug/L      90
    81) n-Propylbenzene            15.644   91    43531     0.8855 ug/L      98
    82) Bromobenzene               15.748  156    10620     0.9004 ug/L      99
    83) 1,3,5-Trimethylbenzene     15.830  105    32510     0.8898 ug/L      99
    84) 2-Chlorotoluene            15.903   91    29505     0.9546 ug/L      98
    85) 4-Chlorotoluene            15.945   91    26383     0.8963 ug/L      96
    86) a-Methylstyrene            16.235  118    17095     0.7760 ug/L      99
    87) tert-Butylbenzene          16.287  134     6798     0.8526 ug/L      87
    88) 1,2,4-Trimethylbenzene     16.338  105    33276     0.9007 ug/L      99
    89) sec-Butylbenzene           16.556  105    39099     0.8648 ug/L     100
    90) p-Isopropyltoluene         16.722  119    31336     0.8350 ug/L      99
    91) 1,3-Dichlorobenzene        16.888  146    18342     0.8503 ug/L      98
    92) 1,4-Dichlorobenzene        17.012  146    18441     0.8810 ug/L #    70
    93) n-Butylbenzene             17.230   91    24177     0.8811 ug/L      98
    94) 1,2-Dichlorobenzene        17.499  146    18593     0.9076 ug/L      98
    95) 1,2-Dibromo-3-Chloropr...  18.484   75     1098     0.7398 ug/L      83
    96) 1,2,4-Trichlorobenzene     19.603  180    11358     0.9227 ug/L      99
    97) Hexachlorobutadiene        19.769  225     6134     0.9213 ug/L      97
    98) Naphthalene                19.956  128    22192     0.8318 ug/L      99
    99) 1,2,3-Trichlorobenzene     20.267  180    11294     0.8893 ug/L      98
   -------------------------------------------------------------------------

   (#) = qualifier out of range (m) = manual integration (+) = signals summed
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                              Quantitation Report    (Not Reviewed)

Data Path : D:\MassHunter\GCMS\1\data\111513\
Data File : 17M001024.D
Acq On    : 15 Nov 2013  15:55
Operator  : adc
Sample    : WG453012-04 1.0ug/L STD 8260
Misc      : 1,1 STD61183
ALS Vial  : 3   Sample Multiplier: 1

Quant Time: Nov 16 17:31:14 2013
Quant Method : D:\MassHunter\GCMS\1\methods\8260WTR.M
Quant Title  : 8260B/624 SOP:OVL MSV01 WATER 11/15/13 HPMS17
QLast Update : Sat Nov 16 17:30:32 2013
Response via : Initial Calibration
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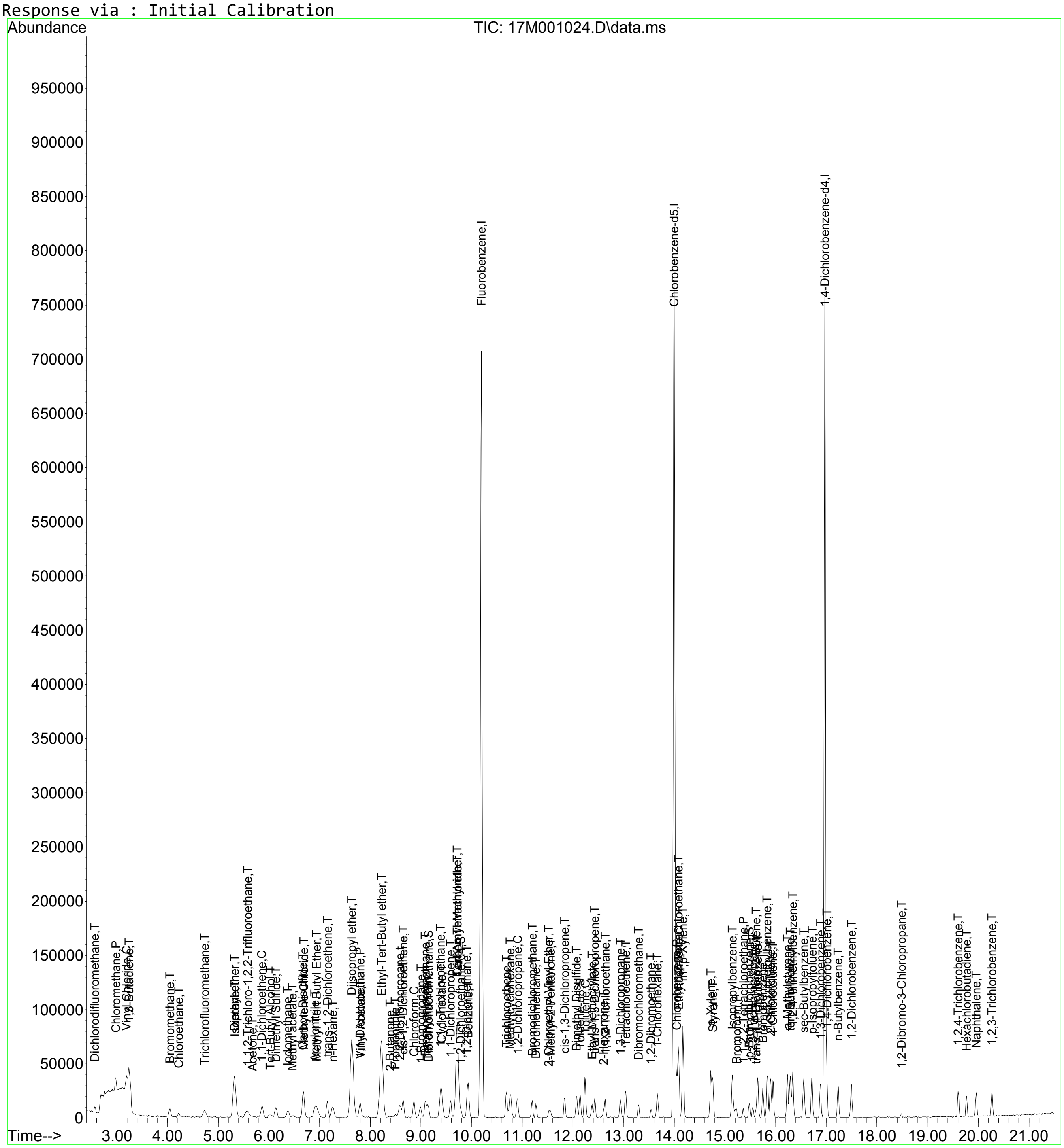

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                               Quantitation Report    (Not Reviewed)

  Data Path : D:\MassHunter\GCMS\1\data\111513\
  Data File : 17M001025.D
  Acq On    : 15 Nov 2013  16:23
  Operator  : adc
  Sample    : WG453012-05 2.0ug/L STD 8260
  Misc      : 1,1 STD61183
  ALS Vial  : 4   Sample Multiplier: 1

  Quant Time: Nov 16 17:31:16 2013
  Quant Method : D:\MassHunter\GCMS\1\methods\8260WTR.M
  Quant Title  : 8260B/624 SOP:OVL MSV01 WATER 11/15/13 HPMS17
  QLast Update : Sat Nov 16 17:30:32 2013
  Response via : Initial Calibration

          Compound                   R.T. QIon  Response  Conc Units Dev(Min)
   -------------------------------------------------------------------------
   Internal Standards
     1) Fluorobenzene              10.192   96   874761    25.00000 ug/L     0.0000
    56) Chlorobenzene-d5           13.996  117   596597    25.00000 ug/L     0.0000
    76) 1,4-Dichlorobenzene-d4     16.971  152   271856    25.00000 ug/L     0.0000

   System Monitoring Compounds
    37) Dibromofluoromethane        9.145  111    10964     1.0065 ug/L    0.0000
     Spiked Amount     25.000   Range  86 - 118    Recovery   =    4.026%#
    43) 1,2-Dichloroethane-d4       9.788   65    11861     1.1048 ug/L    0.0000
     Spiked Amount     25.000   Range  80 - 120    Recovery   =    4.419%#
    57) Toluene-d8                 12.140   98    38831     1.0668 ug/L    0.0000
     Spiked Amount     25.000   Range  88 - 110    Recovery   =    4.267%#
    78) p-Bromofluorobenzene       15.478   95    13370     1.0144 ug/L    0.0000
     Spiked Amount     25.000   Range  86 - 115    Recovery   =    4.058%#

   Target Compounds                                                  Qvalue
     2) Dichlorodifluoromethane     2.563   85    14395     1.7739 ug/L      99
     3) Chloromethane               2.978   50    26276     1.9650 ug/L      88
     4) Vinyl Chloride              3.185   62    26995     2.0553 ug/L      95
     5) 1,3-Butadiene               3.237   54    18786     3.0374 ug/L      91
     6) Bromomethane                4.045   94    14349     1.8720 ug/L     100
     7) Chloroethane                4.221   64    12899     1.9605 ug/L      96
     8) Trichlorofluoromethane      4.729  101    29282     1.9814 ug/L     100
     9) Diethyl ether               5.310   59   164051    25.0555 ug/L      99
    10) Isoprene                    5.330   67    27435     2.0180 ug/L      99
    11) Acrolein                    5.548   56     2763    12.1772 ug/L      71
    12) 1,1,2-Trichloro-1,2,2-...   5.569  101    17526     1.9559 ug/L      98
    13) Acetone                     5.673   43     6090     3.4768 ug/L #    62
    14) 1,1-Dichloroethene          5.859   61    27150     1.9792 ug/L     100
    15) Tert-Butyl Alcohol          6.025   59    30151    50.4531 ug/L      91
    16) Dimethyl Sulfide            6.139   62    18460     2.0528 ug/L     100
    17) Iodomethane                 6.377  142    24447     1.9479 ug/L      98
    18) Methyl acetate              6.460   43    10044     2.1729 ug/L #    80
    19) Methylene Chloride          6.688   84    20048     1.9570 ug/L     100
    20) Carbon Disulfide            6.668   76    57216     1.9199 ug/L      98
    21) Acrylonitrile               6.896   53    27184    12.1705 ug/L      97
    22) Methyl Tert Butyl Ether     6.937   73    44539     1.9214 ug/L      96
    23) trans-1,2-Dichloroethene    7.155   96    18602     1.9362 ug/L      99
    24) n-Hexane                    7.258   57    20025     1.9628 ug/L      91
    25) Diisopropyl ether           7.632   45   711944    25.8308 ug/L      99
    26) Vinyl Acetate               7.808   43    23898     2.0755 ug/L      91
    27) 1,1-Dichloroethane          7.797   63    34327     1.9808 ug/L      99
    28) Ethyl-Tert-Butyl ether      8.212   59   717827    25.5539 ug/L      99
    29) 2-Butanone                  8.388   43     6370     2.4196 ug/L #    77
    30) Propionitrile               8.492   54    19197    24.8973 ug/L      99
    31) 2,2-Dichloropropane         8.585   77    29910     1.9664 ug/L      84
    32) cis-1,2-Dichloroethene      8.658   96    22201     1.9922 ug/L      85
    33) Chloroform                  8.855   83    35850     1.9815 ug/L      99
    34) 1-Bromopropane              8.989  122     4161     1.9058 ug/L      95
    35) Bromochloromethane          9.083  130    13791     1.9702 ug/L      97
    36) Tetrahydrofuran             9.114   42    39789    25.4487 ug/L      98
    38) 1,1,1-Trichloroethane       9.383   97    31637     1.9066 ug/L      99
    39) Cyclohexane                 9.404   56    31507     2.0563 ug/L      95
    40) 1,1-Dichloropropene         9.580   75    24628     1.9586 ug/L      95
    41) Tert-Amyl-Methyl ether      9.715   73   639232    24.8770 ug/L      99
    42) Carbon Tetrachloride        9.715  117    28990     1.9024 ug/L     100
    44) 1,2-Dichloroethane          9.912   62    25022     1.9939 ug/L     100
    45) Benzene                     9.933   78    74633     1.9576 ug/L     100
    46) Trichloroethene            10.689  130    23040     1.9926 ug/L      99
    47) Methylcyclohexane          10.762   83    31590     1.9829 ug/L      95

8260WTR.M Sat Nov 16 17:34:39 2013                                         Page:  1
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                              Quantitation Report    (Not Reviewed)

  Data Path : D:\MassHunter\GCMS\1\data\111513\
  Data File : 17M001025.D
  Acq On    : 15 Nov 2013  16:23
  Operator  : adc
  Sample    : WG453012-05 2.0ug/L STD 8260
  Misc      : 1,1 STD61183
  ALS Vial  : 4   Sample Multiplier: 1

  Quant Time: Nov 16 17:31:16 2013
  Quant Method : D:\MassHunter\GCMS\1\methods\8260WTR.M
  Quant Title  : 8260B/624 SOP:OVL MSV01 WATER 11/15/13 HPMS17
  QLast Update : Sat Nov 16 17:30:32 2013
  Response via : Initial Calibration

          Compound                   R.T. QIon  Response  Conc Units Dev(Min)
   --------------------------------------------------------------------------
    48) 1,2-Dichloropropane        10.897   63    19100     1.9800 ug/L      99
    49) 1,4-Dioxane                11.197   88     3302    46.4287 ug/L      99
    50) Bromodichloromethane       11.197   83    26116     1.8859 ug/L      99
    51) Dibromomethane             11.270   93    11507     1.9353 ug/L      98
    52) 2-Chloroethyl Vinyl Ether  11.529   63     6320     1.7761 ug/L      94
    53) 4-Methyl-2-Pentanone       11.550   58     4809     1.9551 ug/L      96
    54) cis-1,3-Dichloropropene    11.840   75    28947     1.8666 ug/L      99
    55) Dimethyl Disulfide         12.068   79    17206     1.6985 ug/L      99
    58) Toluene                    12.234   91    78540     1.9456 ug/L      98
    59) Ethyl Methacrylate         12.379   69    19643     1.9434 ug/L      89
    60) trans-1,3-Dichloropropene  12.431   75    24827     1.8967 ug/L      99
    61) 1,1,2-Trichloroethane      12.638   97    15223     2.0267 ug/L      98
    62) 2-Hexanone                 12.597   43     8026     2.0339 ug/L      88
    63) 1,3-Dichloropropane        12.939   76    25320     1.9645 ug/L      91
    64) Tetrachloroethene          13.042  166    21680     1.8864 ug/L     100
    65) Dibromochloromethane       13.291  129    18746     1.8393 ug/L     100
    66) 1,2-Dibromoethane          13.540  107    15388     1.9632 ug/L      98
    67) 1-Chlorohexane             13.664   91    24508     1.8893 ug/L      96
    68) Chlorobenzene              14.048  112    51844     1.8656 ug/L      82
    69) 1,1,1,2-Tetrachloroethane  14.079  131    19802     1.7846 ug/L      99
    70) Ethylbenzene               14.089  106    27247     1.7925 ug/L      97
    71) m-,p-Xylene                14.172  106    66604     3.6454 ug/L      97
    72) o-Xylene                   14.721  106    33757     1.8558 ug/L      97
    73) Styrene                    14.763  104    53550     1.8284 ug/L      98
    74) Bromoform                  15.229  173    12000     1.9414 ug/L      99
    75) Isopropylbenzene           15.146  105    83430     1.8801 ug/L     100
    77) 1,1,2,2-Tetrachloroethane  15.364   83    14181     1.7997 ug/L      98
    79) 1,2,3-Trichloropropane     15.551  110     4788     1.9227 ug/L      89
    80) trans-1,4-Dichloro-2-B...  15.613   53     3917     1.7315 ug/L      90
    81) n-Propylbenzene            15.644   91    92321     1.8833 ug/L      99
    82) Bromobenzene               15.748  156    23513     1.9990 ug/L      99
    83) 1,3,5-Trimethylbenzene     15.841  105    68574     1.8821 ug/L     100
    84) 2-Chlorotoluene            15.903   91    59717     1.9375 ug/L      99
    85) 4-Chlorotoluene            15.955   91    55066     1.8760 ug/L      99
    86) a-Methylstyrene            16.235  118    38601     1.7570 ug/L      99
    87) tert-Butylbenzene          16.297  134    15342     1.9294 ug/L      97
    88) 1,2,4-Trimethylbenzene     16.338  105    69366     1.8829 ug/L      99
    89) sec-Butylbenzene           16.556  105    83801     1.8587 ug/L     100
    90) p-Isopropyltoluene         16.722  119    67112     1.7933 ug/L      99
    91) 1,3-Dichlorobenzene        16.888  146    38885     1.8077 ug/L      99
    92) 1,4-Dichlorobenzene        17.012  146    38910     1.8641 ug/L      84
    93) n-Butylbenzene             17.240   91    50935     1.6790 ug/L     100
    94) 1,2-Dichlorobenzene        17.499  146    38606     1.8897 ug/L      98
    95) 1,2-Dibromo-3-Chloropr...  18.484   75     2551     1.7236 ug/L      94
    96) 1,2,4-Trichlorobenzene     19.603  180    24613     1.7041 ug/L      99
    97) Hexachlorobutadiene        19.769  225    13118     1.6766 ug/L      98
    98) Naphthalene                19.956  128    46717     1.7559 ug/L     100
    99) 1,2,3-Trichlorobenzene     20.267  180    24194     1.7178 ug/L      98
   --------------------------------------------------------------------------

   (#) = qualifier out of range (m) = manual integration (+) = signals summed
```

```
Data Path : D:\MassHunter\GCMS\1\data\111513\
Data File : 17M001025.D
Acq On    : 15 Nov 2013  16:23
Operator  : adc
Sample    : WG453012-05 2.0ug/L STD 8260
Misc      : 1,1 STD61183
ALS Vial  : 4   Sample Multiplier: 1

Quant Time: Nov 16 17:31:16 2013
Quant Method : D:\MassHunter\GCMS\1\methods\8260WTR.M
Quant Title  : 8260B/624 SOP:OVL MSV01 WATER 11/15/13 HPMS17
QLast Update : Sat Nov 16 17:30:32 2013
Response via : Initial Calibration
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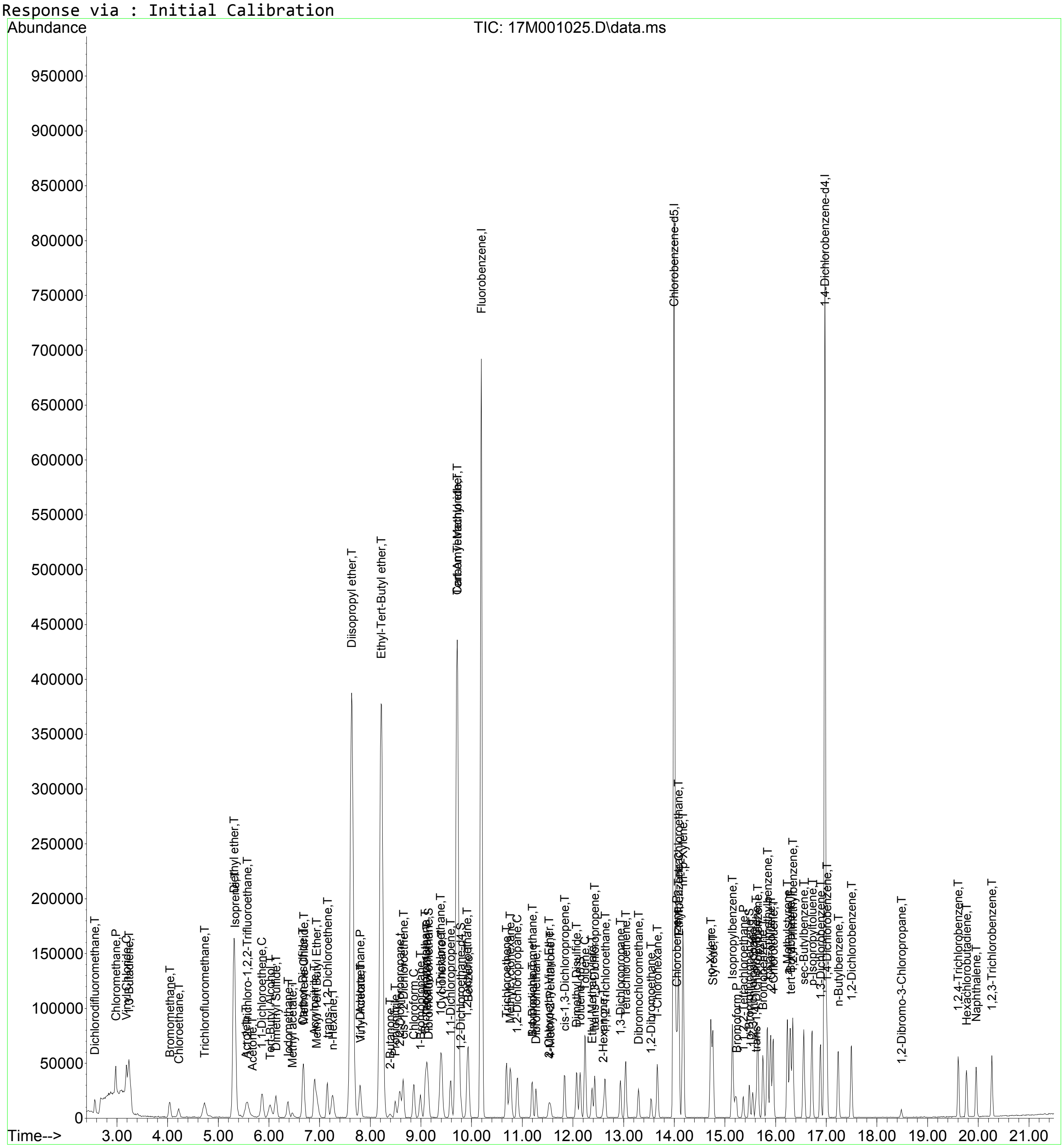

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                              Quantitation Report    (Not Reviewed)

  Data Path : D:\MassHunter\GCMS\1\data\111513\
  Data File : 17M001026.D
  Acq On    : 15 Nov 2013  16:51
  Operator  : adc
  Sample    : WG453012-06 5.0ug/L STD 8260
  Misc      : 1,1 STD61183
  ALS Vial  : 5   Sample Multiplier: 1

  Quant Time: Nov 16 17:35:24 2013
  Quant Method : D:\MassHunter\GCMS\1\methods\8260WTR.M
  Quant Title  : 8260B/624 SOP:OVL MSV01 WATER 11/15/13 HPMS17
  QLast Update : Sat Nov 16 17:30:32 2013
  Response via : Initial Calibration

          Compound                   R.T. QIon  Response  Conc Units Dev(Min)
   -------------------------------------------------------------------------
   Internal Standards
     1) Fluorobenzene              10.192   96   867984    25.00000 ug/L     0.0000
    56) Chlorobenzene-d5           13.996  117   578167    25.00000 ug/L     0.0000
    76) 1,4-Dichlorobenzene-d4     16.971  152   253006    25.00000 ug/L     0.0000

   System Monitoring Compounds
    37) Dibromofluoromethane        9.145  111    26630     2.4637 ug/L    0.0000
     Spiked Amount     25.000   Range  86 - 118    Recovery   =    9.855%#
    43) 1,2-Dichloroethane-d4       9.788   65    26831     2.5188 ug/L    0.0000
     Spiked Amount     25.000   Range  80 - 120    Recovery   =   10.075%#
    57) Toluene-d8                 12.141   98    89468     2.5362 ug/L    0.0000
     Spiked Amount     25.000   Range  88 - 110    Recovery   =   10.145%#
    78) p-Bromofluorobenzene       15.478   95    31929     2.6031 ug/L    0.0000
     Spiked Amount     25.000   Range  86 - 115    Recovery   =   10.412%#

   Target Compounds                                                   Qvalue
     2) Dichlorodifluoromethane     2.563   85    35328     4.3875 ug/L      99
     3) Chloromethane               2.978   50    63785     4.8073 ug/L      93
     4) Vinyl Chloride              3.185   62    65233     5.0054 ug/L      97
     5) 1,3-Butadiene               3.226   54    33351     5.4344 ug/L      95
     6) Bromomethane                4.045   94    35307     4.6423 ug/L     100
     7) Chloroethane                4.221   64    31420     4.8129 ug/L      99
     8) Trichlorofluoromethane      4.729  101    72082     4.9155 ug/L     100
     9) Diethyl ether               5.310   59   321467    49.4810 ug/L     100
    10) Isoprene                    5.320   67    65995     4.8923 ug/L      99
    11) Acrolein                    5.548   56     5504    24.4468 ug/L      91
    12) 1,1,2-Trichloro-1,2,2-...   5.569  101    43123     4.8502 ug/L      99
    13) Acetone                     5.662   43    10686     6.1483 ug/L      83
    14) 1,1-Dichloroethene          5.859   61    67070     4.9275 ug/L      99
    15) Tert-Butyl Alcohol          6.025   59    60373   101.8138 ug/L      97
    16) Dimethyl Sulfide            6.139   62    43632     4.8900 ug/L      97
    17) Iodomethane                 6.367  142    61050     4.9024 ug/L      99
    18) Methyl acetate              6.460   43    25214     5.4974 ug/L      93
    19) Methylene Chloride          6.688   84    48992     4.8197 ug/L      99
    20) Carbon Disulfide            6.668   76   139577     4.7202 ug/L      98
    21) Acrylonitrile               6.896   53    53368    24.0799 ug/L      94
    22) Methyl Tert Butyl Ether     6.927   73   112563     4.8939 ug/L      98
    23) trans-1,2-Dichloroethene    7.155   96    46556     4.8838 ug/L      98
    24) n-Hexane                    7.248   57    47754     4.7172 ug/L      96
    25) Diisopropyl ether           7.632   45  1383519    50.5888 ug/L      99
    26) Vinyl Acetate               7.808   43    57772     5.0566 ug/L      96
    27) 1,1-Dichloroethane          7.798   63    84264     4.9004 ug/L      99
    28) Ethyl-Tert-Butyl ether      8.212   59  1399181    50.1984 ug/L     100
    29) 2-Butanone                  8.388   43    13903     5.3223 ug/L      87
    30) Propionitrile               8.492   54    39290    51.3544 ug/L      98
    31) 2,2-Dichloropropane         8.585   77    73214     4.8511 ug/L      93
    32) cis-1,2-Dichloroethene      8.647   96    53159     4.8074 ug/L      99
    33) Chloroform                  8.865   83    88608     4.9359 ug/L      99
    34) 1-Bromopropane              8.990  122    10803     4.9865 ug/L      96
    35) Bromochloromethane          9.083  130    33447     4.8156 ug/L      99
    36) Tetrahydrofuran             9.114   42    78054    50.3125 ug/L      99
    38) 1,1,1-Trichloroethane       9.383   97    79274     4.8147 ug/L     100
    39) Cyclohexane                 9.404   56    76905     5.0583 ug/L      97
    40) 1,1-Dichloropropene         9.580   75    60840     4.8761 ug/L      98
    41) Tert-Amyl-Methyl ether      9.715   73  1260205    49.4263 ug/L     100
    42) Carbon Tetrachloride        9.715  117    73037     4.8302 ug/L      99
    44) 1,2-Dichloroethane          9.912   62    60742     4.8781 ug/L      98
    45) Benzene                     9.933   78   183547     4.8521 ug/L     100
    46) Trichloroethene            10.689  130    55963     4.8778 ug/L      98
    47) Methylcyclohexane          10.762   83    77818     4.9227 ug/L      98

8260WTR.M Sat Nov 16 17:35:25 2013                                              Page:  1
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                         Quantitation Report    (Not Reviewed)

Data Path : D:\MassHunter\GCMS\1\data\111513\
Data File : 17M001026.D
Acq On    : 15 Nov 2013  16:51
Operator  : adc
Sample    : WG453012-06 5.0ug/L STD 8260
Misc      : 1,1 STD61183
ALS Vial  : 5   Sample Multiplier: 1

Quant Time: Nov 16 17:35:24 2013
Quant Method : D:\MassHunter\GCMS\1\methods\8260WTR.M
Quant Title  : 8260B/624 SOP:OVL MSV01 WATER 11/15/13 HPMS17
QLast Update : Sat Nov 16 17:30:32 2013
Response via : Initial Calibration

        Compound                   R.T. QIon  Response  Conc Units Dev(Min)
 --------------------------------------------------------------------------
  48) 1,2-Dichloropropane        10.907   63    46755     4.8848 ug/L      99
  49) 1,4-Dioxane                11.197   88     6990    99.0522 ug/L      98
  50) Bromodichloromethane       11.197   83    65516     4.7679 ug/L     100
  51) Dibromomethane             11.270   93    28986     4.9130 ug/L      99
  52) 2-Chloroethyl Vinyl Ether  11.519   63    16821     4.7641 ug/L      99
  53) 4-Methyl-2-Pentanone       11.550   58    11323     4.6394 ug/L      98
  54) cis-1,3-Dichloropropene    11.840   75    72537     4.7139 ug/L     100
  55) Dimethyl Disulfide         12.078   79    43554     4.3331 ug/L      99
  58) Toluene                    12.234   91   196491     5.0228 ug/L      99
  59) Ethyl Methacrylate         12.379   69    49674     5.0711 ug/L      95
  60) trans-1,3-Dichloropropene  12.431   75    62505     4.9273 ug/L     100
  61) 1,1,2-Trichloroethane      12.638   97    37131     5.1011 ug/L      98
  62) 2-Hexanone                 12.597   43    19648     5.1379 ug/L      93
  63) 1,3-Dichloropropane        12.939   76    63658     5.0964 ug/L      98
  64) Tetrachloroethene          13.042  166    55202     4.9562 ug/L     100
  65) Dibromochloromethane       13.291  129    47751     4.8346 ug/L      99
  66) 1,2-Dibromoethane          13.540  107    37945     4.9953 ug/L      99
  67) 1-Chlorohexane             13.664   91    61593     4.8994 ug/L      95
  68) Chlorobenzene              14.048  112   130091     4.8306 ug/L      92
  69) 1,1,1,2-Tetrachloroethane  14.079  131    50717     4.7165 ug/L     100
  70) Ethylbenzene               14.089  106    69575     4.7229 ug/L      98
  71) m-,p-Xylene                14.172  106   170042     9.6035 ug/L      99
  72) o-Xylene                   14.722  106    85786     4.8664 ug/L      99
  73) Styrene                    14.763  104   135444     4.7720 ug/L      98
  74) Bromoform                  15.219  173    31253     4.4791 ug/L     100
  75) Isopropylbenzene           15.147  105   213161     4.9566 ug/L     100
  77) 1,1,2,2-Tetrachloroethane  15.364   83    37793     5.1537 ug/L      99
  79) 1,2,3-Trichloropropane     15.551  110    12854     5.5464 ug/L      99
  80) trans-1,4-Dichloro-2-B...  15.603   53    10911     5.1826 ug/L      91
  81) n-Propylbenzene            15.644   91   238319     5.2237 ug/L     100
  82) Bromobenzene               15.748  156    58313     5.3270 ug/L     100
  83) 1,3,5-Trimethylbenzene     15.841  105   176211     5.1967 ug/L     100
  84) 2-Chlorotoluene            15.903   91   150706     5.2539 ug/L     100
  85) 4-Chlorotoluene            15.945   91   138685     5.0768 ug/L      99
  86) a-Methylstyrene            16.235  118   100862     4.9330 ug/L     100
  87) tert-Butylbenzene          16.287  134    38784     5.2409 ug/L      99
  88) 1,2,4-Trimethylbenzene     16.339  105   178158     5.1963 ug/L      99
  89) sec-Butylbenzene           16.556  105   219692     5.2358 ug/L      99
  90) p-Isopropyltoluene         16.722  119   177535     5.0973 ug/L     100
  91) 1,3-Dichlorobenzene        16.888  146   100532     5.0219 ug/L     100
  92) 1,4-Dichlorobenzene        17.012  146   100716     5.1846 ug/L      96
  93) n-Butylbenzene             17.230   91   139593     4.6255 ug/L      99
  94) 1,2-Dichlorobenzene        17.499  146   100287     5.2746 ug/L     100
  95) 1,2-Dibromo-3-Chloropr...  18.474   75     6461     4.6906 ug/L     100
  96) 1,2,4-Trichlorobenzene     19.604  180    66017     4.4281 ug/L     100
  97) Hexachlorobutadiene        19.769  225    36016     4.4362 ug/L      99
  98) Naphthalene                19.956  128   124250     5.0179 ug/L     100
  99) 1,2,3-Trichlorobenzene     20.267  180    65270     4.6614 ug/L      99
 --------------------------------------------------------------------------

 (#) = qualifier out of range (m) = manual integration (+) = signals summed
```

Quantitation Report   (Not Reviewed)

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Data Path : D:\MassHunter\GCMS\1\data\111513\
Data File : 17M001026.D
Acq On    : 15 Nov 2013  16:51
Operator  : adc
Sample    : WG453012-06 5.0ug/L STD 8260
Misc      : 1,1 STD61183
ALS Vial  : 5   Sample Multiplier: 1

Quant Time: Nov 16 17:35:24 2013
Quant Method : D:\MassHunter\GCMS\1\methods\8260WTR.M
Quant Title  : 8260B/624 SOP:OVL MSV01 WATER 11/15/13 HPMS17
QLast Update : Sat Nov 16 17:30:32 2013
Response via : Initial Calibration
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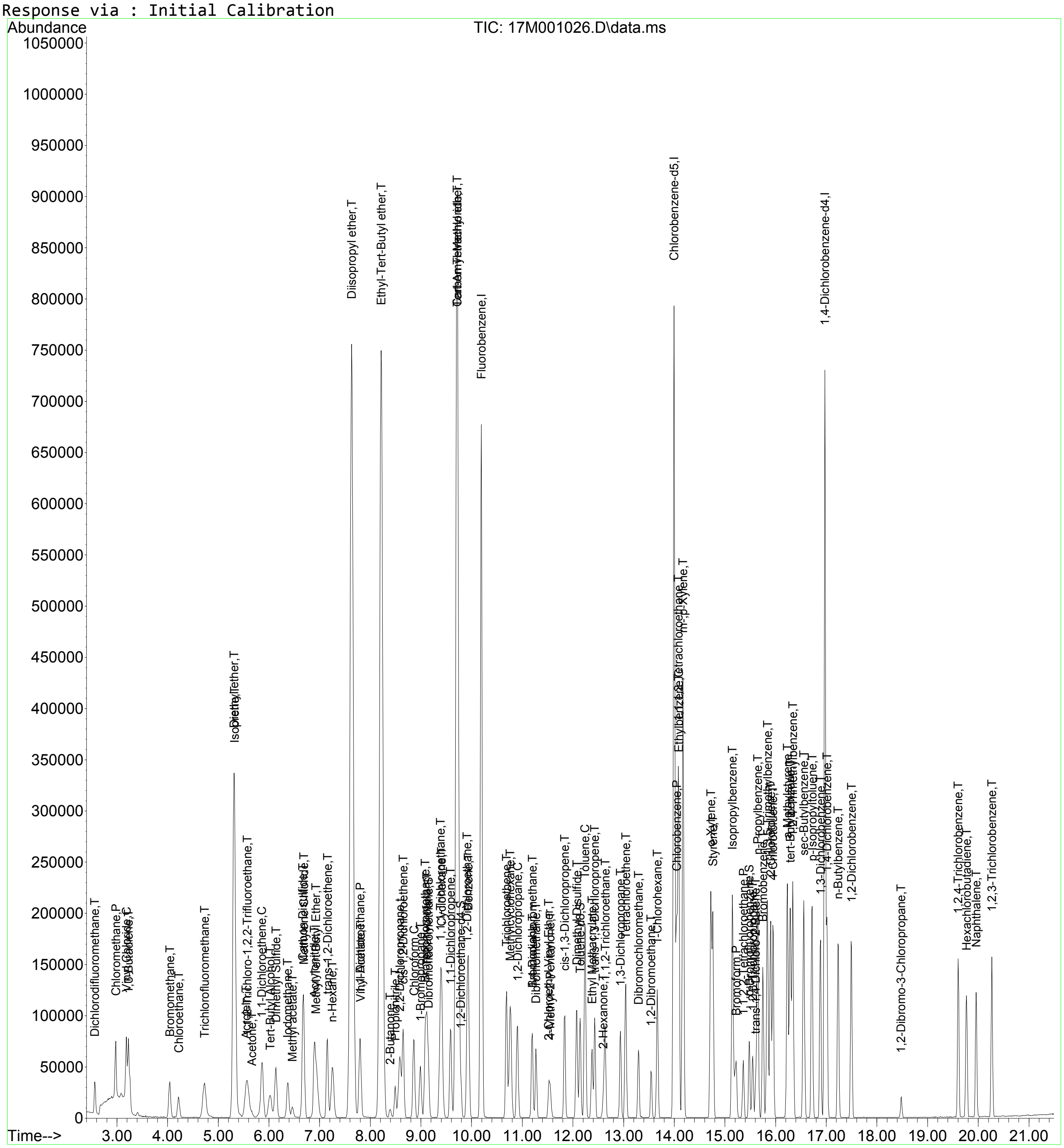

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                         Quantitation Report    (Not Reviewed)

Data Path : D:\MassHunter\GCMS\1\data\111513\
Data File : 17M001027.D
Acq On    : 15 Nov 2013  17:19
Operator  : adc
Sample    : WG453012-07 20.0ug/L STD 8260
Misc      : 1,1 STD61183
ALS Vial  : 6   Sample Multiplier: 1

Quant Time: Nov 16 17:35:28 2013
Quant Method : D:\MassHunter\GCMS\1\methods\8260WTR.M
Quant Title  : 8260B/624 SOP:OVL MSV01 WATER 11/15/13 HPMS17
QLast Update : Sat Nov 16 17:30:32 2013
Response via : Initial Calibration

        Compound                   R.T. QIon  Response  Conc Units Dev(Min)
 --------------------------------------------------------------------------
 Internal Standards
   1) Fluorobenzene              10.192   96   853305    25.00000 ug/L     0.0000
  56) Chlorobenzene-d5           13.996  117   572884    25.00000 ug/L     0.0000
  76) 1,4-Dichlorobenzene-d4     16.971  152   260332    25.00000 ug/L     0.0000

 System Monitoring Compounds
  37) Dibromofluoromethane        9.145  111   108631    10.2228 ug/L    0.0000
   Spiked Amount     25.000   Range  86 - 118    Recovery   =   40.891%#
  43) 1,2-Dichloroethane-d4       9.788   65   105867    10.1093 ug/L    0.0000
   Spiked Amount     25.000   Range  80 - 120    Recovery   =   40.437%#
  57) Toluene-d8                 12.141   98   361846    10.3522 ug/L    0.0000
   Spiked Amount     25.000   Range  88 - 110    Recovery   =   41.409%#
  78) p-Bromofluorobenzene       15.478   95   133522    10.5794 ug/L    0.0000
   Spiked Amount     25.000   Range  86 - 115    Recovery   =   42.318%#

 Target Compounds                                                   Qvalue
   2) Dichlorodifluoromethane     2.563   85   178623    22.5656 ug/L     100
   3) Chloromethane               2.978   50   278572    21.3562 ug/L      99
   4) Vinyl Chloride              3.185   62   291045    22.7163 ug/L      99
   5) 1,3-Butadiene               3.226   54   140077    23.2175 ug/L      99
   6) Bromomethane                4.045   94   155545    20.8034 ug/L     100
   7) Chloroethane                4.211   64   135874    21.1711 ug/L      99
   8) Trichlorofluoromethane      4.729  101   315965    21.9175 ug/L     100
   9) Diethyl ether               5.310   59   525811    82.3264 ug/L      99
  10) Isoprene                    5.331   67   279549    21.0799 ug/L     100
  11) Acrolein                    5.548   56     9234    41.7197 ug/L      99
  12) 1,1,2-Trichloro-1,2,2-...   5.569  101   187216    21.4191 ug/L      99
  13) Acetone                     5.662   43    35478    20.7638 ug/L      95
  14) 1,1-Dichloroethene          5.870   61   289741    21.6530 ug/L     100
  15) Tert-Butyl Alcohol          6.015   59    94136   161.4831 ug/L      99
  16) Dimethyl Sulfide            6.139   62   185071    21.0983 ug/L     100
  17) Iodomethane                 6.378  142   263940    21.5592 ug/L     100
  18) Methyl acetate              6.460   43    93109    20.6496 ug/L      99
  19) Methylene Chloride          6.688   84   209633    20.9777 ug/L      99
  20) Carbon Disulfide            6.668   76   604001    20.7774 ug/L     100
  21) Acrylonitrile               6.896   53    88544    40.6387 ug/L      96
  22) Methyl Tert Butyl Ether     6.927   73   484166    21.4120 ug/L     100
  23) trans-1,2-Dichloroethene    7.155   96   200452    21.3893 ug/L     100
  24) n-Hexane                    7.248   57   210677    21.1691 ug/L     100
  25) Diisopropyl ether           7.632   45  2238870    83.2733 ug/L     100
  26) Vinyl Acetate               7.808   43   245520    21.8595 ug/L     100
  27) 1,1-Dichloroethane          7.798   63   360851    21.3464 ug/L     100
  28) Ethyl-Tert-Butyl ether      8.212   59  2278420    83.1490 ug/L     100
  29) 2-Butanone                  8.388   43    52046    20.2667 ug/L      98
  30) Propionitrile               8.492   54    63363    84.2440 ug/L     100
  31) 2,2-Dichloropropane         8.585   77   312874    21.0872 ug/L      98
  32) cis-1,2-Dichloroethene      8.648   96   230142    21.1706 ug/L      99
  33) Chloroform                  8.865   83   379379    21.4968 ug/L     100
  34) 1-Bromopropane              8.990  122    45804    21.5061 ug/L      99
  35) Bromochloromethane          9.083  130   148099    21.6898 ug/L      99
  36) Tetrahydrofuran             9.114   42   125414    82.2307 ug/L     100
  38) 1,1,1-Trichloroethane       9.383   97   342458    21.1569 ug/L     100
  39) Cyclohexane                 9.404   56   315544    21.1115 ug/L      99
  40) 1,1-Dichloropropene         9.591   75   266295    21.7098 ug/L      99
  41) Tert-Amyl-Methyl ether      9.715   73  2073611    82.7278 ug/L     100
  42) Carbon Tetrachloride        9.715  117   320418    21.5551 ug/L     100
  44) 1,2-Dichloroethane          9.912   62   262752    21.4644 ug/L      99
  45) Benzene                     9.933   78   790149    21.2469 ug/L     100
  46) Trichloroethene            10.689  130   237654    21.0704 ug/L     100
  47) Methylcyclohexane          10.762   83   330317    21.2548 ug/L      99

8260WTR.M Sat Nov 16 17:35:28 2013                                        Page:  1
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                        Quantitation Report    (Not Reviewed)

  Data Path : D:\MassHunter\GCMS\1\data\111513\
  Data File : 17M001027.D
  Acq On    : 15 Nov 2013  17:19
  Operator  : adc
  Sample    : WG453012-07 20.0ug/L STD 8260
  Misc      : 1,1 STD61183
  ALS Vial  : 6   Sample Multiplier: 1

  Quant Time: Nov 16 17:35:28 2013
  Quant Method : D:\MassHunter\GCMS\1\methods\8260WTR.M
  Quant Title  : 8260B/624 SOP:OVL MSV01 WATER 11/15/13 HPMS17
  QLast Update : Sat Nov 16 17:30:32 2013
  Response via : Initial Calibration

          Compound                   R.T. QIon  Response  Conc Units Dev(Min)
   ---------------------------------------------------------------------------
    48) 1,2-Dichloropropane        10.907   63   202711    21.5429 ug/L     100
    49) 1,4-Dioxane                11.197   88    11235   161.9450 ug/L      97
    50) Bromodichloromethane       11.197   83   289028    21.3957 ug/L      98
    51) Dibromomethane             11.270   93   123372    21.2705 ug/L      99
    52) 2-Chloroethyl Vinyl Ether  11.519   63    73257    21.1051 ug/L      99
    53) 4-Methyl-2-Pentanone       11.550   58    49633    20.6859 ug/L     100
    54) cis-1,3-Dichloropropene    11.830   75   326850    21.6059 ug/L     100
    55) Dimethyl Disulfide         12.078   79   195611    19.7956 ug/L     100
    58) Toluene                    12.234   91   853551    22.0199 ug/L      99
    59) Ethyl Methacrylate         12.379   69   210715    21.7099 ug/L      99
    60) trans-1,3-Dichloropropene  12.431   75   280649    22.3279 ug/L     100
    61) 1,1,2-Trichloroethane      12.638   97   163098    22.6132 ug/L      99
    62) 2-Hexanone                 12.597   43    81244    21.4409 ug/L      98
    63) 1,3-Dichloropropane        12.939   76   274080    22.1449 ug/L      99
    64) Tetrachloroethene          13.042  166   241841    21.9133 ug/L     100
    65) Dibromochloromethane       13.291  129   218567    22.3331 ug/L     100
    66) 1,2-Dibromoethane          13.540  107   169402    22.5065 ug/L     100
    67) 1-Chlorohexane             13.664   91   272521    21.8775 ug/L      99
    68) Chlorobenzene              14.048  112   581977    21.8096 ug/L      99
    69) 1,1,1,2-Tetrachloroethane  14.079  131   230361    21.6204 ug/L      99
    70) Ethylbenzene               14.089  106   308726    21.1503 ug/L      98
    71) m-,p-Xylene                14.172  106   747607    42.6121 ug/L      99
    72) o-Xylene                   14.722  106   375382    21.4908 ug/L     100
    73) Styrene                    14.763  104   617418    21.9536 ug/L     100
    74) Bromoform                  15.229  173   151272    20.1802 ug/L     100
    75) Isopropylbenzene           15.147  105   939647    22.0511 ug/L     100
    77) 1,1,2,2-Tetrachloroethane  15.364   83   178979    23.7198 ug/L      99
    79) 1,2,3-Trichloropropane     15.551  110    55681    23.3497 ug/L      99
    80) trans-1,4-Dichloro-2-B...  15.613   53    48977    22.6090 ug/L      96
    81) n-Propylbenzene            15.644   91  1082171    23.0525 ug/L     100
    82) Bromobenzene               15.748  156   260762    23.1506 ug/L     100
    83) 1,3,5-Trimethylbenzene     15.841  105   789535    22.6290 ug/L     100
    84) 2-Chlorotoluene            15.903   91   668924    22.6637 ug/L     100
    85) 4-Chlorotoluene            15.945   91   625425    22.2507 ug/L     100
    86) a-Methylstyrene            16.235  118   449361    21.3591 ug/L      99
    87) tert-Butylbenzene          16.287  134   172021    22.5913 ug/L      99
    88) 1,2,4-Trimethylbenzene     16.339  105   796757    22.5847 ug/L     100
    89) sec-Butylbenzene           16.556  105   991301    22.9603 ug/L     100
    90) p-Isopropyltoluene         16.722  119   825038    23.0214 ug/L     100
    91) 1,3-Dichlorobenzene        16.888  146   462083    22.4329 ug/L     100
    92) 1,4-Dichlorobenzene        17.012  146   459764    23.0014 ug/L      99
    93) n-Butylbenzene             17.230   91   686676    21.4936 ug/L     100
    94) 1,2-Dichlorobenzene        17.499  146   450854    23.0456 ug/L     100
    95) 1,2-Dibromo-3-Chloropr...  18.484   75    30970    21.8512 ug/L      99
    96) 1,2,4-Trichlorobenzene     19.604  180   325289    20.2325 ug/L      99
    97) Hexachlorobutadiene        19.769  225   177766    20.2873 ug/L     100
    98) Naphthalene                19.956  128   598114    23.4755 ug/L     100
    99) 1,2,3-Trichlorobenzene     20.267  180   313320    21.1327 ug/L     100
   ---------------------------------------------------------------------------

   (#) = qualifier out of range (m) = manual integration (+) = signals summed
```

Quantitation Report (Not Reviewed)

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Data Path : D:\MassHunter\GCMS\1\data\111513\
Data File : 17M001027.D
Acq On    : 15 Nov 2013  17:19
Operator  : adc
Sample    : WG453012-07 20.0ug/L STD 8260
Misc      : 1,1 STD61183
ALS Vial  : 6   Sample Multiplier: 1

Quant Time: Nov 16 17:35:28 2013
Quant Method : D:\MassHunter\GCMS\1\methods\8260WTR.M
Quant Title  : 8260B/624 SOP:OVL MSV01 WATER 11/15/13 HPMS17
QLast Update : Sat Nov 16 17:30:32 2013
Response via : Initial Calibration
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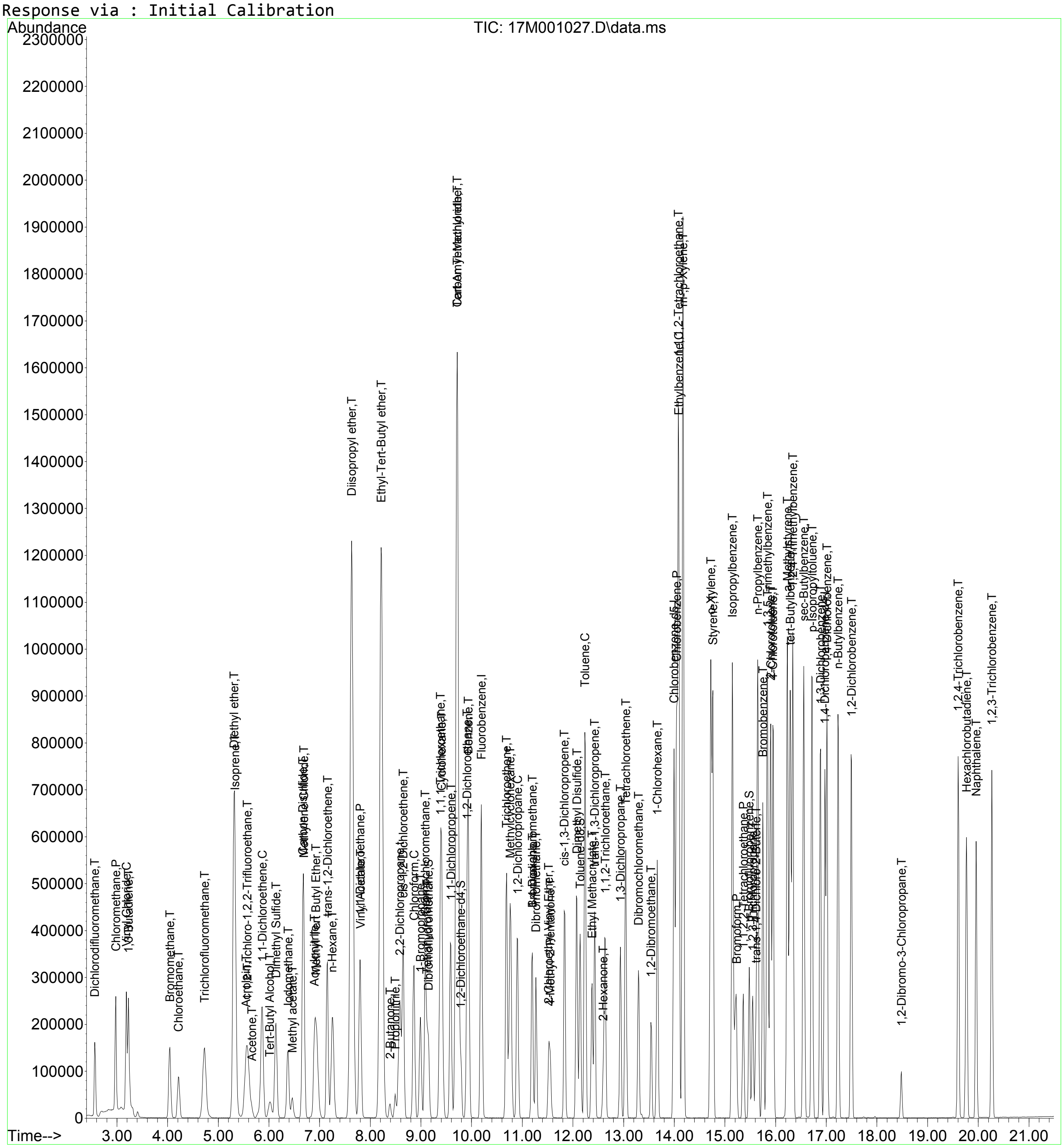

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                          Quantitation Report    (Not Reviewed)

  Data Path : D:\MassHunter\GCMS\1\data\111513\
  Data File : 17M001028.D
  Acq On    : 15 Nov 2013  17:48
  Operator  : adc
  Sample    : WG453012-08 50.0ug/L STD 8260
  Misc      : 1,1 STD61183
  ALS Vial  : 7   Sample Multiplier: 1

  Quant Time: Nov 16 17:35:31 2013
  Quant Method : D:\MassHunter\GCMS\1\methods\8260WTR.M
  Quant Title  : 8260B/624 SOP:OVL MSV01 WATER 11/15/13 HPMS17
  QLast Update : Sat Nov 16 17:30:32 2013
  Response via : Initial Calibration

          Compound                     R.T. QIon  Response  Conc Units Dev(Min)
   --------------------------------------------------------------------------
   Internal Standards
     1) Fluorobenzene               10.192   96   911225    25.00000 ug/L     0.0000
    56) Chlorobenzene-d5            13.996  117   624501    25.00000 ug/L     0.0000
    76) 1,4-Dichlorobenzene-d4      16.971  152   292066    25.00000 ug/L     0.0000

   System Monitoring Compounds
    37) Dibromofluoromethane         9.145  111   277268    24.4341 ug/L    0.0000
     Spiked Amount     25.000   Range  86 - 118    Recovery   =   97.736%
    43) 1,2-Dichloroethane-d4        9.788   65   268481    24.0079 ug/L    0.0000
     Spiked Amount     25.000   Range  80 - 120    Recovery   =   96.032%
    57) Toluene-d8                  12.141   98   923795    24.2448 ug/L    0.0000
     Spiked Amount     25.000   Range  88 - 110    Recovery   =   96.979%
    78) p-Bromofluorobenzene        15.478   95   350966    24.7868 ug/L    0.0000
     Spiked Amount     25.000   Range  86 - 115    Recovery   =   99.147%

   Target Compounds                                                   Qvalue
     2) Dichlorodifluoromethane      2.563   85   443720    52.4925 ug/L     100
     3) Chloromethane                2.978   50   684729    49.1567 ug/L     100
     4) Vinyl Chloride               3.185   62   707099    51.6817 ug/L     100
     5) 1,3-Butadiene                3.226   54   313539    48.6653 ug/L     100
     6) Bromomethane                 4.045   94   393329    49.2621 ug/L     100
     7) Chloroethane                 4.211   64   339507    49.5375 ug/L     100
     8) Trichlorofluoromethane       4.719  101   791081    51.3868 ug/L     100
     9) Diethyl ether                5.310   59   662639    97.1550 ug/L     100
    10) Isoprene                     5.320   67   704836    49.7711 ug/L     100
    11) Acrolein                     5.548   56    11648    49.2812 ug/L     100
    12) 1,1,2-Trichloro-1,2,2-...    5.569  101   465712    49.8946 ug/L     100
    13) Acetone                      5.662   43    82996    45.4865 ug/L     100
    14) 1,1-Dichloroethene           5.859   61   725028    50.7390 ug/L     100
    15) Tert-Butyl Alcohol           6.025   59   116940   187.8508 ug/L     100
    16) Dimethyl Sulfide             6.139   62   462668    49.3920 ug/L     100
    17) Iodomethane                  6.367  142   663485    50.7501 ug/L     100
    18) Methyl acetate               6.450   43   227061    47.1564 ug/L     100
    19) Methylene Chloride           6.688   84   525279    49.2229 ug/L     100
    20) Carbon Disulfide             6.668   76  1549835    49.9251 ug/L     100
    21) Acrylonitrile                6.896   53   118443    50.9059 ug/L     100
    22) Methyl Tert Butyl Ether      6.927   73  1199224    49.6641 ug/L     100
    23) trans-1,2-Dichloroethene     7.144   96   499830    49.9444 ug/L     100
    24) n-Hexane                     7.248   57   538849    50.7026 ug/L     100
    25) Diisopropyl ether            7.632   45  2769781    96.4719 ug/L     100
    26) Vinyl Acetate                7.797   43   585588    48.8229 ug/L     100
    27) 1,1-Dichloroethane           7.797   63   895788    49.6228 ug/L     100
    28) Ethyl-Tert-Butyl ether       8.212   59  2835299    96.8949 ug/L     100
    29) 2-Butanone                   8.388   43   127045    46.3269 ug/L     100
    30) Propionitrile                8.492   54    79292    98.7214 ug/L     100
    31) 2,2-Dichloropropane          8.585   77   770956    48.6585 ug/L     100
    32) cis-1,2-Dichloroethene       8.647   96   575503    49.5752 ug/L     100
    33) Chloroform                   8.855   83   946895    50.2435 ug/L     100
    34) 1-Bromopropane               8.989  122   116164    51.0750 ug/L     100
    35) Bromochloromethane           9.083  130   369331    50.6522 ug/L     100
    36) Tetrahydrofuran              9.114   42   157897    96.9484 ug/L     100
    38) 1,1,1-Trichloroethane        9.383   97   864365    50.0059 ug/L     100
    39) Cyclohexane                  9.404   56   785570    49.2178 ug/L     100
    40) 1,1-Dichloropropene          9.580   75   670824    51.2129 ug/L     100
    41) Tert-Amyl-Methyl ether       9.715   73  2599777    97.1268 ug/L     100
    42) Carbon Tetrachloride         9.715  117   819395    51.6186 ug/L     100
    44) 1,2-Dichloroethane           9.912   62   657517    50.2989 ug/L     100
    45) Benzene                      9.933   78  1970213    49.6109 ug/L     100
    46) Trichloroethene             10.689  130   597457    49.6035 ug/L     100
    47) Methylcyclohexane           10.762   83   832704    50.1760 ug/L     100
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                         Quantitation Report    (Not Reviewed)

Data Path : D:\MassHunter\GCMS\1\data\111513\
Data File : 17M001028.D
Acq On    : 15 Nov 2013  17:48
Operator  : adc
Sample    : WG453012-08 50.0ug/L STD 8260
Misc      : 1,1 STD61183
ALS Vial  : 7   Sample Multiplier: 1

Quant Time: Nov 16 17:35:31 2013
Quant Method : D:\MassHunter\GCMS\1\methods\8260WTR.M
Quant Title  : 8260B/624 SOP:OVL MSV01 WATER 11/15/13 HPMS17
QLast Update : Sat Nov 16 17:30:32 2013
Response via : Initial Calibration

        Compound                   R.T. QIon  Response  Conc Units Dev(Min)
 --------------------------------------------------------------------------
  48) 1,2-Dichloropropane        10.897   63   499658    49.7255 ug/L     100
  49) 1,4-Dioxane                11.197   88    14617   197.3019 ug/L     100
  50) Bromodichloromethane       11.197   83   737834    51.1475 ug/L     100
  51) Dibromomethane             11.270   93   314058    50.7050 ug/L     100
  52) 2-Chloroethyl Vinyl Ether  11.519   63   191376    51.6303 ug/L     100
  53) 4-Methyl-2-Pentanone       11.550   58   125437    48.9563 ug/L     100
  54) cis-1,3-Dichloropropene    11.840   75   831880    51.4949 ug/L     100
  55) Dimethyl Disulfide         12.078   79   514150    48.7242 ug/L     100
  58) Toluene                    12.234   91  2140280    50.6513 ug/L     100
  59) Ethyl Methacrylate         12.379   69   540604    51.0947 ug/L     100
  60) trans-1,3-Dichloropropene  12.431   75   724398    52.8683 ug/L     100
  61) 1,1,2-Trichloroethane      12.638   97   410447    52.2041 ug/L     100
  62) 2-Hexanone                 12.597   43   205683    49.7948 ug/L     100
  63) 1,3-Dichloropropane        12.939   76   688593    51.0379 ug/L     100
  64) Tetrachloroethene          13.042  166   620544    51.5804 ug/L     100
  65) Dibromochloromethane       13.291  129   564757    52.9371 ug/L     100
  66) 1,2-Dibromoethane          13.540  107   428603    52.2371 ug/L     100
  67) 1-Chlorohexane             13.664   91   706140    52.0023 ug/L     100
  68) Chlorobenzene              14.048  112  1486597    51.1056 ug/L     100
  69) 1,1,1,2-Tetrachloroethane  14.079  131   597981    51.4844 ug/L     100
  70) Ethylbenzene               14.089  106   808678    50.8221 ug/L     100
  71) m-,p-Xylene                14.172  106  1961845   102.5787 ug/L     100
  72) o-Xylene                   14.722  106   958876    50.3587 ug/L     100
  73) Styrene                    14.763  104  1595487    52.0419 ug/L     100
  74) Bromoform                  15.229  173   400180    48.3485 ug/L     100
  75) Isopropylbenzene           15.146  105  2427449    52.2576 ug/L     100
  77) 1,1,2,2-Tetrachloroethane  15.364   83   462512    54.6359 ug/L     100
  79) 1,2,3-Trichloropropane     15.551  110   141314    52.8209 ug/L     100
  80) trans-1,4-Dichloro-2-B...  15.613   53   129442    53.2613 ug/L     100
  81) n-Propylbenzene            15.644   91  2832965    53.7910 ug/L     100
  82) Bromobenzene               15.748  156   668889    52.9320 ug/L     100
  83) 1,3,5-Trimethylbenzene     15.841  105  2049106    52.3486 ug/L     100
  84) 2-Chlorotoluene            15.903   91  1704241    51.4673 ug/L     100
  85) 4-Chlorotoluene            15.955   91  1631696    51.7433 ug/L     100
  86) a-Methylstyrene            16.235  118  1198019    50.7572 ug/L     100
  87) tert-Butylbenzene          16.287  134   447355    52.3672 ug/L     100
  88) 1,2,4-Trimethylbenzene     16.338  105  2084702    52.6719 ug/L     100
  89) sec-Butylbenzene           16.556  105  2612818    53.9421 ug/L     100
  90) p-Isopropyltoluene         16.722  119  2189139    54.4475 ug/L     100
  91) 1,3-Dichlorobenzene        16.888  146  1222972    52.9211 ug/L     100
  92) 1,4-Dichlorobenzene        17.012  146  1221464    54.4686 ug/L     100
  93) n-Butylbenzene             17.240   91  1885597    52.3709 ug/L     100
  94) 1,2-Dichlorobenzene        17.499  146  1187303    54.0953 ug/L     100
  95) 1,2-Dibromo-3-Chloropr...  18.484   75    84181    52.9412 ug/L     100
  96) 1,2,4-Trichlorobenzene     19.604  180   893959    49.1894 ug/L     100
  97) Hexachlorobutadiene        19.769  225   490731    49.5370 ug/L     100
  98) Naphthalene                19.956  128  1589125    55.5950 ug/L     100
  99) 1,2,3-Trichlorobenzene     20.267  180   839962    50.2650 ug/L     100
 --------------------------------------------------------------------------

 (#) = qualifier out of range (m) = manual integration (+) = signals summed




8260WTR.M Sat Nov 16 17:35:31 2013                                 Page:  2
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Quantitation Report (Not Reviewed)

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Data Path : D:\MassHunter\GCMS\1\data\111513\
Data File : 17M001028.D
Acq On    : 15 Nov 2013  17:48
Operator  : adc
Sample    : WG453012-08 50.0ug/L STD 8260
Misc      : 1,1 STD61183
ALS Vial  : 7   Sample Multiplier: 1

Quant Time: Nov 16 17:35:31 2013
Quant Method : D:\MassHunter\GCMS\1\methods\8260WTR.M
Quant Title  : 8260B/624 SOP:OVL MSV01 WATER 11/15/13 HPMS17
QLast Update : Sat Nov 16 17:30:32 2013
Response via : Initial Calibration
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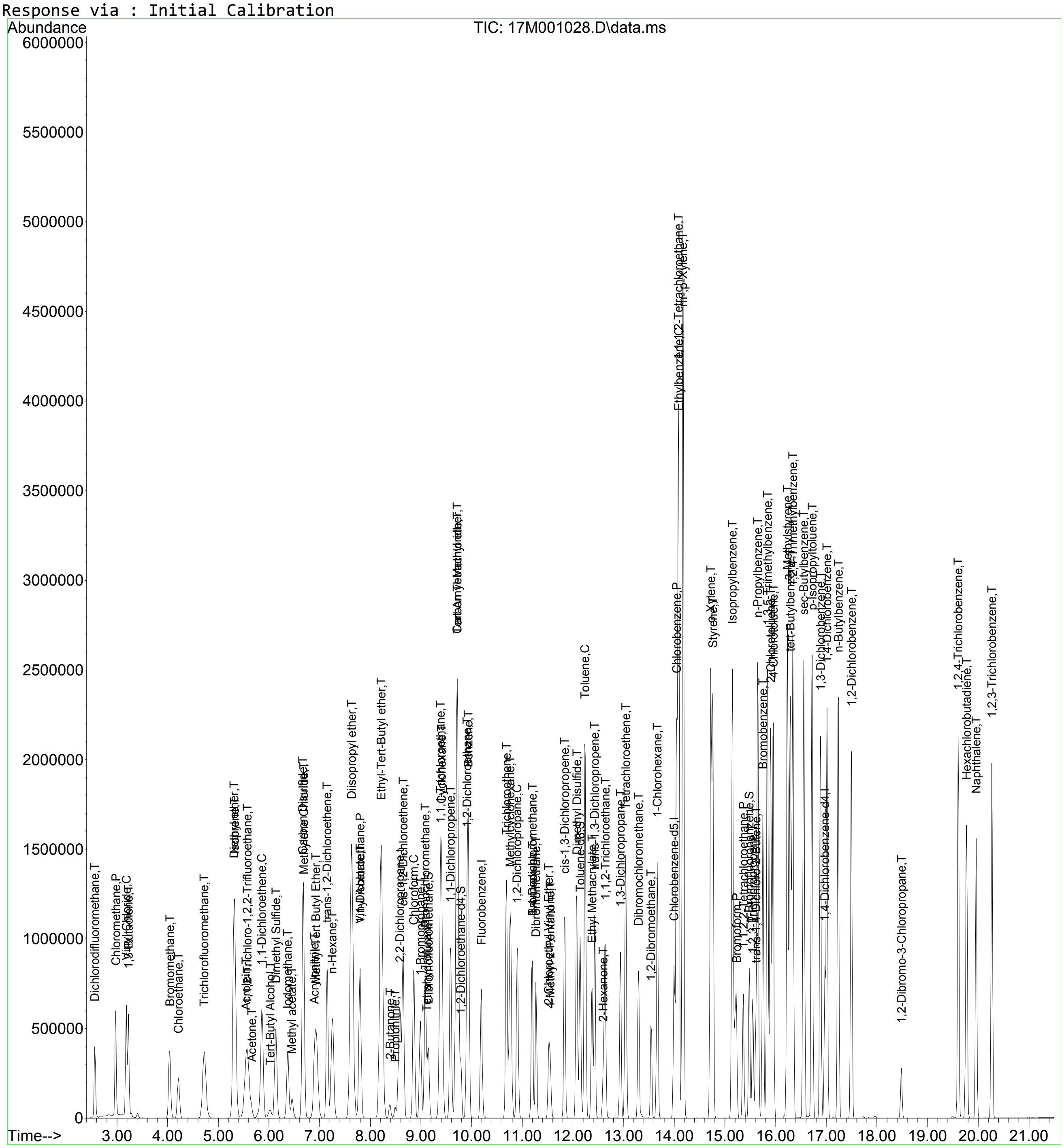

8260WTR.M Sat Nov 16 17:35:32 2013 Page: 3

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                         Quantitation Report    (Not Reviewed)

   Data Path : D:\MassHunter\GCMS\1\data\111513\
   Data File : 17M001029.D
   Acq On    : 15 Nov 2013  18:17
   Operator  : adc
   Sample    : WG453012-09 100.0ug/L STD 8260
   Misc      : 1,1 STD61183
   ALS Vial  : 8   Sample Multiplier: 1

   Quant Time: Nov 16 17:31:24 2013
   Quant Method : D:\MassHunter\GCMS\1\methods\8260WTR.M
   Quant Title  : 8260B/624 SOP:OVL MSV01 WATER 11/15/13 HPMS17
   QLast Update : Sat Nov 16 17:30:32 2013
   Response via : Initial Calibration

           Compound                   R.T. QIon  Response  Conc Units Dev(Min)
    --------------------------------------------------------------------------
    Internal Standards
      1) Fluorobenzene              10.192   96   866111    25.00000 ug/L     0.0000
     56) Chlorobenzene-d5           13.996  117   601955    25.00000 ug/L     0.0000
     76) 1,4-Dichlorobenzene-d4     16.971  152   292319    25.00000 ug/L     0.0000

    System Monitoring Compounds
     37) Dibromofluoromethane        9.145  111   557296    51.6695 ug/L    0.0000
      Spiked Amount     25.000   Range  86 - 118    Recovery   =  206.678%#
     43) 1,2-Dichloroethane-d4       9.788   65   525951    49.4809 ug/L    0.0000
      Spiked Amount     25.000   Range  80 - 120    Recovery   =  197.924%#
     57) Toluene-d8                 12.141   98  1848208    50.3226 ug/L    0.0000
      Spiked Amount     25.000   Range  88 - 110    Recovery   =  201.290%#
     78) p-Bromofluorobenzene       15.478   95   721229    50.8924 ug/L    0.0000
      Spiked Amount     25.000   Range  86 - 115    Recovery   =  203.570%#

    Target Compounds                                                 Qvalue
      2) Dichlorodifluoromethane     2.563   85   871789   108.5055 ug/L     100
      3) Chloromethane               2.978   50  1392060   105.1416 ug/L     100
      4) Vinyl Chloride              3.185   62  1397330   107.4502 ug/L     100
      5) 1,3-Butadiene               3.226   54   570634    93.1831 ug/L      98
      6) Bromomethane                4.035   94   814835   107.3689 ug/L     100
      7) Chloroethane                4.211   64   694106   106.5524 ug/L     100
      8) Trichlorofluoromethane      4.719  101  1574660   107.6143 ug/L     100
      9) Diethyl ether               5.310   59  1385979   213.7948 ug/L     100
     10) Isoprene                    5.320   67  1408365   104.6300 ug/L     100
     11) Acrolein                    5.548   56    23235   103.4248 ug/L      98
     12) 1,1,2-Trichloro-1,2,2-...   5.569  101   919525   103.6458 ug/L      99
     13) Acetone                     5.662   43   175180   101.0095 ug/L      98
     14) 1,1-Dichloroethene          5.859   61  1468201   108.0997 ug/L     100
     15) Tert-Butyl Alcohol          6.025   59   236069   398.9707 ug/L      98
     16) Dimethyl Sulfide            6.129   62   922332   103.5920 ug/L     100
     17) Iodomethane                 6.367  142  1323460   106.5047 ug/L     100
     18) Methyl acetate              6.460   43   447904    97.8667 ug/L      99
     19) Methylene Chloride          6.688   84  1074603   105.9442 ug/L      98
     20) Carbon Disulfide            6.668   76  3136359   106.2946 ug/L     100
     21) Acrylonitrile               6.896   53   239411   108.2568 ug/L      99
     22) Methyl Tert Butyl Ether     6.927   73  2416919   105.3068 ug/L     100
     23) trans-1,2-Dichloroethene    7.145   96  1026305   107.8930 ug/L     100
     24) n-Hexane                    7.248   57  1058316   104.7686 ug/L      99
     25) Diisopropyl ether           7.632   45  5769795   211.4307 ug/L     100
     26) Vinyl Acetate               7.798   43  1141234   100.1056 ug/L     100
     27) 1,1-Dichloroethane          7.798   63  1815859   105.8303 ug/L     100
     28) Ethyl-Tert-Butyl ether      8.212   59  5918361   212.7920 ug/L     100
     29) 2-Butanone                  8.388   43   246513    94.5730 ug/L      98
     30) Propionitrile               8.492   54   161987   212.1847 ug/L      99
     31) 2,2-Dichloropropane         8.585   77  1567976   104.1167 ug/L      99
     32) cis-1,2-Dichloroethene      8.647   96  1177398   106.7068 ug/L     100
     33) Chloroform                  8.855   83  1912872   106.7865 ug/L     100
     34) 1-Bromopropane              8.990  122   230067   106.4250 ug/L      99
     35) Bromochloromethane          9.083  130   745676   107.5933 ug/L      99
     36) Tetrahydrofuran             9.114   42   317157   204.8769 ug/L      99
     38) 1,1,1-Trichloroethane       9.383   97  1777304   108.1777 ug/L      99
     39) Cyclohexane                 9.404   56  1525827   100.5761 ug/L      99
     40) 1,1-Dichloropropene         9.580   75  1363785   109.5390 ug/L      99
     41) Tert-Amyl-Methyl ether      9.715   73  5504370   216.3528 ug/L     100
     42) Carbon Tetrachloride        9.715  117  1700383   112.6968 ug/L     100
     44) 1,2-Dichloroethane          9.912   62  1334123   107.3741 ug/L      99
     45) Benzene                     9.933   78  4029701   106.7552 ug/L     100
     46) Trichloroethene            10.689  130  1225408   107.0380 ug/L     100
     47) Methylcyclohexane          10.762   83  1602224   101.5736 ug/L     100

 8260WTR.M Sat Nov 16 17:35:47 2013                                          Page:  1
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                         Quantitation Report    (Not Reviewed)

Data Path : D:\MassHunter\GCMS\1\data\111513\
Data File : 17M001029.D
Acq On    : 15 Nov 2013  18:17
Operator  : adc
Sample    : WG453012-09 100.0ug/L STD 8260
Misc      : 1,1 STD61183
ALS Vial  : 8   Sample Multiplier: 1

Quant Time: Nov 16 17:31:24 2013
Quant Method : D:\MassHunter\GCMS\1\methods\8260WTR.M
Quant Title  : 8260B/624 SOP:OVL MSV01 WATER 11/15/13 HPMS17
QLast Update : Sat Nov 16 17:30:32 2013
Response via : Initial Calibration

        Compound                   R.T. QIon  Response  Conc Units Dev(Min)
 -------------------------------------------------------------------------
  48) 1,2-Dichloropropane        10.897   63  1013559   106.1224 ug/L     100
  49) 1,4-Dioxane                11.197   88    30483   432.8953 ug/L      99
  50) Bromodichloromethane       11.197   83  1509112   110.0625 ug/L     100
  51) Dibromomethane             11.270   93   636774   108.1628 ug/L      99
  52) 2-Chloroethyl Vinyl Ether  11.519   63   406053   115.2530 ug/L     100
  53) 4-Methyl-2-Pentanone       11.550   58   249786   102.5659 ug/L     100
  54) cis-1,3-Dichloropropene    11.830   75  1706241   111.1209 ug/L     100
  55) Dimethyl Disulfide         12.068   79  1043315   104.0212 ug/L     100
  58) Toluene                    12.234   91  4441174   109.0404 ug/L     100
  59) Ethyl Methacrylate         12.379   69  1078037   105.7059 ug/L      99
  60) trans-1,3-Dichloropropene  12.431   75  1484894   112.4302 ug/L      99
  61) 1,1,2-Trichloroethane      12.638   97   829790   109.4925 ug/L     100
  62) 2-Hexanone                 12.597   43   408971   102.7181 ug/L      99
  63) 1,3-Dichloropropane        12.939   76  1388932   106.8022 ug/L      99
  64) Tetrachloroethene          13.042  166  1279808   110.3636 ug/L     100
  65) Dibromochloromethane       13.291  129  1169865   113.7636 ug/L     100
  66) 1,2-Dibromoethane          13.540  107   870191   110.0290 ug/L     100
  67) 1-Chlorohexane             13.664   91  1448021   110.6306 ug/L     100
  68) Chlorobenzene              14.048  112  3128519   111.5791 ug/L     100
  69) 1,1,1,2-Tetrachloroethane  14.079  131  1274412   113.8327 ug/L     100
  70) Ethylbenzene               14.079  106  1745124   113.7818 ug/L      98
  71) m-,p-Xylene                14.172  106  4231206   229.5229 ug/L      98
  72) o-Xylene                   14.722  106  2033083   110.7735 ug/L     100
  73) Styrene                    14.763  104  3424706   115.8917 ug/L      99
  74) Bromoform                  15.219  173   835692   104.2370 ug/L     100
  75) Isopropylbenzene           15.147  105  5116328   114.2687 ug/L     100
  77) 1,1,2,2-Tetrachloroethane  15.364   83   949165   112.0264 ug/L     100
  79) 1,2,3-Trichloropropane     15.551  110   289563   108.1403 ug/L      98
  80) trans-1,4-Dichloro-2-B...  15.613   53   269243   110.6890 ug/L      97
  81) n-Propylbenzene            15.644   91  6011208   114.0392 ug/L      99
  82) Bromobenzene               15.748  156  1408861   111.3926 ug/L      99
  83) 1,3,5-Trimethylbenzene     15.841  105  4371858   111.5913 ug/L      99
  84) 2-Chlorotoluene            15.903   91  3453578   104.2061 ug/L      98
  85) 4-Chlorotoluene            15.955   91  3516233   111.4079 ug/L     100
  86) a-Methylstyrene            16.235  118  2554744   108.1447 ug/L      99
  87) tert-Butylbenzene          16.287  134   951926   111.3355 ug/L      99
  88) 1,2,4-Trimethylbenzene     16.339  105  4452275   112.3934 ug/L     100
  89) sec-Butylbenzene           16.556  105  5582212   115.1461 ug/L     100
  90) p-Isopropyltoluene         16.722  119  4723529   117.3802 ug/L     100
  91) 1,3-Dichlorobenzene        16.888  146  2636193   113.9760 ug/L     100
  92) 1,4-Dichlorobenzene        17.012  146  2643204   117.7660 ug/L     100
  93) n-Butylbenzene             17.230   91  4109034   113.8332 ug/L     100
  94) 1,2-Dichlorobenzene        17.499  146  2536907   115.4852 ug/L     100
  95) 1,2-Dibromo-3-Chloropr...  18.484   75   174441   109.6106 ug/L      99
  96) 1,2,4-Trichlorobenzene     19.604  180  1937641   106.2258 ug/L     100
  97) Hexachlorobutadiene        19.769  225  1056444   106.2500 ug/L      99
  98) Naphthalene                19.956  128  3306097   115.5625 ug/L     100
  99) 1,2,3-Trichlorobenzene     20.267  180  1783738   106.4622 ug/L     100
 -------------------------------------------------------------------------

 (#) = qualifier out of range (m) = manual integration (+) = signals summed
```

Quantitation Report   (Not Reviewed)

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Data Path : D:\MassHunter\GCMS\1\data\111513\
Data File : 17M001029.D
Acq On    : 15 Nov 2013  18:17
Operator  : adc
Sample    : WG453012-09 100.0ug/L STD 8260
Misc      : 1,1 STD61183
ALS Vial  : 8   Sample Multiplier: 1

Quant Time: Nov 16 17:31:24 2013
Quant Method : D:\MassHunter\GCMS\1\methods\8260WTR.M
Quant Title  : 8260B/624 SOP:OVL MSV01 WATER 11/15/13 HPMS17
QLast Update : Sat Nov 16 17:30:32 2013
Response via : Initial Calibration
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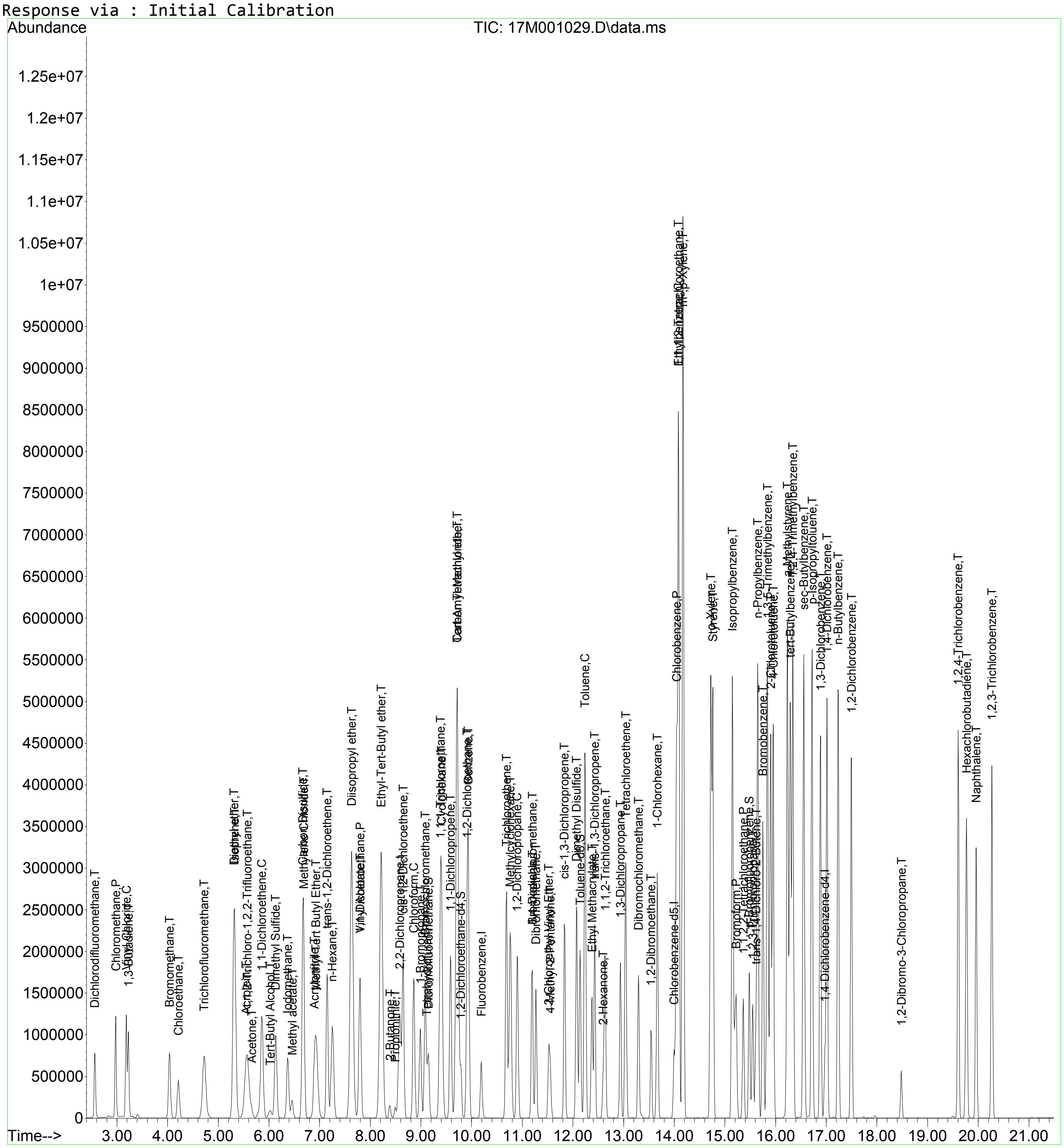

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                         Quantitation Report    (Not Reviewed)

  Data Path : D:\MassHunter\GCMS\1\data\111513\
  Data File : 17M001030.D
  Acq On    : 15 Nov 2013  18:45
  Operator  : adc
  Sample    : WG453012-10 200.0ug/L STD 8260
  Misc      : 1,1 STD61183
  ALS Vial  : 9   Sample Multiplier: 1

  Quant Time: Nov 16 17:31:26 2013
  Quant Method : D:\MassHunter\GCMS\1\methods\8260WTR.M
  Quant Title  : 8260B/624 SOP:OVL MSV01 WATER 11/15/13 HPMS17
  QLast Update : Sat Nov 16 17:30:32 2013
  Response via : Initial Calibration

          Compound                   R.T. QIon  Response  Conc Units Dev(Min)
   --------------------------------------------------------------------------
   Internal Standards
     1) Fluorobenzene              10.192   96   914870    25.00000 ug/L     0.0000
    56) Chlorobenzene-d5           13.996  117   676017    25.00000 ug/L     0.0000
    76) 1,4-Dichlorobenzene-d4     16.971  152   346375    25.00000 ug/L     0.0000

   System Monitoring Compounds
    37) Dibromofluoromethane        9.145  111  1110845    97.5026 ug/L    0.0000
     Spiked Amount     25.000   Range  86 - 118    Recovery   =  390.010%#
    43) 1,2-Dichloroethane-d4       9.787   65  1040577    92.6788 ug/L    0.0000
     Spiked Amount     25.000   Range  80 - 120    Recovery   =  370.715%#
    57) Toluene-d8                 12.140   98  3742097    90.7263 ug/L    0.0000
     Spiked Amount     25.000   Range  88 - 110    Recovery   =  362.905%#
    78) p-Bromofluorobenzene       15.478   95  1497032    89.1499 ug/L    0.0000
     Spiked Amount     25.000   Range  86 - 115    Recovery   =  356.600%#

   Target Compounds                                                   Qvalue
     2) Dichlorodifluoromethane     2.563   85  1850719   218.0695 ug/L     100
     3) Chloromethane               2.977   50  2819875   201.6325 ug/L     100
     4) Vinyl Chloride              3.185   62  2535739   184.5980 ug/L     100
     5) 1,3-Butadiene               3.226   54  1095914   169.4222 ug/L      99
     6) Bromomethane                4.035   94  1722811   214.9121 ug/L     100
     7) Chloroethane                4.211   64  1437554   208.9179 ug/L     100
     8) Trichlorofluoromethane      4.719  101  3269770   211.5507 ug/L      99
     9) Diethyl ether               5.320   59     2826     0.4127 ug/L      97
    10) Isoprene                    5.320   67  2874867   202.1961 ug/L     100
    12) 1,1,2-Trichloro-1,2,2-...   5.569  101  1933087   206.2784 ug/L     100
    13) Acetone                     5.662   43   332498   181.5019 ug/L     100
    14) 1,1-Dichloroethene          5.859   61  3028311   211.0831 ug/L      99
    16) Dimethyl Sulfide            6.139   62  1914855   203.6053 ug/L      99
    17) Iodomethane                 6.367  142  2745150   209.1405 ug/L     100
    18) Methyl acetate              6.460   43   909726   188.1806 ug/L      98
    19) Methylene Chloride          6.688   84  2277191   212.5410 ug/L      96
    20) Carbon Disulfide            6.668   76  6707650   215.2137 ug/L     100
    21) Acrylonitrile               6.927   53    43697    18.7058 ug/L #    32
    22) Methyl Tert Butyl Ether     6.927   73  4976842   205.2875 ug/L      99
    23) trans-1,2-Dichloroethene    7.144   96  2149220   213.9005 ug/L      99
    24) n-Hexane                    7.248   57  2248885   210.7643 ug/L      99
    26) Vinyl Acetate               7.797   43  2342345   194.5130 ug/L      99
    27) 1,1-Dichloroethane          7.797   63  3805471   209.9667 ug/L     100
    29) 2-Butanone                  8.388   43   506197   183.8489 ug/L      98
    31) 2,2-Dichloropropane         8.585   77  3263474   205.1519 ug/L      97
    32) cis-1,2-Dichloroethene      8.647   96  2469158   211.8516 ug/L      99
    33) Chloroform                  8.855   83  4001155   211.4608 ug/L     100
    34) 1-Bromopropane              8.989  122   485191   212.4791 ug/L     100
    35) Bromochloromethane          9.083  130  1562845   213.4838 ug/L     100
    38) 1,1,1-Trichloroethane       9.383   97  3782822   217.9747 ug/L      98
    39) Cyclohexane                 9.404   56  3302355   206.0761 ug/L      98
    40) 1,1-Dichloropropene         9.580   75  2851595   216.8327 ug/L      98
    42) Carbon Tetrachloride        9.715  117  3395147   213.0284 ug/L     100
    44) 1,2-Dichloroethane          9.912   62  2820981   214.9403 ug/L      99
    45) Benzene                     9.933   78  8463189   212.2582 ug/L     100
    46) Trichloroethene            10.689  130  2596115   214.6820 ug/L      98
    47) Methylcyclohexane          10.762   83  3468180   208.1486 ug/L      99
    48) 1,2-Dichloropropane        10.907   63  2118521   209.9931 ug/L     100
    49) 1,4-Dioxane                11.187   88     3680    49.4752 ug/L #    23
    50) Bromodichloromethane       11.197   83  3189551   220.2225 ug/L     100
    51) Dibromomethane             11.270   93  1325733   213.1881 ug/L      99
    52) 2-Chloroethyl Vinyl Ether  11.518   63   867273   233.0448 ug/L     100
    53) 4-Methyl-2-Pentanone       11.550   58   515756   200.4902 ug/L     100
    54) cis-1,3-Dichloropropene    11.840   75  3631991   223.9310 ug/L     100
```

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                         Quantitation Report    (Not Reviewed)

Data Path : D:\MassHunter\GCMS\1\data\111513\
Data File : 17M001030.D
Acq On    : 15 Nov 2013  18:45
Operator  : adc
Sample    : WG453012-10 200.0ug/L STD 8260
Misc      : 1,1 STD61183
ALS Vial  : 9   Sample Multiplier: 1

Quant Time: Nov 16 17:31:26 2013
Quant Method : D:\MassHunter\GCMS\1\methods\8260WTR.M
Quant Title  : 8260B/624 SOP:OVL MSV01 WATER 11/15/13 HPMS17
QLast Update : Sat Nov 16 17:30:32 2013
Response via : Initial Calibration

        Compound                   R.T. QIon  Response  Conc Units Dev(Min)
 --------------------------------------------------------------------------
  55) Dimethyl Disulfide         12.078   79  2282017   215.3970 ug/L      99
  58) Toluene                    12.244   91  9238758   201.9805 ug/L      98
  59) Ethyl Methacrylate         12.379   69  2309276   201.6266 ug/L      98
  60) trans-1,3-Dichloropropene  12.431   75  3181299   214.4857 ug/L      99
  61) 1,1,2-Trichloroethane      12.638   97  1763149   207.1628 ug/L     100
  62) 2-Hexanone                 12.596   43   839676   187.7901 ug/L      98
  63) 1,3-Dichloropropane        12.939   76  2967668   203.1987 ug/L      98
  64) Tetrachloroethene          13.042  166  2761718   212.0640 ug/L      99
  65) Dibromochloromethane       13.291  129  2543352   220.2320 ug/L     100
  66) 1,2-Dibromoethane          13.540  107  1860989   209.5284 ug/L     100
  67) 1-Chlorohexane             13.664   91  3158603   214.8830 ug/L     100
  68) Chlorobenzene              14.048  112  6863080   217.9563 ug/L     100
  69) 1,1,1,2-Tetrachloroethane  14.079  131  2888610   229.7485 ug/L      99
  70) Ethylbenzene               14.089  106  3984741   231.3412 ug/L      89
  71) m-,p-Xylene                14.172  106  9332181   450.7662 ug/L      83
  72) o-Xylene                   14.721  106  4542461   220.3832 ug/L      96
  73) Styrene                    14.763  104  7535982   227.0782 ug/L     100
  74) Bromoform                  15.229  173  1842367   204.2035 ug/L     100
  75) Isopropylbenzene           15.146  105 10921476   217.1984 ug/L      97
  77) 1,1,2,2-Tetrachloroethane  15.364   83  2059713   205.1615 ug/L     100
  79) 1,2,3-Trichloropropane     15.551  110   617305   194.5606 ug/L      97
  80) trans-1,4-Dichloro-2-B...  15.613   53   590294   204.8043 ug/L      94
  81) n-Propylbenzene            15.644   91 12367699   198.0121 ug/L      96
  82) Bromobenzene               15.748  156  3089318   206.1395 ug/L      99
  83) 1,3,5-Trimethylbenzene     15.841  105  9334698   201.0829 ug/L      97
  84) 2-Chlorotoluene            15.903   91  7266990   185.0500 ug/L      97
  85) 4-Chlorotoluene            15.955   91  7679153   205.3347 ug/L      99
  86) a-Methylstyrene            16.235  118  5635060   201.3107 ug/L      99
  87) tert-Butylbenzene          16.297  134  2083094   205.6127 ug/L      98
  88) 1,2,4-Trimethylbenzene     16.338  105  9451454   201.3576 ug/L      97
  89) sec-Butylbenzene           16.556  105 11611651   202.1377 ug/L      97
  90) p-Isopropyltoluene         16.722  119  9908607   207.8027 ug/L      98
  91) 1,3-Dichlorobenzene        16.888  146  5732045   209.1492 ug/L     100
  92) 1,4-Dichlorobenzene        17.012  146  5765768   216.7989 ug/L     100
  93) n-Butylbenzene             17.240   91  8728809   203.9473 ug/L      98
  94) 1,2-Dichlorobenzene        17.499  146  5449062   209.3409 ug/L     100
  95) 1,2-Dibromo-3-Chloropr...  18.484   75   376489   199.6488 ug/L      99
  96) 1,2,4-Trichlorobenzene     19.603  180  4358366   201.4160 ug/L     100
  97) Hexachlorobutadiene        19.769  225  2354334   199.5999 ug/L      99
  98) Naphthalene                19.956  128  7205436   212.5554 ug/L     100
  99) 1,2,3-Trichlorobenzene     20.267  180  4010187   201.8441 ug/L     100
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 (#) = qualifier out of range (m) = manual integration (+) = signals summed
```

Quantitation Report   (Not Reviewed)

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Data Path : D:\MassHunter\GCMS\1\data\111513\
Data File : 17M001030.D
Acq On    : 15 Nov 2013  18:45
Operator  : adc
Sample    : WG453012-10 200.0ug/L STD 8260
Misc      : 1,1 STD61183
ALS Vial  : 9   Sample Multiplier: 1

Quant Time: Nov 16 17:31:26 2013
Quant Method : D:\MassHunter\GCMS\1\methods\8260WTR.M
Quant Title  : 8260B/624 SOP:OVL MSV01 WATER 11/15/13 HPMS17
QLast Update : Sat Nov 16 17:30:32 2013
Response via : Initial Calibration
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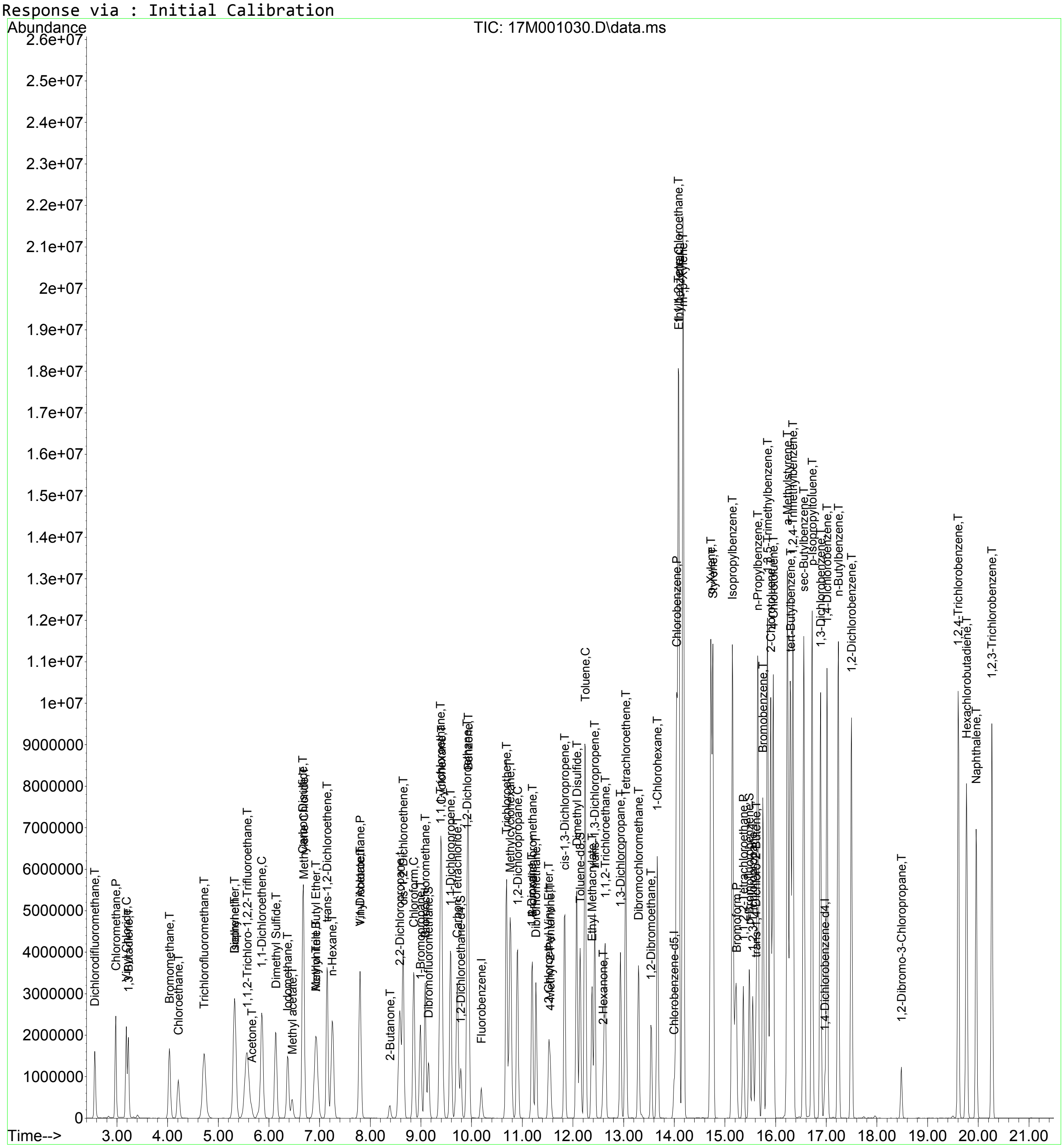

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                         Quantitation Report    (Not Reviewed)

Data Path : D:\MassHunter\GCMS\1\data\111513\
Data File : 17M001031.D
Acq On    : 15 Nov 2013  19:13
Operator  : adc
Sample    : WG453012-11 300.0ug/L STD 8260
Misc      : 1,1 STD61183
ALS Vial  : 10   Sample Multiplier: 1

Quant Time: Nov 16 17:31:28 2013
Quant Method : D:\MassHunter\GCMS\1\methods\8260WTR.M
Quant Title  : 8260B/624 SOP:OVL MSV01 WATER 11/15/13 HPMS17
QLast Update : Sat Nov 16 17:30:32 2013
Response via : Initial Calibration

        Compound                   R.T. QIon  Response  Conc Units Dev(Min)
 --------------------------------------------------------------------------
 Internal Standards
   1) Fluorobenzene              10.192   96   940968    25.00000 ug/L     0.0000
  56) Chlorobenzene-d5           13.996  117   721313    25.00000 ug/L     0.0000
  76) 1,4-Dichlorobenzene-d4     16.981  152   371687    25.00000 ug/L   # 0.0101

 System Monitoring Compounds
  37) Dibromofluoromethane        9.145  111      789     0.0673 ug/L    0.0000
   Spiked Amount     25.000   Range  86 - 118    Recovery   =    0.269%#
  43) 1,2-Dichloroethane-d4       9.715   65    11828     1.0242 ug/L   -0.0730
   Spiked Amount     25.000   Range  80 - 120    Recovery   =    4.097%#
  57) Toluene-d8                 12.140   98     9642     0.2191 ug/L    0.0000
   Spiked Amount     25.000   Range  88 - 110    Recovery   =    0.876%#
  78) p-Bromofluorobenzene       15.478   95     7886     0.4376 ug/L    0.0000
   Spiked Amount     25.000   Range  86 - 115    Recovery   =    1.750%#

 Target Compounds                                                Qvalue
   2) Dichlorodifluoromethane     2.563   85  2710955   310.5713 ug/L      99
   3) Chloromethane               2.978   50  4114699   286.0574 ug/L     100
   4) Vinyl Chloride              3.185   62  3581702   253.5107 ug/L     100
   5) 1,3-Butadiene               3.226   54  1344509   202.0887 ug/L      99
   6) Bromomethane                4.035   94  2573139   312.0836 ug/L     100
   7) Chloroethane                4.211   64  2125172   300.2826 ug/L     100
   8) Trichlorofluoromethane      4.719  101  4777233   300.5095 ug/L     100
   9) Diethyl ether               5.310   59  2165454   307.4596 ug/L      99
  10) Isoprene                    5.320   67  4401251   300.9648 ug/L      99
  11) Acrolein                    5.548   56    36065   147.7633 ug/L      96
  12) 1,1,2-Trichloro-1,2,2-...   5.569  101  2817858   292.3519 ug/L     100
  13) Acetone                     5.662   43   511452   271.4448 ug/L      99
  14) 1,1-Dichloroethene          5.859   61  4447534   301.4094 ug/L      99
  15) Tert-Butyl Alcohol          6.035   59   396057   616.1102 ug/L      97
  16) Dimethyl Sulfide            6.129   62  2798545   289.3144 ug/L      99
  17) Iodomethane                 6.367  142  4009163   296.9684 ug/L     100
  18) Methyl acetate              6.460   43  1370694   275.6699 ug/L      98
  19) Methylene Chloride          6.688   84  3405217   309.0101 ug/L      94
  20) Carbon Disulfide            6.668   76  9898219   308.7742 ug/L      99
  21) Acrylonitrile               6.896   53   406729   169.2836 ug/L      95
  22) Methyl Tert Butyl Ether     6.927   73  7329170   293.9327 ug/L     100
  23) trans-1,2-Dichloroethene    7.144   96  3199038   309.5529 ug/L      98
  24) n-Hexane                    7.248   57  3261202   297.1611 ug/L      99
  25) Diisopropyl ether           7.632   45  8503420   286.8137 ug/L      99
  26) Vinyl Acetate               7.797   43  3373295   272.3558 ug/L      98
  27) 1,1-Dichloroethane          7.797   63  5598076   300.3069 ug/L     100
  28) Ethyl-Tert-Butyl ether      8.212   59  8890652   294.2295 ug/L     100
  29) 2-Butanone                  8.388   43   782340   276.2623 ug/L      97
  30) Propionitrile               8.492   54   257664   310.6608 ug/L      98
  31) 2,2-Dichloropropane         8.585   77  4717239   288.3153 ug/L      96
  32) cis-1,2-Dichloroethene      8.647   96  3679616   306.9515 ug/L      97
  33) Chloroform                  8.855   83  5909903   303.6752 ug/L      99
  34) 1-Bromopropane              8.989  122   710945   302.7081 ug/L     100
  35) Bromochloromethane          9.083  130  2335283   310.1509 ug/L     100
  36) Tetrahydrofuran             9.114   42   485891   288.9059 ug/L      98
  38) 1,1,1-Trichloroethane       9.383   97  5661961   317.2062 ug/L      97
  39) Cyclohexane                 9.404   56  4875469   295.8045 ug/L      97
  40) 1,1-Dichloropropene         9.580   75  4225119   312.3635 ug/L      97
  41) Tert-Amyl-Methyl ether      9.715   73  8544017   309.1118 ug/L      99
  42) Carbon Tetrachloride        9.715  117  5317350   324.3834 ug/L      99
  44) 1,2-Dichloroethane          9.912   62  4186981   310.1724 ug/L      98
  45) Benzene                     9.933   78 12382445   301.9406 ug/L     100
  46) Trichloroethene            10.689  130  3911949   314.5208 ug/L      97
  47) Methylcyclohexane          10.762   83  5133192   299.5325 ug/L      99

8260WTR.M Sat Nov 16 17:36:14 2013                                        Page:  1
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                    Quantitation Report    (Not Reviewed)

Data Path : D:\MassHunter\GCMS\1\data\111513\
Data File : 17M001031.D
Acq On    : 15 Nov 2013  19:13
Operator  : adc
Sample    : WG453012-11 300.0ug/L STD 8260
Misc      : 1,1 STD61183
ALS Vial  : 10   Sample Multiplier: 1

Quant Time: Nov 16 17:31:28 2013
Quant Method : D:\MassHunter\GCMS\1\methods\8260WTR.M
Quant Title  : 8260B/624 SOP:OVL MSV01 WATER 11/15/13 HPMS17
QLast Update : Sat Nov 16 17:30:32 2013
Response via : Initial Calibration

        Compound                   R.T. QIon  Response  Conc Units Dev(Min)
 --------------------------------------------------------------------------
  48) 1,2-Dichloropropane        10.907   63  3154256   303.9861 ug/L      99
  49) 1,4-Dioxane                11.197   88    56335   736.3803 ug/L      95
  50) Bromodichloromethane       11.197   83  4816281   323.3169 ug/L     100
  51) Dibromomethane             11.270   93  1990890   311.2710 ug/L      99
  52) 2-Chloroethyl Vinyl Ether  11.519   63  1400385   365.8605 ug/L     100
  53) 4-Methyl-2-Pentanone       11.550   58   818044   309.1791 ug/L      99
  54) cis-1,3-Dichloropropene    11.840   75  5482037   328.6215 ug/L      99
  55) Dimethyl Disulfide         12.078   79  3438745   315.5769 ug/L      99
  58) Toluene                    12.244   91 13331093   273.1464 ug/L      95
  59) Ethyl Methacrylate         12.379   69  3478057   284.6050 ug/L      97
  60) trans-1,3-Dichloropropene  12.431   75  4816977   304.3703 ug/L      99
  61) 1,1,2-Trichloroethane      12.638   97  2704139   297.7731 ug/L     100
  62) 2-Hexanone                 12.597   43  1318767   276.4158 ug/L      97
  63) 1,3-Dichloropropane        12.939   76  4502757   288.9468 ug/L      97
  64) Tetrachloroethene          13.042  166  4216975   303.4747 ug/L      99
  65) Dibromochloromethane       13.291  129  3913377   317.5846 ug/L     100
  66) 1,2-Dibromoethane          13.540  107  2830076   298.6283 ug/L      99
  67) 1-Chlorohexane             13.664   91  4790686   305.4489 ug/L      99
  68) Chlorobenzene              14.048  112 10369660   308.6375 ug/L      99
  69) 1,1,1,2-Tetrachloroethane  14.089  131  4517169   336.7161 ug/L      98
  70) Ethylbenzene               14.089  106  6201786   337.4453 ug/L      75
  71) m-,p-Xylene                14.172  106 13435209   608.2001 ug/L      72
  72) o-Xylene                   14.721  106  7050014   320.5613 ug/L      89
  73) Styrene                    14.763  104 11327496   319.8920 ug/L      98
  74) Bromoform                  15.229  173  2827240   293.4944 ug/L      99
  75) Isopropylbenzene           15.146  105 15592011   290.6104 ug/L      93
  77) 1,1,2,2-Tetrachloroethane  15.364   83  3110422   288.7205 ug/L     100
  79) 1,2,3-Trichloropropane     15.551  110   934154   274.3738 ug/L      98
  80) trans-1,4-Dichloro-2-B...  15.613   53   891955   288.3917 ug/L      91
  81) n-Propylbenzene            15.654   91 17131025   255.5967 ug/L      90
  82) Bromobenzene               15.758  156  4777751   297.0923 ug/L      99
  83) 1,3,5-Trimethylbenzene     15.841  105 13575869   272.5283 ug/L      92
  84) 2-Chlorotoluene            15.903   91 11273557   267.5252 ug/L      92
  85) 4-Chlorotoluene            15.955   91 11400016   284.0688 ug/L      97
  86) a-Methylstyrene            16.235  118  8684968   289.1384 ug/L      99
  87) tert-Butylbenzene          16.297  134  3274824   301.2300 ug/L      92
  88) 1,2,4-Trimethylbenzene     16.338  105 13705768   272.1085 ug/L      91
  89) sec-Butylbenzene           16.556  105 16421991   266.4087 ug/L      93
  90) p-Isopropyltoluene         16.722  119 14365267   280.7511 ug/L      93
  91) 1,3-Dichlorobenzene        16.888  146  8794998   299.0553 ug/L      98
  92) 1,4-Dichlorobenzene        17.012  146  8806849   308.5955 ug/L      98
  93) n-Butylbenzene             17.240   91 12821540   279.1119 ug/L      94
  94) 1,2-Dichlorobenzene        17.499  146  8381573   300.0731 ug/L      98
  95) 1,2-Dibromo-3-Chloropr...  18.484   75   579358   286.3060 ug/L      99
  96) 1,2,4-Trichlorobenzene     19.604  180  6823888   293.7631 ug/L      99
  97) Hexachlorobutadiene        19.769  225  3737625   295.1703 ug/L      99
  98) Naphthalene                19.956  128 10667442   293.2523 ug/L      98
  99) 1,2,3-Trichlorobenzene     20.267  180  6204576   290.9525 ug/L      99
 --------------------------------------------------------------------------

 (#) = qualifier out of range (m) = manual integration (+) = signals summed
```
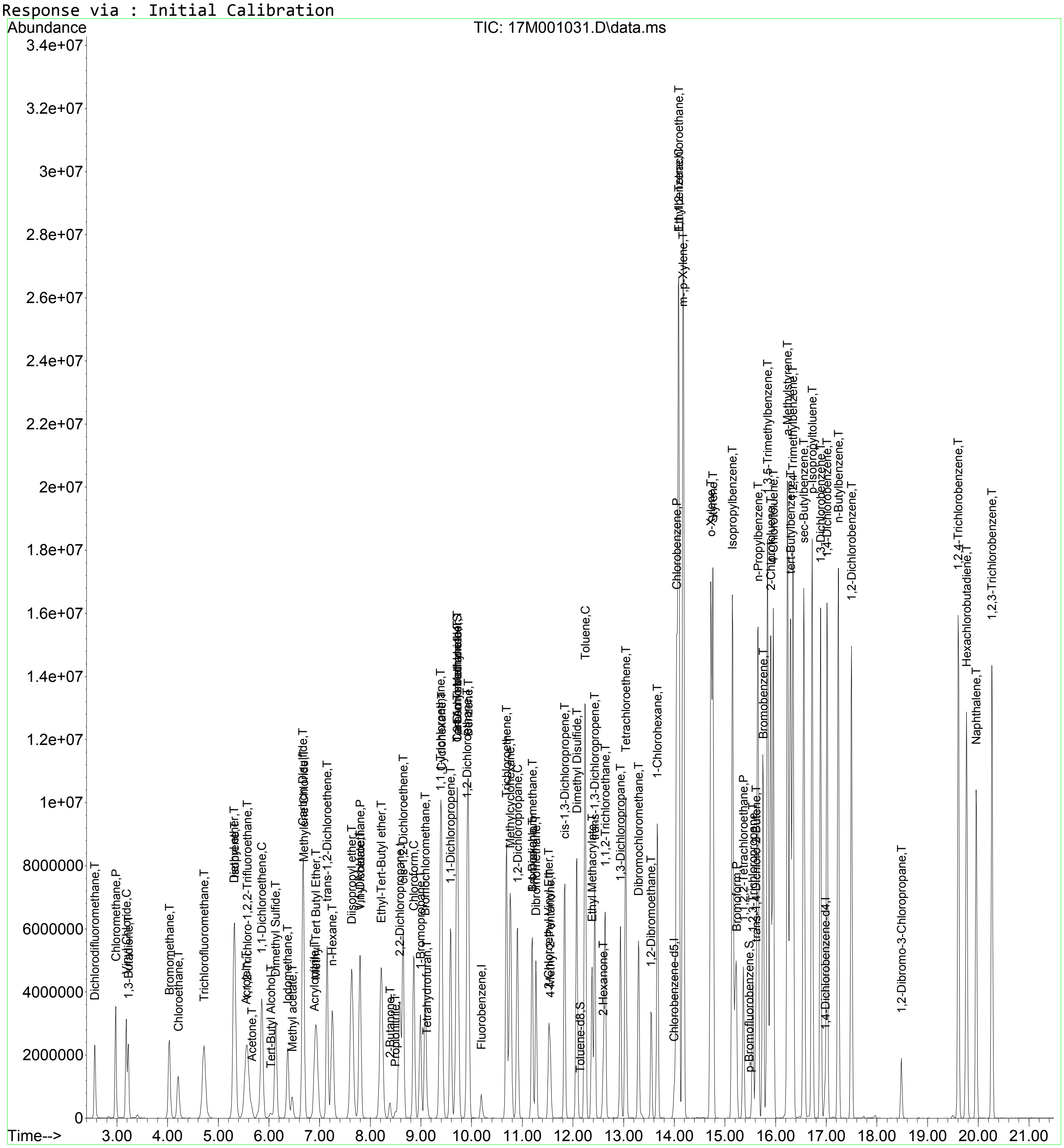
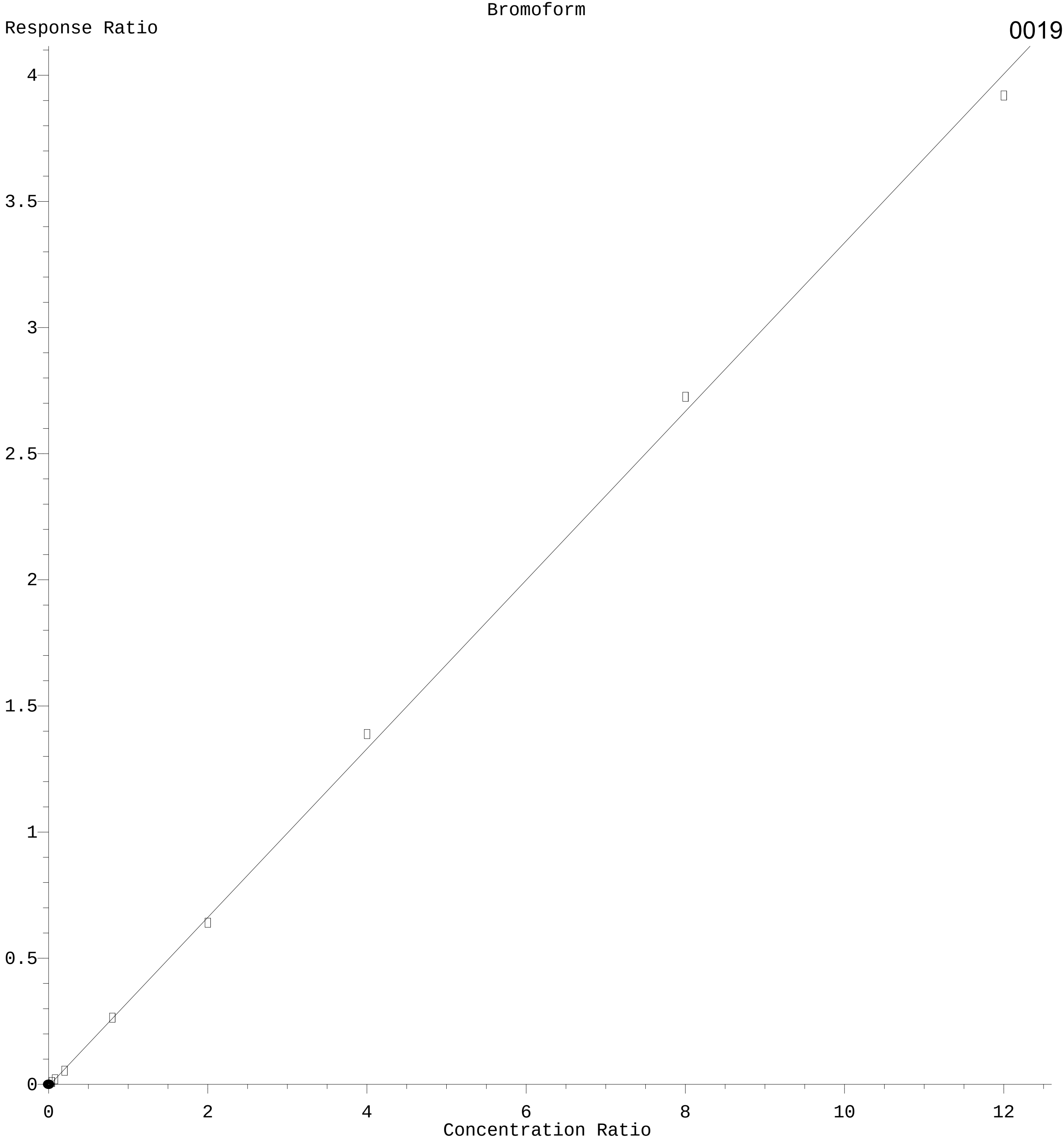
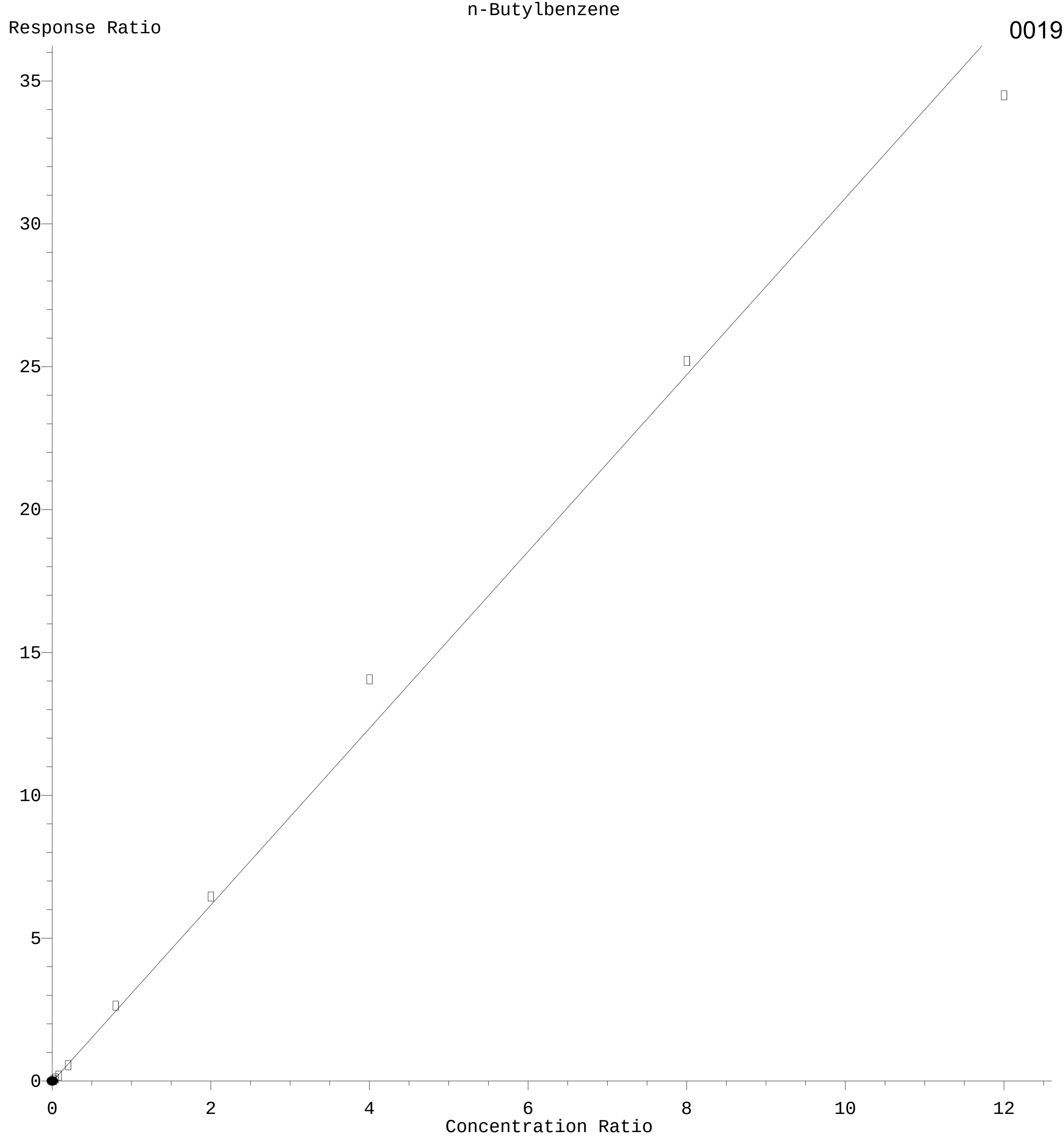

```
                         Quantitation Report    (Not Reviewed)

Data Path : D:\MassHunter\GCMS\1\data\111513\
Data File : 17M001031.D
Acq On    : 15 Nov 2013  19:13
Operator  : adc
Sample    : WG453012-11 300.0ug/L STD 8260
Misc      : 1,1 STD61183
ALS Vial  : 10   Sample Multiplier: 1

Quant Time: Nov 16 17:31:28 2013
Quant Method : D:\MassHunter\GCMS\1\methods\8260WTR.M
Quant Title  : 8260B/624 SOP:OVL MSV01 WATER 11/15/13 HPMS17
QLast Update : Sat Nov 16 17:30:32 2013
Response via : Initial Calibration
```

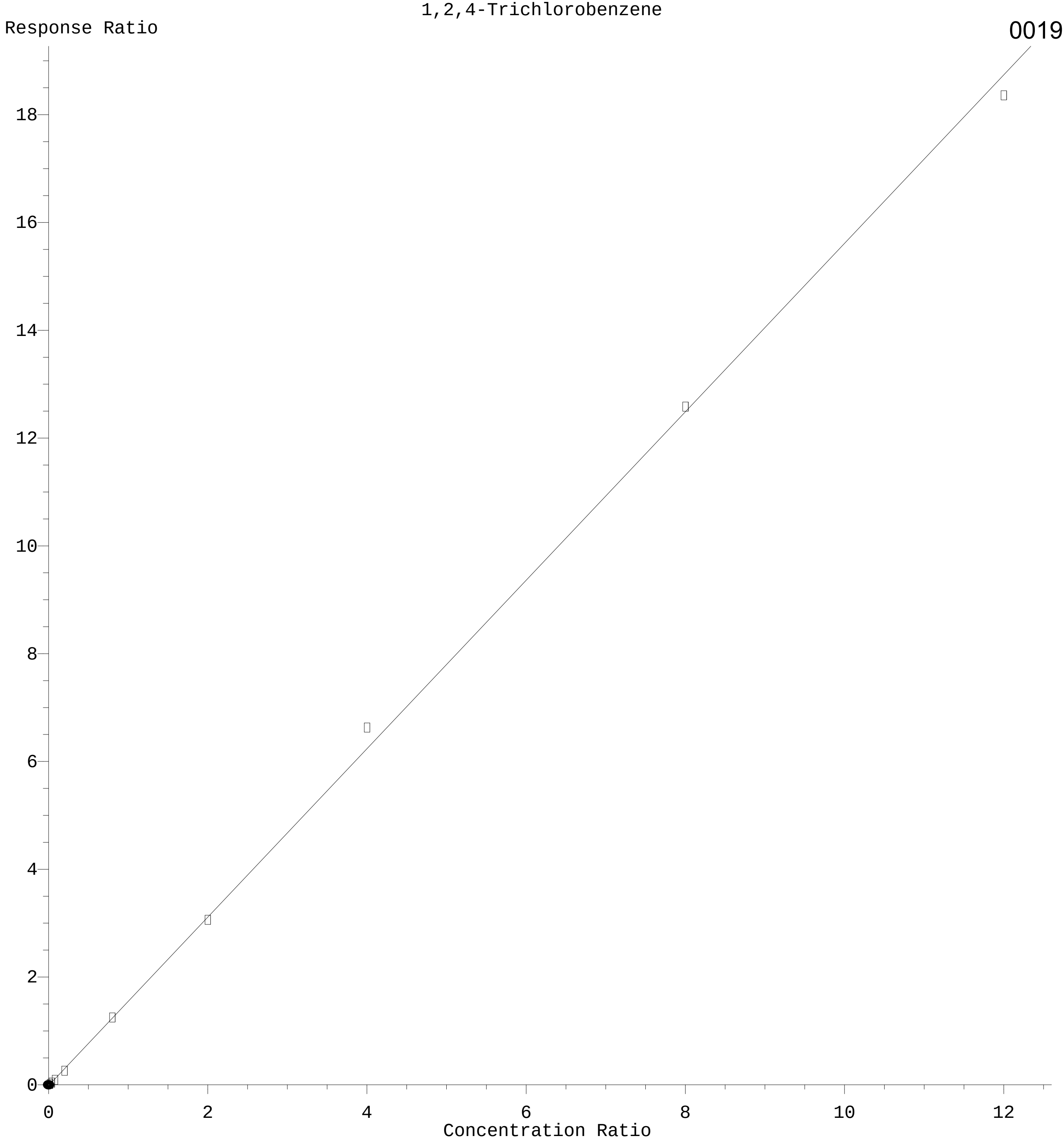




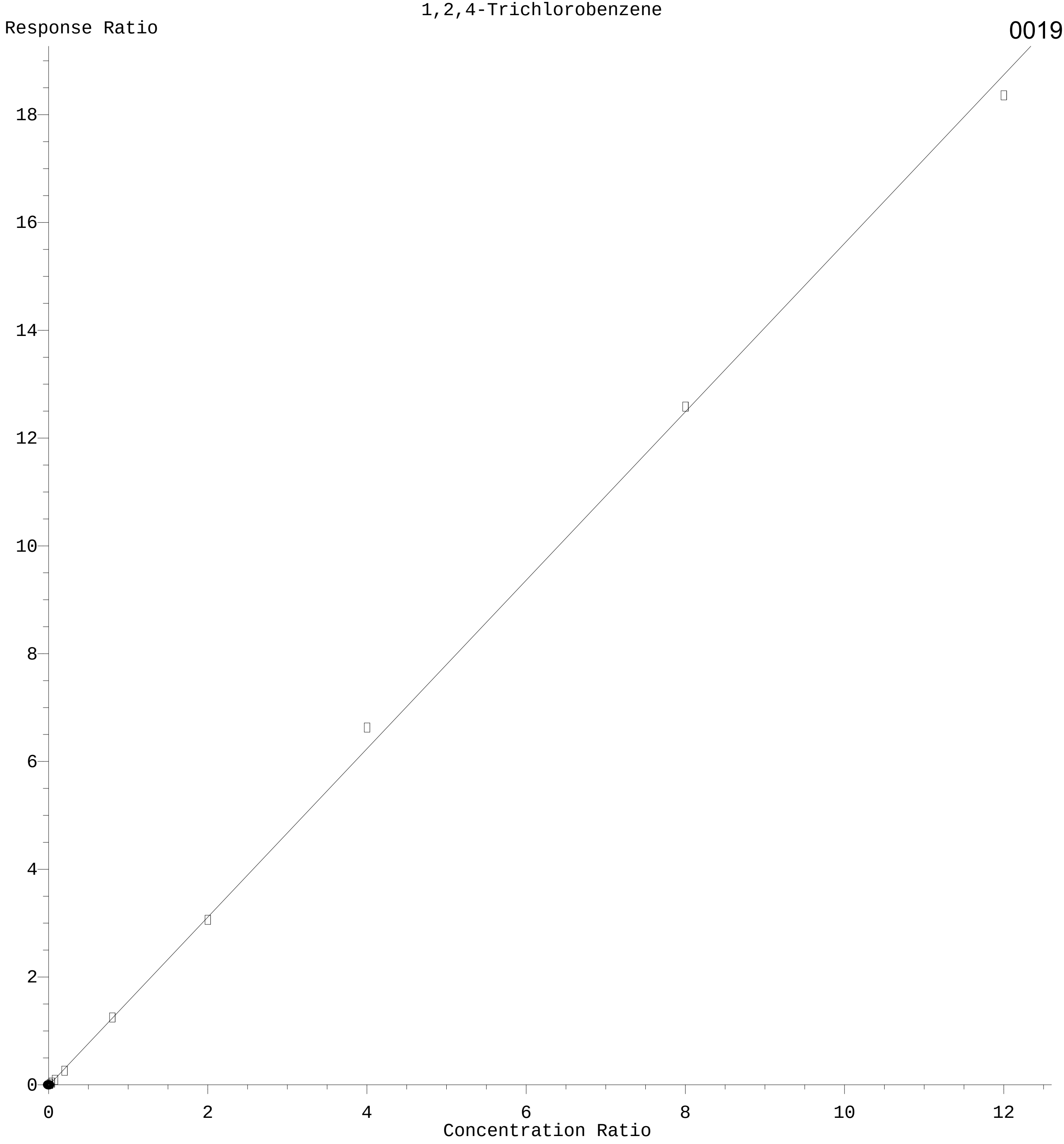
```
      Response = 3.344e-001 * Amt - 5.852e-003
  Coef of Det (r^2) = 0.999168   Curve Fit: wlr(1/a)
  Method Name:  D:\MassHunter\GCMS\1\methods\8260WTR.M
  Calibration Table Last Updated: Sat Nov 16 17:30:32 2013
```



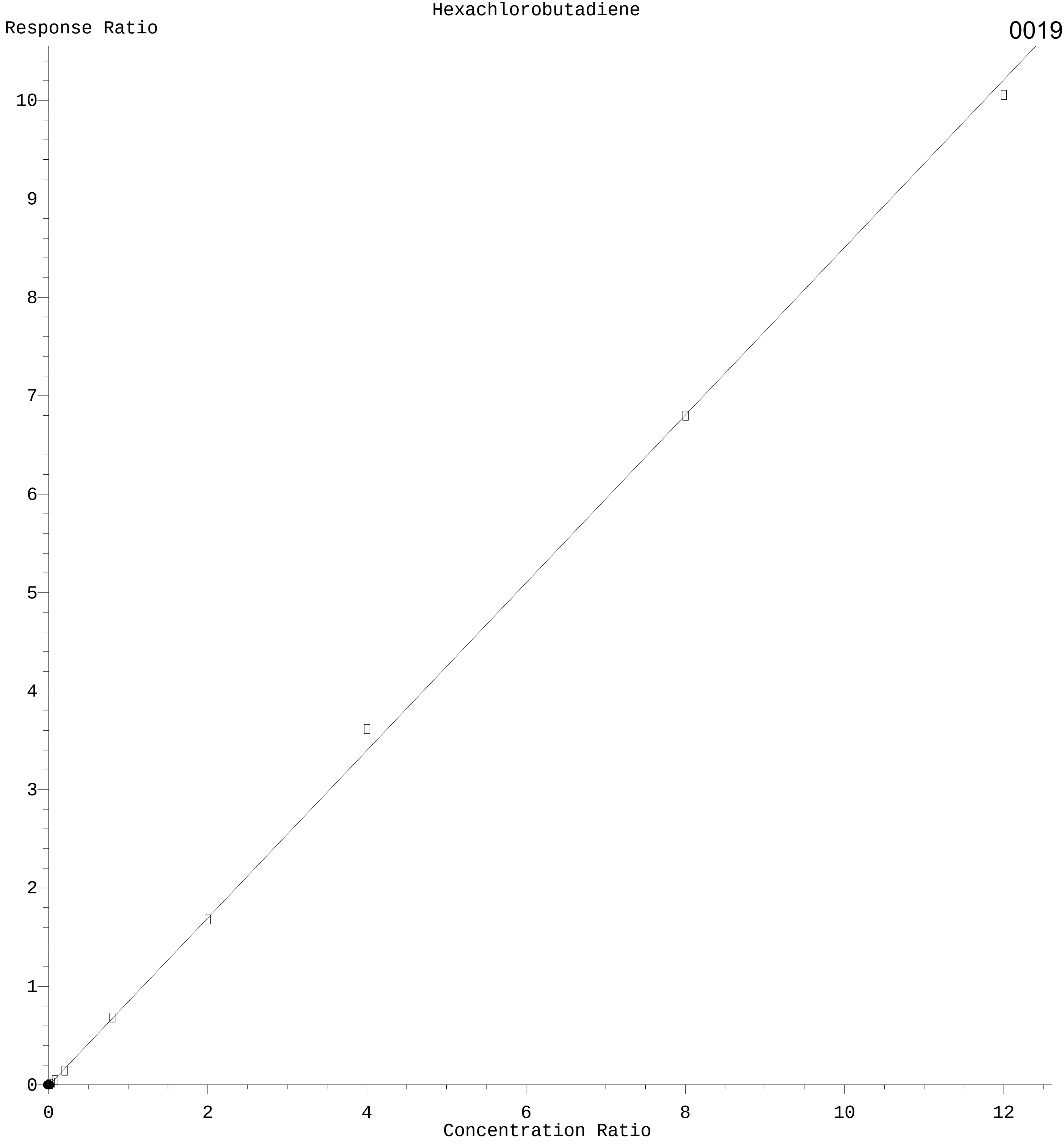
```
     Response = 3.092e+000 * Amt - 2.027e-002
Coef of Det (r^2) = 0.994313   Curve Fit: wlr(1/a)
Method Name:  D:\MassHunter\GCMS\1\methods\8260WTR.M
Calibration Table Last Updated: Sat Nov 16 17:30:32 2013
```



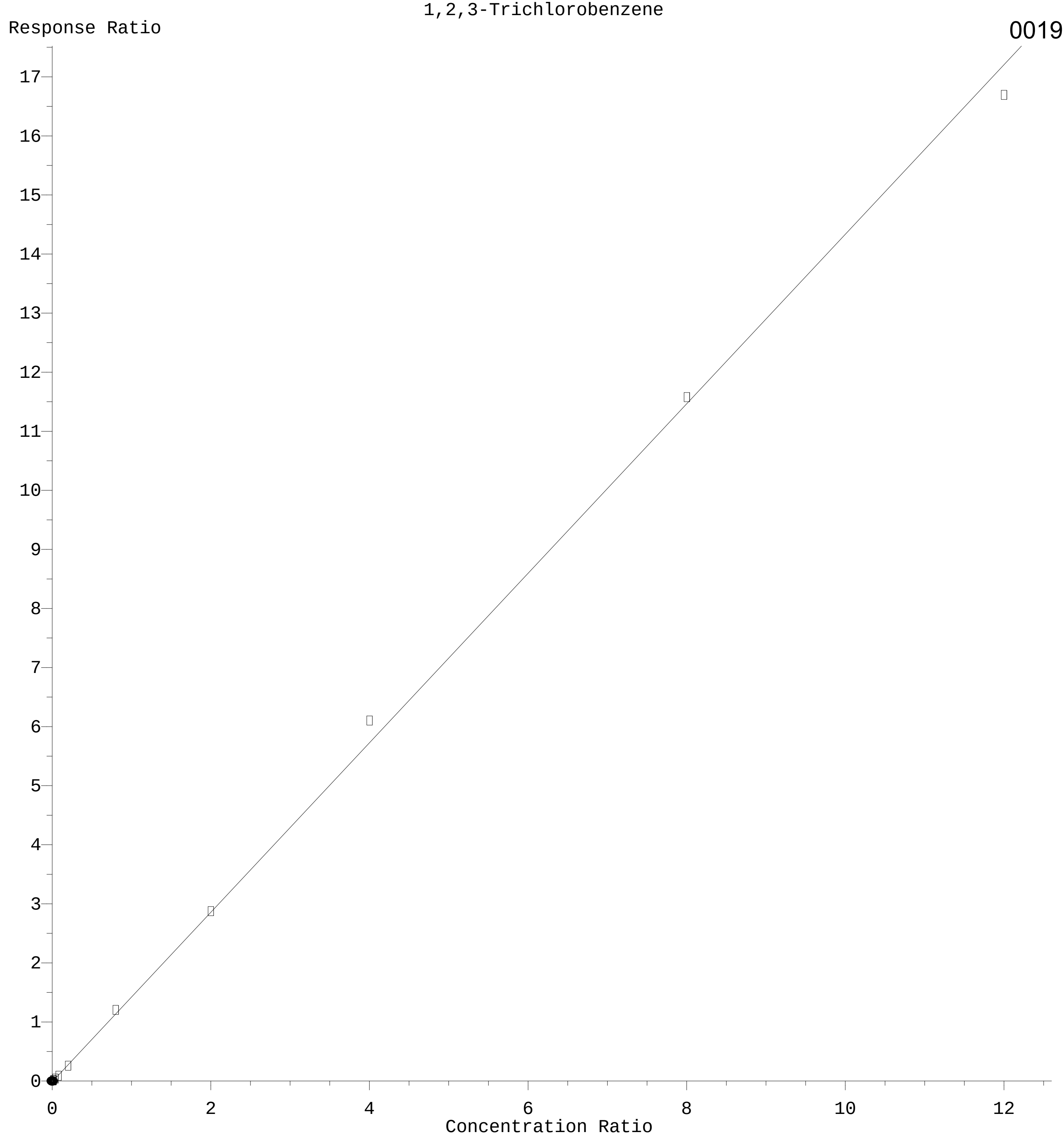
Response = 1.564e+000 * Amt - 1.606e-002
Coef of Det (r^2) = 0.998950   Curve Fit: wlr(1/a)
Method Name: D:\MassHunter\GCMS\1\methods\8260WTR.M
Calibration Table Last Updated: Sat Nov 16 17:30:32 2013



Response = 1.564e+000 * Amt - 1.606e-002
Coef of Det (r^2) = 0.998950   Curve Fit: wlr(1/a)
Method Name: D:\MassHunter\GCMS\1\methods\8260WTR.M
Calibration Table Last Updated: Sat Nov 16 17:30:32 2013



Response = 8.525e-001 * Amt - 8.914e-003
Coef of Det (r^2) = 0.999036   Curve Fit: wlr(1/a)
Method Name: D:\MassHunter\GCMS\1\methods\8260WTR.M
Calibration Table Last Updated: Sat Nov 16 17:30:32 2013



```
      Response = 1.435e+000 * Amt - 9.620e-003
Coef of Det (r^2) = 0.998716   Curve Fit: wlr(1/a)
Method Name:  D:\MassHunter\GCMS\1\methods\8260WTR.M
Calibration Table Last Updated: Sat Nov 16 17:30:32 2013
```

```
                             Quantitation Report    (Not Reviewed)

  Data Path : D:\MassHunter\GCMS\1\data\111513\
  Data File : 17M001033.D
  Acq On    : 15 Nov 2013  20:12
  Operator  : adc
  Sample    : WG453012-12 50.0ug/L ALTSRC 8260
  Misc      : 1,1 STD61121
  ALS Vial  : 12   Sample Multiplier: 1

  Quant Time: Nov 16 17:36:33 2013
  Quant Method : D:\MassHunter\GCMS\1\methods\8260WTR.M
  Quant Title  : 8260B/624 SOP:OVL MSV01 WATER 11/15/13 HPMS17
  QLast Update : Sat Nov 16 17:30:32 2013
  Response via : Initial Calibration

          Compound                   R.T. QIon  Response  Conc Units Dev(Min)
   --------------------------------------------------------------------------
   Internal Standards
     1) Fluorobenzene              10.192   96   861716    25.00000 ug/L     0.0000
    56) Chlorobenzene-d5           13.996  117   613825    25.00000 ug/L     0.0000
    76) 1,4-Dichlorobenzene-d4     16.971  152   324730    25.00000 ug/L     0.0000

   System Monitoring Compounds
    37) Dibromofluoromethane        9.145  111   233727    21.7804 ug/L    0.0000
     Spiked Amount     25.000   Range  86 - 118    Recovery   =   87.122%
    43) 1,2-Dichloroethane-d4       9.788   65   205250    19.4082 ug/L    0.0000
     Spiked Amount     25.000   Range  80 - 120    Recovery   =   77.633%#
    57) Toluene-d8                 12.141   98   732251    19.5520 ug/L    0.0000
     Spiked Amount     25.000   Range  88 - 110    Recovery   =   78.208%#
    78) p-Bromofluorobenzene       15.478   95   281313    17.8691 ug/L    0.0000
     Spiked Amount     25.000   Range  86 - 115    Recovery   =   71.476%#

   Target Compounds                                                   Qvalue
     2) Dichlorodifluoromethane     2.563   85   555277    69.4639 ug/L     100
     3) Chloromethane               2.978   50   715318    54.3031 ug/L     100
     4) Vinyl Chloride              3.185   62   640548    49.5073 ug/L     100
     5) 1,3-Butadiene               3.216   54   204540    33.5712 ug/L      99
     6) Bromomethane                4.025   94   382008    50.5930 ug/L      99
     7) Chloroethane                4.201   64   318196    49.0955 ug/L     100
     8) Trichlorofluoromethane      4.709  101   800342    54.9754 ug/L     100
     9) Diethyl ether               5.310   59   601233    93.2165 ug/L     100
    10) Isoprene                    5.320   67   579521    43.2732 ug/L     100
    11) Acrolein                    5.538   56    79398   355.2229 ug/L      96
    12) 1,1,2-Trichloro-1,2,2-...   5.559  101   474732    53.7831 ug/L      97
    13) Acetone                     5.662   43    80464    46.6325 ug/L      96
    14) 1,1-Dichloroethene          5.859   61   627220    46.4160 ug/L     100
    15) Tert-Butyl Alcohol          6.046   59   139512   236.9861 ug/L      96
    16) Dimethyl Sulfide            6.129   62   459833    51.9097 ug/L      99
    17) Iodomethane                 6.367  142   512350    41.4414 ug/L     100
    18) Methyl acetate              6.460   43   210215    46.1661 ug/L      98
    19) Methylene Chloride          6.678   84   469759    46.5494 ug/L      99
    20) Carbon Disulfide            6.657   76  1233809    42.0284 ug/L     100
    21) Acrylonitrile               6.896   53   111007    50.4511 ug/L      99
    22) Methyl Tert Butyl Ether     6.937   73  1141799    50.0027 ug/L     100
    23) trans-1,2-Dichloroethene    7.144   96   448747    47.4163 ug/L     100
    24) n-Hexane                    7.248   57   401665    39.9658 ug/L     100
    25) Diisopropyl ether           7.632   45  2529240    93.1552 ug/L     100
    26) Vinyl Acetate               7.798   43   630866    55.6199 ug/L     100
    27) 1,1-Dichloroethane          7.798   63   817833    47.9073 ug/L     100
    28) Ethyl-Tert-Butyl ether      8.212   59  2585855    93.4475 ug/L     100
    29) 2-Butanone                  8.388   43   121567    46.8762 ug/L      99
    30) Propionitrile               8.492   54    80307   105.7296 ug/L      99
    31) 2,2-Dichloropropane         8.585   77   663742    44.2986 ug/L     100
    32) cis-1,2-Dichloroethene      8.647   96   524206    47.7507 ug/L      98
    33) Chloroform                  8.855   83   879888    49.3705 ug/L     100
    34) 1-Bromopropane              8.989  122   111050    51.6318 ug/L     100
    35) Bromochloromethane          9.083  130   340273    49.3483 ug/L     100
    36) Tetrahydrofuran             9.114   42   148425    96.3685 ug/L      98
    38) 1,1,1-Trichloroethane       9.383   97   803882    49.1788 ug/L      99
    39) Cyclohexane                 9.404   56   646548    42.8351 ug/L      99
    40) 1,1-Dichloropropene         9.580   75   601773    48.5808 ug/L     100
    41) Tert-Amyl-Methyl ether      9.715   73  2436135    96.2422 ug/L     100
    42) Carbon Tetrachloride        9.715  117   757393    50.4540 ug/L      99
    44) 1,2-Dichloroethane          9.902   62   585596    47.3708 ug/L     100
    45) Benzene                     9.933   78  1792629    47.7327 ug/L     100
    46) Trichloroethene            10.689  130   523592    45.9685 ug/L     100
    47) Methylcyclohexane          10.762   83   695367    44.3079 ug/L     100

8260WTR.M Sat Nov 16 17:36:34 2013                                                   Page:  1
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                          Quantitation Report    (Not Reviewed)

Data Path : D:\MassHunter\GCMS\1\data\111513\
Data File : 17M001033.D
Acq On    : 15 Nov 2013  20:12
Operator  : adc
Sample    : WG453012-12 50.0ug/L ALTSRC 8260
Misc      : 1,1 STD61121
ALS Vial  : 12   Sample Multiplier: 1

Quant Time: Nov 16 17:36:33 2013
Quant Method : D:\MassHunter\GCMS\1\methods\8260WTR.M
Quant Title  : 8260B/624 SOP:OVL MSV01 WATER 11/15/13 HPMS17
QLast Update : Sat Nov 16 17:30:32 2013
Response via : Initial Calibration

        Compound                   R.T. QIon  Response  Conc Units Dev(Min)
 --------------------------------------------------------------------------
  48) 1,2-Dichloropropane        10.897   63   446540    46.9924 ug/L     100
  49) 1,4-Dioxane                11.197   88    15931   227.3933 ug/L     100
  50) Bromodichloromethane       11.197   83   658440    48.2662 ug/L     100
  51) Dibromomethane             11.270   93   289364    49.4022 ug/L     100
  52) 2-Chloroethyl Vinyl Ether  11.519   63   188650    53.8190 ug/L     100
  53) 4-Methyl-2-Pentanone       11.550   58   122278    50.4653 ug/L     100
  54) cis-1,3-Dichloropropene    11.830   75   761931    49.8747 ug/L     100
  55) Dimethyl Disulfide         12.068   79   451793    45.2747 ug/L      99
  58) Toluene                    12.234   91  1950827    46.9708 ug/L     100
  59) Ethyl Methacrylate         12.379   69   495310    47.6280 ug/L      99
  60) trans-1,3-Dichloropropene  12.431   75   612412    45.4727 ug/L      99
  61) 1,1,2-Trichloroethane      12.638   97   367693    47.5796 ug/L      99
  62) 2-Hexanone                 12.597   43   203754    50.1857 ug/L      99
  63) 1,3-Dichloropropane        12.939   76   613820    46.2871 ug/L     100
  64) Tetrachloroethene          13.042  166   572718    48.4330 ug/L      99
  65) Dibromochloromethane       13.291  129   520754    49.6615 ug/L     100
  66) 1,2-Dibromoethane          13.540  107   380648    47.1993 ug/L     100
  67) 1-Chlorohexane             13.664   91   637142    47.7371 ug/L     100
  68) Chlorobenzene              14.048  112  1425292    49.8502 ug/L      99
  69) 1,1,1,2-Tetrachloroethane  14.079  131   531917    46.5930 ug/L     100
  70) Ethylbenzene               14.079  106   729905    46.6694 ug/L     100
  71) m-,p-Xylene                14.172  106  1813100    96.4502 ug/L     100
  72) o-Xylene                   14.722  106   905305    48.3721 ug/L     100
  73) Styrene                    14.763  104  1494008    49.5794 ug/L     100
  74) Bromoform                  15.229  173   376109    46.2499 ug/L     100
  75) Isopropylbenzene           15.147  105  2306043    50.5075 ug/L     100
  77) 1,1,2,2-Tetrachloroethane  15.364   83   458174    48.6792 ug/L     100
  79) 1,2,3-Trichloropropane     15.551  110   133540    44.8942 ug/L      99
  80) trans-1,4-Dichloro-2-B...  15.613   53    91184    33.7453 ug/L     100
  81) n-Propylbenzene            15.644   91  2675713    45.6948 ug/L      99
  82) Bromobenzene               15.748  156   641458    45.6553 ug/L      99
  83) 1,3,5-Trimethylbenzene     15.841  105  1981424    45.5278 ug/L      99
  84) 2-Chlorotoluene            15.903   91  1699831    46.1705 ug/L     100
  85) 4-Chlorotoluene            15.955   91  1619207    46.1823 ug/L     100
  86) a-Methylstyrene            16.235  118  1191588    45.4066 ug/L      99
  87) tert-Butylbenzene          16.287  134   441967    46.5324 ug/L     100
  88) 1,2,4-Trimethylbenzene     16.339  105  2011814    45.7174 ug/L      99
  89) sec-Butylbenzene           16.556  105  2594480    48.1757 ug/L     100
  90) p-Isopropyltoluene         16.722  119  2138884    47.8465 ug/L     100
  91) 1,3-Dichlorobenzene        16.888  146  1257390    48.9374 ug/L     100
  92) 1,4-Dichlorobenzene        17.012  146  1217408    48.8270 ug/L     100
  93) n-Butylbenzene             17.230   91  1890793    47.2488 ug/L     100
  94) 1,2-Dichlorobenzene        17.499  146  1256087    51.4726 ug/L     100
  95) 1,2-Dibromo-3-Chloropr...  18.484   75    84384    47.7308 ug/L     100
  96) 1,2,4-Trichlorobenzene     19.604  180   930859    46.0840 ug/L     100
  97) Hexachlorobutadiene        19.769  225   496441    45.0962 ug/L      99
  98) Naphthalene                19.956  128  1608984    50.6276 ug/L     100
  99) 1,2,3-Trichlorobenzene     20.267  180   883616    47.5676 ug/L     100
 --------------------------------------------------------------------------

 (#) = qualifier out of range (m) = manual integration (+) = signals summed
```

Quantitation Report   (Not Reviewed)

```
Data Path : D:\MassHunter\GCMS\1\data\111513\
Data File : 17M001033.D
Acq On    : 15 Nov 2013  20:12
Operator  : adc
Sample    : WG453012-12 50.0ug/L ALTSRC 8260
Misc      : 1,1 STD61121
ALS Vial  : 12   Sample Multiplier: 1

Quant Time: Nov 16 17:36:33 2013
Quant Method : D:\MassHunter\GCMS\1\methods\8260WTR.M
Quant Title  : 8260B/624 SOP:OVL MSV01 WATER 11/15/13 HPMS17
QLast Update : Sat Nov 16 17:30:32 2013
Response via : Initial Calibration
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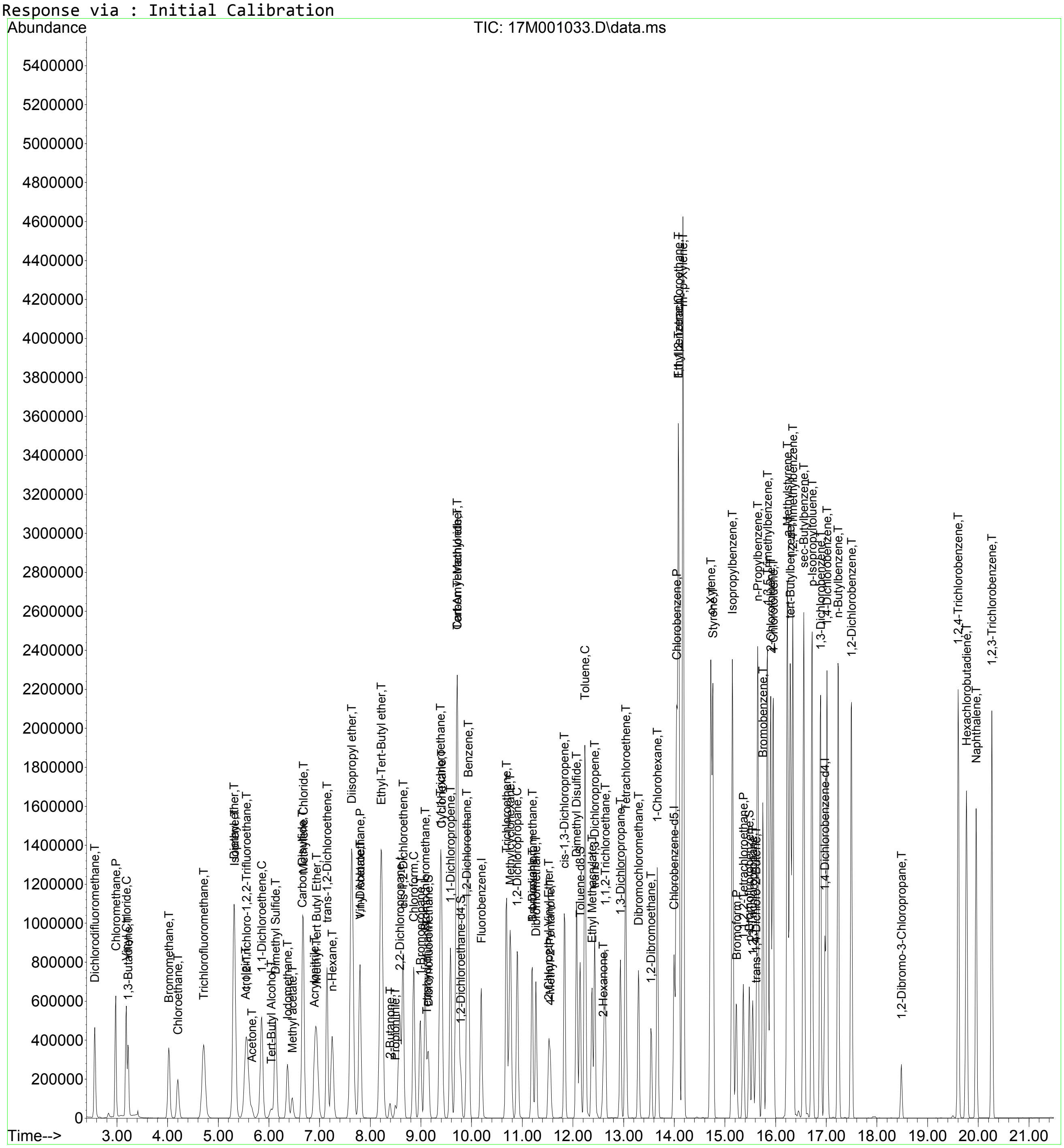

8260WTR.M Sat Nov 16 17:36:34 2013 Page: 3

```
                         Evaluate Continuing Calibration Report

  Data Path : D:\MassHunter\GCMS\1\data\111513\
  Data File : 17M001033.D
  Acq On    : 15 Nov 2013  20:12
  Operator  : adc
  Sample    : WG453012-12 50.0ug/L ALTSRC 8260
  Misc      : 1,1 STD61121
  ALS Vial  : 12   Sample Multiplier: 1

  Quant Time: Nov 16 17:36:33 2013
  Quant Method : D:\MassHunter\GCMS\1\methods\8260WTR.M
  Quant Title  : 8260B/624 SOP:OVL MSV01 WATER 11/15/13 HPMS17
  QLast Update : Sat Nov 16 17:30:32 2013
  Response via : Initial Calibration


  Min. RRF     :   0.000  Min. Rel. Area :   50%  Max. R.T. Dev  0.500min
  Max. RRF Dev :  20%     Max. Rel. Area :  150%

         Compound                     Amount  Calc.     %Dev Area% Dev(min)
  -----------------------------------------------------------------------
   1 I    Fluorobenzene               25.000  25.000       0.0   95   0.000
   2 T    Dichlorodifluoromethane     50.000  69.464     -38.9# 125   0.000
   3 P    Chloromethane               50.000  54.303      -8.6  104   0.000
   4 C    Vinyl Chloride              50.000  49.507       1.0#  91   0.000
   5 T    1,3-Butadiene               50.000  33.571      32.9#  65   0.000
   6 T    Bromomethane                50.000  50.593      -1.2   97  -0.020
   7 T    Chloroethane                50.000  49.095       1.8   94  -0.010
   8 T    Trichlorofluoromethane      50.000  54.975     -10.0  101  -0.010
   9 T    Diethyl ether              100.000  93.216       6.8   91   0.000
  10 T    Isoprene                    50.000  43.273      13.5   82   0.000
  11 T    Acrolein                    50.000 355.223    -610.4# 682  -0.010
  12 T    1,1,2-Trichloro-1,2,2-Trifl 50.000  53.783      -7.6  102  -0.010
  13 T    Acetone                     50.000  46.633       6.7   97   0.000
  14 C    1,1-Dichloroethene          50.000  46.416       7.2#  87   0.000
  15 T    Tert-Butyl Alcohol         200.000 236.986     -18.5  119   0.021
  16 T    Dimethyl Sulfide            50.000  51.910      -3.8   99  -0.010
  17 T    Iodomethane                 50.000  41.441      17.1   77   0.000
  18 T    Methyl acetate              50.000  46.166       7.7   93   0.010
  19 T    Methylene Chloride          50.000  46.549       6.9   89   0.000
  20 T    Carbon Disulfide            50.000  42.028      15.9   80  -0.011
  21 T    Acrylonitrile               50.000  50.451      -0.9   94   0.000
  22 T    Methyl Tert Butyl Ether     50.000  50.003      -0.0   95   0.010
  23 T    trans-1,2-Dichloroethene    50.000  47.416       5.2   90   0.000
  24 T    n-Hexane                    50.000  39.966      20.1#  75   0.000
  25 T    Diisopropyl ether          100.000  93.155       6.8   91   0.000
  26 T    Vinyl Acetate               50.000  55.620     -11.2  108   0.000
  27 P    1,1-Dichloroethane          50.000  47.907       4.2   91   0.000
  28 T    Ethyl-Tert-Butyl ether     100.000  93.447       6.6   91   0.000
  29 T    2-Butanone                  50.000  46.876       6.2   96   0.000
  30 T    Propionitrile              100.000 105.730      -5.7  101   0.000
  31 t    2,2-Dichloropropane         50.000  44.299      11.4   86   0.000
  32 T    cis-1,2-Dichloroethene      50.000  47.751       4.5   91   0.000
  33 C    Chloroform                  50.000  49.370       1.3#  93   0.000
  34 T    1-Bromopropane              50.000  51.632      -3.3   96   0.000
  35 T    Bromochloromethane          50.000  49.348       1.3   92   0.000
  36 T    Tetrahydrofuran            100.000  96.369       3.6   94   0.000
  37 S    Dibromofluoromethane        25.000  21.780      12.9   84   0.000
  38 T    1,1,1-Trichloroethane       50.000  49.179       1.6   93   0.000
  39 T    Cyclohexane                 50.000  42.835      14.3   82   0.000
  40 T    1,1-Dichloropropene         50.000  48.581       2.8   90   0.000
  41 T    Tert-Amyl-Methyl ether     100.000  96.242       3.8   94   0.000
  42 T    Carbon Tetrachloride        50.000  50.454      -0.9   92   0.000
  43 S    1,2-Dichloroethane-d4       25.000  19.408      22.4#  76   0.000
  44 T    1,2-Dichloroethane          50.000  47.371       5.3   89  -0.010
  45 T    Benzene                     50.000  47.733       4.5   91   0.000
  46 T    Trichloroethene             50.000  45.968       8.1   88   0.000
  47 T    Methylcyclohexane           50.000  44.308      11.4   84   0.000
  48 C    1,2-Dichloropropane         50.000  46.992       6.0#  89   0.000
  49 T    1,4-Dioxane                200.000 227.393     -13.7  109   0.000
  50 T    Bromodichloromethane        50.000  48.266       3.5   89   0.000
  51 T    Dibromomethane              50.000  49.402       1.2   92   0.000
  52 T    2-Chloroethyl Vinyl Ether   50.000  53.819      -7.6   99   0.000
  53 T    4-Methyl-2-Pentanone        50.000  50.465      -0.9   97   0.000
  54 T    cis-1,3-Dichloropropene     50.000  49.875       0.3   92  -0.010
  55 T    Dimethyl Disulfide          50.000  45.275       9.5   88   0.000
```

```
                         Evaluate Continuing Calibration Report

    Data Path : D:\MassHunter\GCMS\1\data\111513\
    Data File : 17M001033.D
    Acq On    : 15 Nov 2013  20:12
    Operator  : adc
    Sample    : WG453012-12 50.0ug/L ALTSRC 8260
    Misc      : 1,1 STD61121
    ALS Vial  : 12   Sample Multiplier: 1

    Quant Time: Nov 16 17:36:33 2013
    Quant Method : D:\MassHunter\GCMS\1\methods\8260WTR.M
    Quant Title  : 8260B/624 SOP:OVL MSV01 WATER 11/15/13 HPMS17
    QLast Update : Sat Nov 16 17:30:32 2013
    Response via : Initial Calibration


    Min. RRF     :   0.000  Min. Rel. Area :   50%  Max. R.T. Dev  0.500min
    Max. RRF Dev :  20%     Max. Rel. Area :  150%

           Compound                     Amount  Calc.     %Dev Area% Dev(min)
    ------------------------------------------------------------------------
   56 I    Chlorobenzene-d5             25.000  25.000       0.0   98   0.000
   57 S    Toluene-d8                   25.000  19.552      21.8#  79   0.000
   58 C    Toluene                      50.000  46.971       6.1#  91   0.000
   59 T    Ethyl Methacrylate           50.000  47.628       4.7   92   0.000
   60 T    trans-1,3-Dichloropropene    50.000  45.473       9.1   85   0.000
   61 T    1,1,2-Trichloroethane        50.000  47.580       4.8   90   0.000
   62 T    2-Hexanone                   50.000  50.186      -0.4   99   0.000
   63 T    1,3-Dichloropropane          50.000  46.287       7.4   89   0.000
   64 T    Tetrachloroethene            50.000  48.433       3.1   92   0.000
   65 T    Dibromochloromethane         50.000  49.661       0.7   92   0.000
   66 T    1,2-Dibromoethane            50.000  47.199       5.6   89   0.000
   67 T    1-Chlorohexane               50.000  47.737       4.5   90   0.000
   68 P    Chlorobenzene                50.000  49.850       0.3   96   0.000
   69 T    1,1,1,2-Tetrachloroethane    50.000  46.593       6.8   89   0.000
   70 C    Ethylbenzene                 50.000  46.669       6.7#  90  -0.010
   71 T    m-,p-Xylene                 100.000  96.450       3.5   92   0.000
   72 T    o-Xylene                     50.000  48.372       3.3   94   0.000
   73 T    Styrene                      50.000  49.579       0.8   94   0.000
   74 P    Bromoform                    50.000  46.250       7.5   94   0.000
   75 T    Isopropylbenzene             50.000  50.507      -1.0   95   0.000

   76 I    1,4-Dichlorobenzene-d4       25.000  25.000       0.0  111   0.000
   77 P    1,1,2,2-Tetrachloroethane    50.000  48.679       2.6   99   0.000
   78 S    p-Bromofluorobenzene         25.000  17.869      28.5#  80   0.000
   79 T    1,2,3-Trichloropropane       50.000  44.894      10.2   94   0.000
   80 T    trans-1,4-Dichloro-2-Butene  50.000  33.745      32.5#  70   0.000
   81 T    n-Propylbenzene              50.000  45.695       8.6   94   0.000
   82 T    Bromobenzene                 50.000  45.655       8.7   96   0.000
   83 T    1,3,5-Trimethylbenzene       50.000  45.528       8.9   97   0.000
   84 T    2-Chlorotoluene              50.000  46.170       7.7  100   0.000
   85 T    4-Chlorotoluene              50.000  46.182       7.6   99   0.000
   86 T    a-Methylstyrene              50.000  45.407       9.2   99   0.000
   87 T    tert-Butylbenzene            50.000  46.532       6.9   99   0.000
   88 T    1,2,4-Trimethylbenzene       50.000  45.717       8.6   97   0.000
   89 T    sec-Butylbenzene             50.000  48.176       3.6   99   0.000
   90 T    p-Isopropyltoluene           50.000  47.846       4.3   98   0.000
   91 T    1,3-Dichlorobenzene          50.000  48.937       2.1  103   0.000
   92 T    1,4-Dichlorobenzene          50.000  48.827       2.3  100   0.000
   93 T    n-Butylbenzene               50.000  47.249       5.5  100  -0.010
   94 T    1,2-Dichlorobenzene          50.000  51.473      -2.9  106   0.000
   95 T    1,2-Dibromo-3-Chloropropane  50.000  47.731       4.5  100   0.000
   96 T    1,2,4-Trichlorobenzene       50.000  46.084       7.8  104   0.000
   97 T    Hexachlorobutadiene          50.000  45.096       9.8  101   0.000
   98 T    Naphthalene                  50.000  50.628      -1.3  101   0.000
   99 T    1,2,3-Trichlorobenzene       50.000  47.568       4.9  105   0.000
   -------------------------------------------------------------------------

     (#) = Out of Range               SPCC's out = 0  CCC's out = 6
```

```
                               Quantitation Report    (Not Reviewed)

Data File : C:\MSDchem\1\data\122313\11M97806.D          Vial: 2
Acq On    : 23 Dec 2013  15:55                       Operator: FJB
Sample    : WG457422-02 50ug/L CCV 8260              Inst    : hpms11
Misc      : 1,1 STD61850                             Multiplr: 1.00
MS Integration Params: rteint.p
Quant Time: Dec 23 16:17:27 2013          Quant Results File: 8260_WT.RES

Quant Method : C:\MSDCHEM\1\METHODS\8260_WT.M (RTE Integrator)
Title        : 8260B/624 (SOP: OVL MSV01) Water 11/05/13 HPMS11
Last Update  : Mon Dec 16 17:06:06 2013
Response via : Initial Calibration
DataAcq Meth : 8260_WT

 Internal Standards                R.T. QIon  Response  Conc Units Dev(Min)
-----------------------------------------------------------------------------
   1) Fluorobenzene               10.62   96  1425098    25.00 ug/L   -0.01
  56) Chlorobenzene-d5            14.26  117  1071573    25.00 ug/L    0.00
  76) 1,4-Dichlorobenzene-d4      17.07  152   564119    25.00 ug/L    0.00

 System Monitoring Compounds
  37) Dibromofluoromethane         9.64  111   405442    23.5184 ug/L  0.00
   Spiked Amount     25.000   Range  86 - 118    Recovery   =   94.08%
  43) 1,2-Dichloroethane-d4       10.25   65   457439    23.4953 ug/L  0.00
   Spiked Amount     25.000   Range  80 - 120    Recovery   =   94.00%
  57) Toluene-d8                  12.48   98  1443825    26.8286 ug/L  0.00
   Spiked Amount     25.000   Range  88 - 110    Recovery   =  107.32%
  78) p-Bromofluorobenzene        15.65   95   634012    27.9850 ug/L  0.00
   Spiked Amount     25.000   Range  86 - 115    Recovery   =  111.92%

 Target Compounds                                                   Qvalue
   2) Dichlorodifluoromethane      3.24   85   760337    54.0889 ug/L    94
   3) Chloromethane                3.70   50  1176590    59.3007 ug/L    98
   4) Vinyl Chloride               3.94   62  1105327    58.7876 ug/L    98
   5) 1,3-Butadiene                3.98   54   736256    69.0096 ug/L    98
   6) Bromomethane                 4.85   94   410428    50.8762 ug/L   100
   7) Chloroethane                 5.00   64   608799    55.6536 ug/L    98
   8) Trichlorofluoromethane       5.49  101  1310684    50.0693 ug/L   100
   9) Diethyl ether                6.01   59  1273060   115.9097 ug/L    94
  10) Isoprene                     6.05   67  1044397    48.4795 ug/L    88
  11) Acrolein                     6.25   56    13234    59.8611 ug/L    95
  12) 1,1,2-Trichloro-1,2,2-Trif   6.26  101   729438    47.7415 ug/L    86
  13) Acetone                      6.34   43   210743    63.6584 ug/L    82
  14) 1,1-Dichloroethene           6.57   61  1383368    53.4954 ug/L   100
  15) Tert-Butyl Alcohol           6.66   59   205127   199.4418 ug/L    99
  16) Dimethyl Sulfide             6.82   62   761748    51.9180 ug/L    90
  17) Iodomethane                  7.07  142   752125    62.7032 ug/L    95
  18) Methyl acetate               7.07   43   436741    45.5298 ug/L    97
  19) Methylene Chloride           7.33   84   812196    49.1172 ug/L   100
  20) Carbon Disulfide             7.37   76  2378198    50.5184 ug/L    99
  21) Acrylonitrile                7.50   53   252306    62.4559 ug/L    93
  22) Methyl Tert Butyl Ether      7.53   73  2010373    52.1177 ug/L    95
  23) trans-1,2-Dichloroethene     7.77   96   792980    48.5532 ug/L    99
  24) n-Hexane                     7.84   57  1000439    49.5342 ug/L   100
  25) Diisopropyl ether            8.16   45  5886918   113.9117 ug/L   100
  26) Vinyl Acetate                8.32   43   300788    15.5044 ug/L    98
  27) 1,1-Dichloroethane           8.36   63  1572057    52.9865 ug/L    97
  28) Ethyl-Tert-Butyl ether       8.71   59  5151941   108.4292 ug/L    97
  29) 2-Butanone                   8.88   43   253933    52.7772 ug/L    93
  30) Propionitrile                8.99   54   159501   119.0173 ug/L    99
  31) 2,2-Dichloropropane          9.10   77  1249874    44.1082 ug/L    99
  32) cis-1,2-Dichloroethene       9.16   96   875127    50.2245 ug/L    96
  33) Chloroform                   9.36   83  1487048    49.9045 ug/L    99
  34) 1-Bromopropane               9.49  122   150349    48.3489 ug/L    99
  35) Bromochloromethane           9.59  130   517067    53.2424 ug/L    91
  36) Tetrahydrofuran              9.61   42   339720   118.9506 ug/L    99
  38) 1,1,1-Trichloroethane        9.86   97  1344544    50.1202 ug/L    89
  39) Cyclohexane                  9.91   56  1399506    49.8486 ug/L    99
  40) 1,1-Dichloropropene         10.05   75  1150529    51.0251 ug/L    99
  41) Carbon Tetrachloride        10.20  117  1207338    48.9414 ug/L    98
  42) Tert-Amyl-Methyl ether      10.14   73  4065824   103.8885 ug/L    95
-----------------------------------------------------------------------------
 (#) = qualifier out of range (m) = manual integration
 11M97806.D  8260_WT.M      Mon Dec 23 16:17:28 2013                    Page 1
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                         Quantitation Report    (Not Reviewed)

Data File : C:\MSDchem\1\data\122313\11M97806.D         Vial: 2
Acq On    : 23 Dec 2013  15:55                       Operator: FJB
Sample    : WG457422-02 50ug/L CCV 8260              Inst    : hpms11
Misc      : 1,1 STD61850                             Multiplr: 1.00
MS Integration Params: rteint.p
Quant Time: Dec 23 16:17:27 2013          Quant Results File: 8260_WT.RES

Quant Method : C:\MSDCHEM\1\METHODS\8260_WT.M (RTE Integrator)
Title        : 8260B/624 (SOP: OVL MSV01) Water 11/05/13 HPMS11
Last Update  : Mon Dec 16 17:06:06 2013
Response via : Initial Calibration
DataAcq Meth : 8260_WT


      Compound                     R.T. QIon  Response  Conc Unit   Qvalue
 -------------------------------------------------------------------------
  44) 1,2-Dichloroethane          10.36   62  1179925    54.7758 ug/L    93
  45) Benzene                     10.40   78  3050092    49.0460 ug/L   100
  46) Trichloroethene             11.10  130   827779    48.4866 ug/L    99
  47) Methylcyclohexane           11.18   83  1144958    48.4680 ug/L    92
  48) 1,2-Dichloropropane         11.30   63   870760    53.8278 ug/L    83
  49) 1,4-Dioxane                 11.57   88    25469   240.8582 ug/L    98
  50) Bromodichloromethane        11.59   83  1149015    51.1156 ug/L    99
  51) Dibromomethane              11.67   93   467707    52.8521 ug/L    88
  52) 2-Chloroethyl Vinyl Ether   11.85   63   165351    21.9855 ug/L    95
  53) 4-Methyl-2-Pentanone        11.88   58   196807    50.2268 ug/L    97
  54) cis-1,3-Dichloropropene     12.18   75  1330138    51.5577 ug/L    99
  55) Dimethyl Disulfide          12.43   79   730931    51.5329 ug/L    95
  58) Toluene                     12.57   91  3087327    51.7925 ug/L    98
  59) Ethyl Methacrylate          12.65   69   661453    45.0501 ug/L    94
  60) trans-1,3-Dichloropropene   12.74   75  1180460    54.9817 ug/L    97
  61) 1,1,2-Trichloroethane       12.95   97   596700    55.1812 ug/L    93
  62) 2-Hexanone                  12.87   43   364931    53.7248 ug/L #  80
  63) 1,3-Dichloropropane         13.22   76  1094031    55.3626 ug/L    97
  64) Tetrachloroethene           13.35  164   595060    47.2666 ug/L    96
  65) Dibromochloromethane        13.60  129   773596    53.3882 ug/L    99
  66) 1,2-Dibromoethane           13.83  107   616237    55.7866 ug/L   100
  67) 1-Chlorohexane              13.90   91  1022851    50.8330 ug/L    90
  68) Chlorobenzene               14.30  112  2157782    51.3363 ug/L   100
  69) 1,1,1,2-Tetrachloroethane   14.33  131   816671    52.1055 ug/L    99
  70) Ethylbenzene                14.32  106  1183860    50.8662 ug/L    91
  71) m-,p-Xylene                 14.40  106  2767615   102.5521 ug/L    84
  72) o-Xylene                    14.93  106  1383724    50.1717 ug/L    88
  73) Styrene                     14.96  104  2269296    51.6858 ug/L    94
  74) Bromoform                   15.44  173   447726    53.0034 ug/L    98
  75) Isopropylbenzene            15.32  105  3314840    52.0997 ug/L    95
  77) 1,1,2,2-Tetrachloroethane   15.52   83   682829    54.0575 ug/L    97
  79) 1,2,3-Trichloropropane      15.71  110   200466    53.3503 ug/L #  45
  80) trans-1,4-Dichloro-2-Buten  15.74   53   200428    42.8444 ug/L #   1
  81) n-Propylbenzene             15.79   91  3922947    51.0033 ug/L    98
  82) Bromobenzene                15.93  156   857694    50.5684 ug/L #  45
  83) 1,3,5-Trimethylbenzene      15.96  105  2842932    52.2462 ug/L    93
  84) 2-Chlorotoluene             16.06   91  2738675    54.5214 ug/L    92
  85) 4-Chlorotoluene             16.10   91  2294576    44.6585 ug/L    85
  86) a-Methylstyrene             16.35  118  1511678    51.9340 ug/L    90
  87) tert-Butylbenzene           16.40  134   595333    51.6376 ug/L    84
  88) 1,2,4-Trimethylbenzene      16.45  105  2912298    52.7221 ug/L    94
  89) sec-Butylbenzene            16.65  105  3311806    53.0949 ug/L   100
  90) p-Isopropyltoluene          16.79  119  2819977    52.9037 ug/L    97
  91) 1,3-Dichlorobenzene         16.99  146  1606087    50.6396 ug/L    96
  92) 1,4-Dichlorobenzene         17.11  146  1629491    48.9044 ug/L    97
  93) n-Butylbenzene              17.29   91  2539368    53.4838 ug/L   100
  94) 1,2-Dichlorobenzene         17.57  146  1522521    51.0236 ug/L    97
  95) 1,2-Dibromo-3-Chloropropan  18.50   75   119403    51.1344 ug/L    89
  96) 1,2,4-Trichlorobenzene      19.55  180   943627    46.7764 ug/L    98
  97) Hexachlorobutadiene         19.69  225   343187    44.0375 ug/L    94
  98) Naphthalene                 19.90  128  1824470    46.7757 ug/L    99
  99) 1,2,3-Trichlorobenzene      20.19  180   827037    44.5249 ug/L    99


 -------------------------------------------------------------------------
 (#) = qualifier out of range (m) = manual integration
 11M97806.D  8260_WT.M      Mon Dec 23 16:17:28 2013                        Page 2
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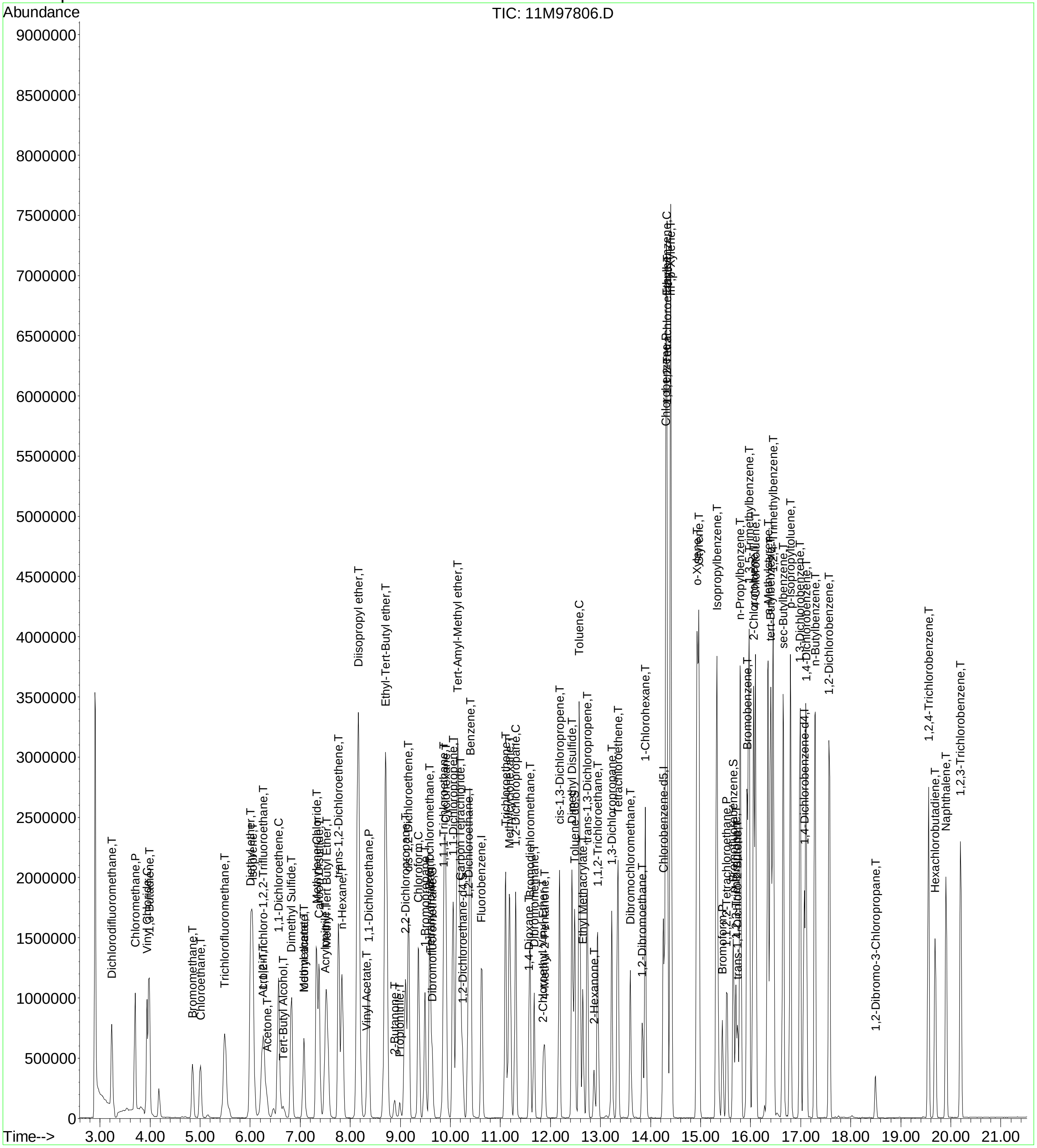
                         Quantitation Report    (Not Reviewed)

  Data File : C:\MSDchem\1\data\122313\11M97806.D         Vial: 2
  Acq On    : 23 Dec 2013  15:55                      Operator: FJB
  Sample    : WG457422-02 50ug/L CCV 8260             Inst    : hpms11
  Misc      : 1,1 STD61850                            Multiplr: 1.00
  MS Integration Params: rteint.p
  Quant Time: Dec 23 16:17 2013            Quant Results File: 8260_WT.RES

  Method       : C:\MSDCHEM\1\METHODS\8260_WT.M (RTE Integrator)
  Title        : 8260B/624 (SOP: OVL MSV01) Water 11/05/13 HPMS11
  Last Update  : Mon Dec 16 17:06:06 2013
  Response via : Initial Calibration
```



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11M97806.D  8260_WT.M       Mon Dec 23 16:17:29 2013                      Page 3
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Continuing Calibration Area and RT check

Instrument: hpms11
Initial cal date: 5 Nov 2013 20:05
CCV date: 23 Dec 2013 15:55
CCV Filename: 11M97806.D

	Fluorobenzene		Chlorobenzene-d5		1,4-Dichlorobenzene-d4	
	Amount	RT	Amount	RT	Amount	RT
InitCal	886698	10.63	702242	14.26	381974	17.07
CCV	1425098	10.62	1071573	14.26	564119	17.07

```
                     Evaluate Continuing Calibration Report

     Data File : C:\MSDCHEM\1\DATA\122313\11M97806.D         Vial: 2
     Acq On    : 23 Dec 2013  15:55                       Operator: FJB
     Sample    : WG457422-02 50ug/L CCV 8260              Inst    : hpms11
     Misc      : 1,1 STD61850                             Multiplr: 1.00
     MS Integration Params: rteint.p

     Method       : C:\MSDCHEM\1\METHODS\8260_WT.M (RTE Integrator)
     Title        : 8260B/624 (SOP: OVL MSV01) Water 11/05/13 HPMS11
     Last Update  : Mon Dec 16 17:06:06 2013
     Response via : Multiple Level Calibration

     Min. RRF     :   0.000  Min. Rel. Area :  50%  Max. R.T. Dev  0.50min
     Max. RRF Dev :  25%     Max. Rel. Area : 150%

          Compound                      AvgRF   CCRF       %Dev Area% Dev(min)
    ------------------------------------------------------------------------
   1 I    Fluorobenzene                 1.0000   1.0000       0.0  161# -0.01
   2 T    Dichlorodifluoromethane       0.2466   0.2668      -8.2  161#  0.00
   3 P    Chloromethane                 0.3481   0.4128     -18.6  201#  0.00
   4 C    Vinyl Chloride                0.3298   0.3878     -17.6  178#  0.00
   5 T    1,3-Butadiene                 0.2061   0.2583     -25.3# 198#  0.00
   6 T    Bromomethane                  0.1415   0.1440      -1.8  186#  0.00
   7 T    Chloroethane                  0.1919   0.2136     -11.3  175#  0.00
   8 T    Trichlorofluoromethane        0.4592   0.4599      -0.1  157#  0.00
   9 T    Diethyl ether                 0.1927   0.2233     -15.9  183#  0.00
  10 T    Isoprene                      0.3779   0.3664       3.0  159#  0.00
  11 T    Acrolein                      0.0037   0.0046     -25.4# 178#  0.00
  12 T    1,1,2-Trichloro-1,2,2-Trifl   0.2680   0.2559       4.5  152# -0.01
  13 T    Acetone                       0.0581   0.0739     -27.3# 223#  0.00
  14 C    1,1-Dichloroethene            0.4537   0.4854      -7.0  168#  0.00
  15 T    Tert-Butyl Alcohol            0.0180   0.0180       0.3  151# -0.01
  16 T    Dimethyl Sulfide              0.2574   0.2673      -3.8  168#  0.00
  17 T    Iodomethane                   0.1709   0.2639     -54.4# 216#  0.00
  18 T    Methyl acetate                0.1683   0.1532       8.9  156# -0.01
  19 T    Methylene Chloride            0.2901   0.2850       1.8  169#  0.00
  20 T    Carbon Disulfide              0.8258   0.8344      -1.0  163# -0.01
  21 T    Acrylonitrile                 0.0709   0.0885     -24.9  191#  0.00
  22 T    Methyl Tert Butyl Ether       0.6767   0.7054      -4.2  163#  0.00
  23 T    trans-1,2-Dichloroethene      0.2865   0.2782       2.9  157#  0.00
  24 T    n-Hexane                      0.3543   0.3510       0.9  162#  0.00
  25 T    Diisopropyl ether             0.9066   1.0327     -13.9  181#  0.00
  26 T    Vinyl Acetate                 0.3403   0.1055      69.0#  46#  0.00
  27 P    1,1-Dichloroethane            0.5205   0.5516      -6.0  168#  0.00
  28 T    Ethyl-Tert-Butyl ether        0.8335   0.9038      -8.4  170#  0.00
  29 T    2-Butanone                    0.0844   0.0891      -5.5  175# -0.01
  30 T    Propionitrile                 0.0235   0.0280     -19.0  179#  0.00
  31 T    2,2-Dichloropropane           0.4971   0.4385      11.8  143  -0.01
  32 T    cis-1,2-Dichloroethene        0.3057   0.3070      -0.4  161# -0.01
  33 C    Chloroform                    0.5227   0.5217       0.2  163# -0.01
  34 T    1-Bromopropane                0.0546   0.0527       3.3  158# -0.01
  35 T    Bromochloromethane            0.1704   0.1814      -6.5  164#  0.00
  36 T    Tetrahydrofuran               0.0501   0.0596     -19.0  181#  0.00
  37 S    Dibromofluoromethane          0.3024   0.2845       5.9  163#  0.00
  38 T    1,1,1-Trichloroethane         0.4706   0.4717      -0.2  158# -0.01
  39 T    Cyclohexane                   0.4925   0.4910       0.3  169#  0.00
  40 T    1,1-Dichloropropene           0.3956   0.4037      -2.1  160# -0.01
  41 T    Carbon Tetrachloride          0.4328   0.4236       2.1  152#  0.00
  42 T    Tert-Amyl-Methyl ether        0.6866   0.7133      -3.9  163# -0.01
  43 S    1,2-Dichloroethane-d4         0.3415   0.3210       6.0  164#  0.00
  44 T    1,2-Dichloroethane            0.3779   0.4140      -9.6  171#  0.00
  45 T    Benzene                       1.0910   1.0701       1.9  160#  0.00
  46 T    Trichloroethene               0.2995   0.2904       3.0  156#  0.00
  47 T    Methylcyclohexane             0.4144   0.4017       3.1  159# -0.01
  48 C    1,2-Dichloropropane           0.2838   0.3055      -7.7  171# -0.01
  49 T    1,4-Dioxane                   0.0019   0.0022     -19.9  180#  0.00
  50 T    Bromodichloromethane          0.3943   0.4031      -2.2  161#  0.00
  51 T    Dibromomethane                0.1552   0.1641      -5.7  165#  0.00
  52 T    2-Chloroethyl Vinyl Ether     0.1319   0.0580      56.0#  68  -0.01
  53 T    4-Methyl-2-Pentanone          0.0687   0.0691      -0.5  151# -0.01
  54 T    cis-1,3-Dichloropropene       0.4526   0.4667      -3.1  161#  0.00
  ----------------------------------------------------------------------------
   (#) = Out of Range
   11M97806.D  8260_WT.M      Mon Dec 23 16:17:50 2013                          Page 1
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                     Evaluate Continuing Calibration Report

   Data File : C:\MSDCHEM\1\DATA\122313\11M97806.D          Vial: 2
   Acq On    : 23 Dec 2013  15:55                       Operator: FJB
   Sample    : WG457422-02 50ug/L CCV 8260              Inst    : hpms11
   Misc      : 1,1 STD61850                             Multiplr: 1.00
   MS Integration Params: rteint.p

   Method       : C:\MSDCHEM\1\METHODS\8260_WT.M (RTE Integrator)
   Title        : 8260B/624 (SOP: OVL MSV01) Water 11/05/13 HPMS11
   Last Update  : Mon Dec 16 17:06:06 2013
   Response via : Multiple Level Calibration

   Min. RRF     :   0.000  Min. Rel. Area :  50%  Max. R.T. Dev  0.50min
   Max. RRF Dev :  25%     Max. Rel. Area : 150%

        Compound                        AvgRF   CCRF       %Dev Area% Dev(min)
  ----------------------------------------------------------------------------
 55 T    Dimethyl Disulfide             0.2488   0.2565      -3.1  165# -0.01
 56 I    Chlorobenzene-d5               1.0000   1.0000       0.0  153#  0.00
 57 S    Toluene-d8                     1.2555   1.3474      -7.3  168#  0.00
 58 C    Toluene                        1.3907   1.4406      -3.6  154# -0.01
 59 T    Ethyl Methacrylate             0.3426   0.3086       9.9  133  -0.01
 60 T    trans-1,3-Dichloropropene      0.5009   0.5508     -10.0  159#  0.00
 61 T    1,1,2-Trichloroethane          0.2523   0.2784     -10.4  161#  0.00
 62 T    2-Hexanone                     0.1585   0.1703      -7.5  153#  0.00
 63 T    1,3-Dichloropropane            0.4610   0.5105     -10.7  165# -0.01
 64 T    Tetrachloroethene              0.2937   0.2777       5.5  146   0.00
 65 T    Dibromochloromethane           0.3381   0.3610      -6.8  156#  0.00
 66 T    1,2-Dibromoethane              0.2577   0.2875     -11.6  163# -0.01
 67 T    1-Chlorohexane                 0.4694   0.4773      -1.7  155# -0.01
 68 P    Chlorobenzene                  0.9806   1.0068      -2.7  156# -0.01
 69 T    1,1,1,2-Tetrachloroethane      0.3657   0.3811      -4.2  158#  0.00
 70 C    Ethylbenzene                   0.5430   0.5524      -1.7  154# -0.01
 71 T    m-,p-Xylene                    0.6296   0.6457      -2.6  151#  0.00
 72 T    o-Xylene                       0.6434   0.6456      -0.3  153# -0.01
 73 T    Styrene                        1.0243   1.0589      -3.4  151# -0.01
 74 P    Bromoform                      0.1971   0.2089      -6.0  151#  0.00
 75 T    Isopropylbenzene               1.4844   1.5467      -4.2  152#  0.00

 76 I    1,4-Dichlorobenzene-d4         1.0000   1.0000       0.0  148   0.00
 77 P    1,1,2,2-Tetrachloroethane      0.5598   0.6052      -8.1  152# -0.01
 78 S    p-Bromofluorobenzene           1.0040   1.1239     -11.9  178#  0.00
 79 T    1,2,3-Trichloropropane         0.1665   0.1777      -6.7  155#  0.00
 80 T    trans-1,4-Dichloro-2-Butene    0.1803   0.1777       1.5  135   0.00
 81 T    n-Propylbenzene                3.4087   3.4771      -2.0  150# -0.01
 82 T    Bromobenzene                   0.7517   0.7602      -1.1  153#  0.00
 83 T    1,3,5-Trimethylbenzene         2.4115   2.5198      -4.5  153#  0.00
 84 T    2-Chlorotoluene                2.2261   2.4274      -9.0  168#  0.00
 85 T    4-Chlorotoluene                2.2770   2.0338      10.7  137   0.00
 86 T    a-Methylstyrene                1.2900   1.3399      -3.9  149   0.00
 87 T    tert-Butylbenzene              0.5109   0.5277      -3.3  154# -0.01
 88 T    1,2,4-Trimethylbenzene         2.4480   2.5813      -5.4  153#  0.00
 89 T    sec-Butylbenzene               2.7643   2.9354      -6.2  152# -0.01
 90 T    p-Isopropyltoluene             2.3623   2.4994      -5.8  151# -0.01
 91 T    1,3-Dichlorobenzene            1.4056   1.4235      -1.3  150# -0.01
 92 T    1,4-Dichlorobenzene            1.4766   1.4443       2.2  151#  0.00
 93 T    n-Butylbenzene                 2.1041   2.2507      -7.0  153#  0.00
 94 T    1,2-Dichlorobenzene            1.3224   1.3495      -2.0  152# -0.01
 95 T    1,2-Dibromo-3-Chloropropane    0.1035   0.1058      -2.3  136   0.00
 96 T    1,2,4-Trichlorobenzene         0.8940   0.8364       6.4  138  -0.01
 97 T    Hexachlorobutadiene            0.3454   0.3042      11.9  134  -0.01
 98 T    Naphthalene                    1.7286   1.6171       6.4  129  -0.01
 99 T    1,2,3-Trichlorobenzene         0.8232   0.7330      11.0  134  -0.01




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  (#) = Out of Range             SPCC's out = 0  CCC's out = 0
  11M97806.D  8260_WT.M      Mon Dec 23 16:17:51 2013                            Page 2
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                         Evaluate Continuing Calibration Report

    Data File : C:\MSDCHEM\1\DATA\122313\11M97806.D         Vial: 2
    Acq On    : 23 Dec 2013  15:55                       Operator: FJB
    Sample    : WG457422-02 50ug/L CCV 8260              Inst    : hpms11
    Misc      : 1,1 STD61850                             Multiplr: 1.00
    MS Integration Params: rteint.p

    Method       : C:\MSDCHEM\1\METHODS\8260_WT.M (RTE Integrator)
    Title        : 8260B/624 (SOP: OVL MSV01) Water 11/05/13 HPMS11
    Last Update  : Mon Dec 16 17:06:06 2013
    Response via : Multiple Level Calibration

    Min. RRF     :   0.000  Min. Rel. Area :  50%  Max. R.T. Dev  0.50min
    Max. RRF Dev :  25%     Max. Rel. Area : 150%

         Compound                       Amount  Calc.      %Dev Area% Dev(min)
   ----------------------------------------------------------------------------
  1 I    Fluorobenzene                 25.0000  25.0000      0.0  161  -0.01
  2 T    Dichlorodifluoromethane       50.0000  54.0889     -8.2  161   0.00
  3 P    Chloromethane                 50.0000  59.3007    -18.6  201   0.00
  4 C    Vinyl Chloride                50.0000  58.7876    -17.6  178   0.00
  5 T    1,3-Butadiene                 50.0000  69.0096    -38.0# 198   0.00
  6 T    Bromomethane                  50.0000  50.8762     -1.8  186   0.00
  7 T    Chloroethane                  50.0000  55.6536    -11.3  175   0.00
  8 T    Trichlorofluoromethane        50.0000  50.0693     -0.1  157   0.00
  9 T    Diethyl ether                100.0000 115.9097    -15.9  183   0.00
 10 T    Isoprene                      50.0000  48.4795      3.0  159   0.00
 11 T    Acrolein                      50.0000  59.8611    -19.7  178   0.00
 12 T    1,1,2-Trichloro-1,2,2-Trifl   50.0000  47.7415      4.5  152  -0.01
 13 T    Acetone                       50.0000  63.6584    -27.3# 223   0.00
 14 C    1,1-Dichloroethene            50.0000  53.4954     -7.0  168   0.00
 15 T    Tert-Butyl Alcohol           200.0000 199.4418      0.3  151  -0.01
 16 T    Dimethyl Sulfide              50.0000  51.9180     -3.8  168   0.00
 17 T    Iodomethane                   50.0000  62.7032    -25.4# 216   0.00
 18 T    Methyl acetate                50.0000  45.5298      8.9  156  -0.01
 19 T    Methylene Chloride            50.0000  49.1172      1.8  169   0.00
 20 T    Carbon Disulfide              50.0000  50.5184     -1.0  163  -0.01
 21 T    Acrylonitrile                 50.0000  62.4559    -24.9  191   0.00
 22 T    Methyl Tert Butyl Ether       50.0000  52.1177     -4.2  163   0.00
 23 T    trans-1,2-Dichloroethene      50.0000  48.5532      2.9  157   0.00
 24 T    n-Hexane                      50.0000  49.5342      0.9  162   0.00
 25 T    Diisopropyl ether            100.0000 113.9117    -13.9  181   0.00
 26 T    Vinyl Acetate                 50.0000  15.5044     69.0#  46   0.00
 27 P    1,1-Dichloroethane            50.0000  52.9865     -6.0  168   0.00
 28 T    Ethyl-Tert-Butyl ether       100.0000 108.4292     -8.4  170   0.00
 29 T    2-Butanone                    50.0000  52.7772     -5.6  175  -0.01
 30 T    Propionitrile                100.0000 119.0173    -19.0  179  -0.01
 31 T    2,2-Dichloropropane           50.0000  44.1082     11.8  143  -0.01
 32 T    cis-1,2-Dichloroethene        50.0000  50.2245     -0.4  161  -0.01
 33 C    Chloroform                    50.0000  49.9045      0.2  163  -0.01
 34 T    1-Bromopropane                50.0000  48.3489      3.3  158  -0.01
 35 T    Bromochloromethane            50.0000  53.2424     -6.5  164   0.00
 36 T    Tetrahydrofuran              100.0000 118.9506    -19.0  181   0.00
 37 S    Dibromofluoromethane          25.0000  23.5184      5.9  163   0.00
 38 T    1,1,1-Trichloroethane         50.0000  50.1202     -0.2  158  -0.01
 39 T    Cyclohexane                   50.0000  49.8486      0.3  169   0.00
 40 T    1,1-Dichloropropene           50.0000  51.0251     -2.1  160  -0.01
 41 T    Carbon Tetrachloride          50.0000  48.9414      2.1  152   0.00
 42 T    Tert-Amyl-Methyl ether       100.0000 103.8885     -3.9  163  -0.01
 43 S    1,2-Dichloroethane-d4         25.0000  23.4953      6.0  164   0.00
 44 T    1,2-Dichloroethane            50.0000  54.7758     -9.6  171   0.00
 45 T    Benzene                       50.0000  49.0460      1.9  160   0.00
 46 T    Trichloroethene               50.0000  48.4866      3.0  156   0.00
 47 T    Methylcyclohexane             50.0000  48.4680      3.1  159  -0.01
 48 C    1,2-Dichloropropane           50.0000  53.8278     -7.7  171  -0.01
 49 T    1,4-Dioxane                  200.0000 240.8582    -20.4  180   0.00
 50 T    Bromodichloromethane          50.0000  51.1156     -2.2  161   0.00
 51 T    Dibromomethane                50.0000  52.8521     -5.7  165   0.00
 52 T    2-Chloroethyl Vinyl Ether     50.0000  21.9855     56.0#  68  -0.01
 53 T    4-Methyl-2-Pentanone          50.0000  50.2268     -0.5  151  -0.01
 54 T    cis-1,3-Dichloropropene       50.0000  51.5577     -3.1  161   0.00
 --------------------------------------------------------------------------
  (#) = Out of Range
  11M97806.D  8260_WT.M      Mon Dec 23 16:17:53 2013                          Page 1
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                          Evaluate Continuing Calibration Report

   Data File : C:\MSDCHEM\1\DATA\122313\11M97806.D         Vial: 2
   Acq On    : 23 Dec 2013  15:55                      Operator: FJB
   Sample    : WG457422-02 50ug/L CCV 8260             Inst    : hpms11
   Misc      : 1,1 STD61850                            Multiplr: 1.00
   MS Integration Params: rteint.p

   Method       : C:\MSDCHEM\1\METHODS\8260_WT.M (RTE Integrator)
   Title        : 8260B/624 (SOP: OVL MSV01) Water 11/05/13 HPMS11
   Last Update  : Mon Dec 16 17:06:06 2013
   Response via : Multiple Level Calibration

   Min. RRF     :   0.000  Min. Rel. Area :  50%  Max. R.T. Dev  0.50min
   Max. RRF Dev :  25%     Max. Rel. Area : 150%

        Compound                       Amount  Calc.      %Dev Area% Dev(min)
  ----------------------------------------------------------------------------
 55 T    Dimethyl Disulfide            50.0000  51.5329      -3.1  165  -0.01
 56 I    Chlorobenzene-d5              25.0000  25.0000       0.0  153   0.00
 57 S    Toluene-d8                    25.0000  26.8286      -7.3  168   0.00
 58 C    Toluene                       50.0000  51.7925      -3.6  154  -0.01
 59 T    Ethyl Methacrylate            50.0000  45.0501       9.9  133  -0.01
 60 T    trans-1,3-Dichloropropene     50.0000  54.9817     -10.0  159   0.00
 61 T    1,1,2-Trichloroethane         50.0000  55.1812     -10.4  161   0.00
 62 T    2-Hexanone                    50.0000  53.7248      -7.4  153   0.00
 63 T    1,3-Dichloropropane           50.0000  55.3626     -10.7  165  -0.01
 64 T    Tetrachloroethene             50.0000  47.2666       5.5  146   0.00
 65 T    Dibromochloromethane          50.0000  53.3882      -6.8  156   0.00
 66 T    1,2-Dibromoethane             50.0000  55.7866     -11.6  163  -0.01
 67 T    1-Chlorohexane                50.0000  50.8330      -1.7  155  -0.01
 68 P    Chlorobenzene                 50.0000  51.3363      -2.7  156  -0.01
 69 T    1,1,1,2-Tetrachloroethane     50.0000  52.1055      -4.2  158   0.00
 70 C    Ethylbenzene                  50.0000  50.8662      -1.7  154  -0.01
 71 T    m-,p-Xylene                  100.0000 102.5521      -2.6  151   0.00
 72 T    o-Xylene                      50.0000  50.1717      -0.3  153  -0.01
 73 T    Styrene                       50.0000  51.6858      -3.4  151  -0.01
 74 P    Bromoform                     50.0000  53.0034      -6.0  151   0.00
 75 T    Isopropylbenzene              50.0000  52.0997      -4.2  152   0.00

 76 I    1,4-Dichlorobenzene-d4        25.0000  25.0000       0.0  148   0.00
 77 P    1,1,2,2-Tetrachloroethane     50.0000  54.0575      -8.1  152  -0.01
 78 S    p-Bromofluorobenzene          25.0000  27.9850     -11.9  178   0.00
 79 T    1,2,3-Trichloropropane        50.0000  53.3503      -6.7  155   0.00
 80 T    trans-1,4-Dichloro-2-Butene   50.0000  42.8444      14.3  135   0.00
 81 T    n-Propylbenzene               50.0000  51.0033      -2.0  150  -0.01
 82 T    Bromobenzene                  50.0000  50.5684      -1.1  153   0.00
 83 T    1,3,5-Trimethylbenzene        50.0000  52.2462      -4.5  153   0.00
 84 T    2-Chlorotoluene               50.0000  54.5214      -9.0  168   0.00
 85 T    4-Chlorotoluene               50.0000  44.6585      10.7  137   0.00
 86 T    a-Methylstyrene               50.0000  51.9340      -3.9  149   0.00
 87 T    tert-Butylbenzene             50.0000  51.6376      -3.3  154  -0.01
 88 T    1,2,4-Trimethylbenzene        50.0000  52.7221      -5.4  153   0.00
 89 T    sec-Butylbenzene              50.0000  53.0949      -6.2  152  -0.01
 90 T    p-Isopropyltoluene            50.0000  52.9037      -5.8  151  -0.01
 91 T    1,3-Dichlorobenzene           50.0000  50.6396      -1.3  150  -0.01
 92 T    1,4-Dichlorobenzene           50.0000  48.9044       2.2  151   0.00
 93 T    n-Butylbenzene                50.0000  53.4838      -7.0  153   0.00
 94 T    1,2-Dichlorobenzene           50.0000  51.0237      -2.0  152  -0.01
 95 T    1,2-Dibromo-3-Chloropropane   50.0000  51.1344      -2.3  136   0.00
 96 T    1,2,4-Trichlorobenzene        50.0000  46.7764       6.4  138  -0.01
 97 T    Hexachlorobutadiene           50.0000  44.0375      11.9  134  -0.01
 98 T    Naphthalene                   50.0000  46.7757       6.4  129  -0.01
 99 T    1,2,3-Trichlorobenzene        50.0000  44.5249      11.0  134  -0.01




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  (#) = Out of Range            SPCC's out = 0  CCC's out = 0
  11M97806.D  8260_WT.M      Mon Dec 23 16:17:53 2013                          Page 2
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                         Quantitation Report    (Not Reviewed)

Data Path : D:\MassHunter\GCMS\1\data\122213\
Data File : 17M001841.D
Acq On    : 22 Dec 2013  17:32
Operator  : ADC
Sample    : WG457313-02 50ug/L CCV 8260
Misc      : 1,1 STD61850
ALS Vial  : 1   Sample Multiplier: 1

Quant Time: Dec 22 17:54:14 2013
Quant Method : D:\MassHunter\GCMS\1\methods\8260WTR.M
Quant Title  : 8260B/624 SOP:OVL MSV01 WATER 11/15/13 HPMS17
QLast Update : Sat Nov 16 17:30:32 2013
Response via : Initial Calibration

        Compound                   R.T. QIon  Response  Conc Units Dev(Min)
 --------------------------------------------------------------------------
 Internal Standards
   1) Fluorobenzene               10.192   96   622457    25.00000 ug/L     0.0000
  56) Chlorobenzene-d5            13.996  117   453600    25.00000 ug/L     0.0000
  76) 1,4-Dichlorobenzene-d4      16.971  152   232251    25.00000 ug/L     0.0000

 System Monitoring Compounds
  37) Dibromofluoromethane         9.145  111   200744    25.8973 ug/L    0.0000
   Spiked Amount     25.000   Range  86 - 118    Recovery   =  103.589%
  43) 1,2-Dichloroethane-d4        9.788   65   184393    24.1380 ug/L    0.0000
   Spiked Amount     25.000   Range  80 - 120    Recovery   =   96.552%
  57) Toluene-d8                  12.141   98   662672    23.9443 ug/L    0.0000
   Spiked Amount     25.000   Range  88 - 110    Recovery   =   95.777%
  78) p-Bromofluorobenzene        15.478   95   229501    20.3828 ug/L    0.0000
   Spiked Amount     25.000   Range  86 - 115    Recovery   =   81.531%#

 Target Compounds                                                   Qvalue
   2) Dichlorodifluoromethane      2.563   85   287867    49.8536 ug/L     100
   3) Chloromethane                2.967   50   520551    54.7071 ug/L      99
   4) Vinyl Chloride               3.185   62   523175    55.9783 ug/L      99
   5) 1,3-Butadiene                3.226   54   257162    58.4320 ug/L      98
   6) Bromomethane                 4.035   94   244381    44.8065 ug/L     100
   7) Chloroethane                 4.211   64   249207    53.2307 ug/L      99
   8) Trichlorofluoromethane       4.719  101   564818    53.7101 ug/L     100
   9) Diethyl ether                5.310   59   502253   107.8021 ug/L      98
  10) Isoprene                     5.320   67   470577    48.6447 ug/L      99
  11) Acrolein                     5.538   56     4512    27.9457 ug/L      99
  12) 1,1,2-Trichloro-1,2,2-...    5.559  101   353391    55.4253 ug/L     100
  13) Acetone                      5.652   43    58628    47.0378 ug/L     100
  14) 1,1-Dichloroethene           5.859   61   536743    54.9882 ug/L      99
  15) Tert-Butyl Alcohol           6.015   59    90506   212.8353 ug/L      95
  16) Dimethyl Sulfide             6.129   62   311699    48.7123 ug/L     100
  17) Iodomethane                  6.367  142   393202    44.0289 ug/L      98
  18) Methyl acetate               6.450   43   175827    53.4564 ug/L     100
  19) Methylene Chloride           6.678   84   386391    53.0054 ug/L      99
  20) Carbon Disulfide             6.657   76  1073011    50.6004 ug/L     100
  21) Acrylonitrile                6.896   53    88352    55.5894 ug/L      98
  22) Methyl Tert Butyl Ether      6.927   73   869588    52.7196 ug/L     100
  23) trans-1,2-Dichloroethene     7.144   96   371771    54.3822 ug/L      99
  24) n-Hexane                     7.248   57   421798    58.1011 ug/L     100
  25) Diisopropyl ether            7.632   45  2133729   108.7955 ug/L      98
  26) Vinyl Acetate                7.797   43   418077    51.0275 ug/L      99
  27) 1,1-Dichloroethane           7.787   63   667151    54.1024 ug/L     100
  28) Ethyl-Tert-Butyl ether       8.212   59  2143700   107.2463 ug/L      99
  29) 2-Butanone                   8.388   43    90385    48.2490 ug/L     100
  30) Propionitrile                8.492   54    60335   109.9683 ug/L      97
  31) 2,2-Dichloropropane          8.585   77   569164    52.5875 ug/L      95
  32) cis-1,2-Dichloroethene       8.647   96   423441    53.3981 ug/L      99
  33) Chloroform                   8.855   83   691664    53.7266 ug/L     100
  34) 1-Bromopropane               8.989  122    76480    49.2268 ug/L     100
  35) Bromochloromethane           9.083  130   262522    52.7066 ug/L      99
  36) Tetrahydrofuran              9.114   42   119275   107.2093 ug/L      98
  38) 1,1,1-Trichloroethane        9.383   97   623703    52.8224 ug/L      99
  39) Cyclohexane                  9.404   56   564560    51.7802 ug/L      98
  40) 1,1-Dichloropropene          9.580   75   505387    56.4821 ug/L      98
  41) Tert-Amyl-Methyl ether       9.715   73  1954186   106.8772 ug/L      99
  42) Carbon Tetrachloride         9.715  117   593836    54.7640 ug/L     100
  44) 1,2-Dichloroethane           9.902   62   475374    53.2357 ug/L     100
  45) Benzene                      9.933   78  1448221    53.3845 ug/L      99
  46) Trichloroethene             10.689  130   426996    51.8974 ug/L      98
  47) Methylcyclohexane           10.762   83   604321    53.3077 ug/L     100
```

```
                           Quantitation Report    (Not Reviewed)

Data Path : D:\MassHunter\GCMS\1\data\122213\
Data File : 17M001841.D
Acq On    : 22 Dec 2013  17:32
Operator  : ADC
Sample    : WG457313-02 50ug/L CCV 8260
Misc      : 1,1 STD61850
ALS Vial  : 1   Sample Multiplier: 1

Quant Time: Dec 22 17:54:14 2013
Quant Method : D:\MassHunter\GCMS\1\methods\8260WTR.M
Quant Title  : 8260B/624 SOP:OVL MSV01 WATER 11/15/13 HPMS17
QLast Update : Sat Nov 16 17:30:32 2013
Response via : Initial Calibration

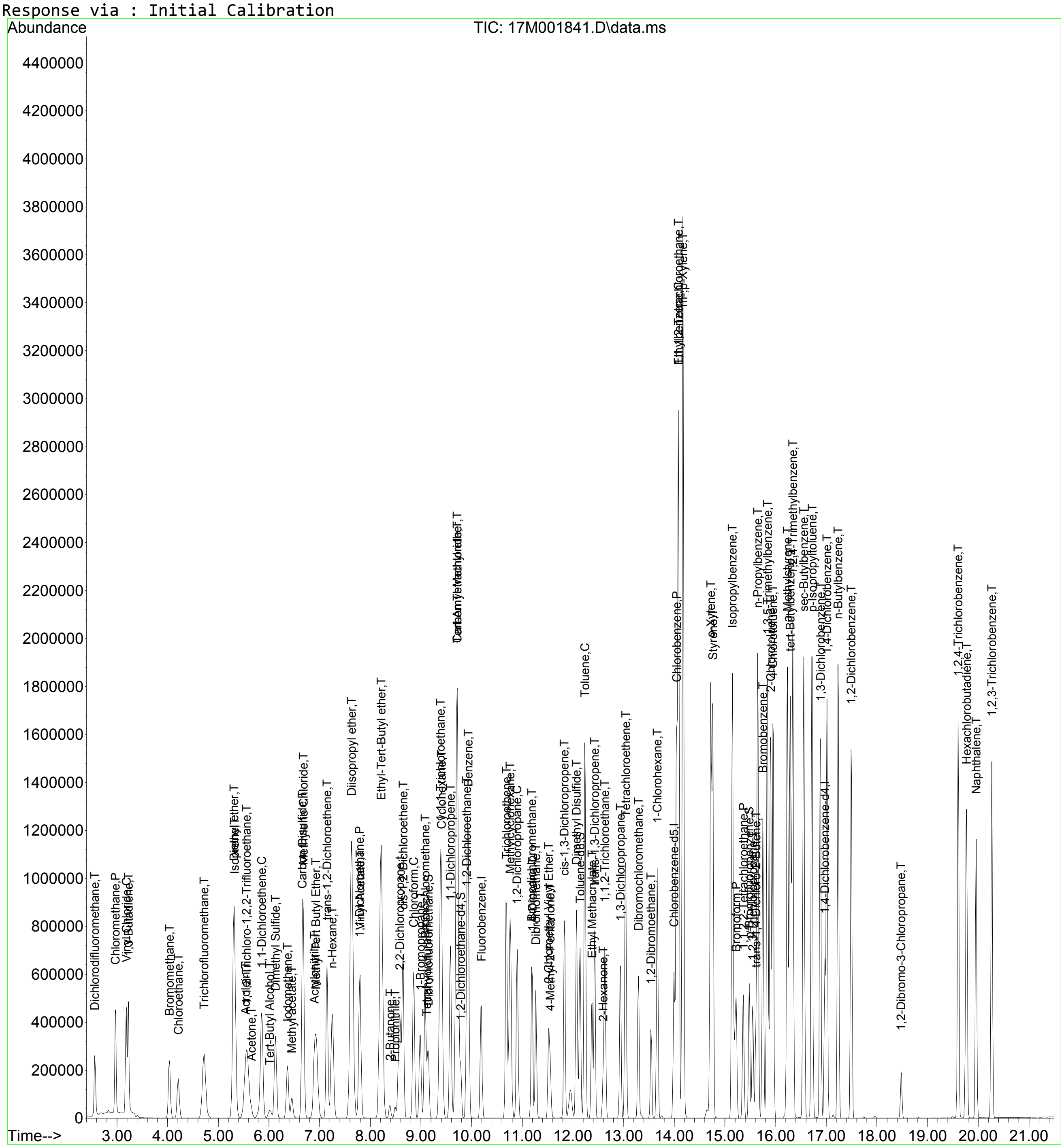
        Compound                   R.T. QIon  Response  Conc Units Dev(Min)
 --------------------------------------------------------------------------
  48) 1,2-Dichloropropane        10.897   63   368890    53.7427 ug/L      98
  49) 1,4-Dioxane                11.197   88    12082   238.7417 ug/L      98
  50) Bromodichloromethane       11.187   83   534037    54.1943 ug/L     100
  51) Dibromomethane             11.270   93   222362    52.5554 ug/L     100
  52) 2-Chloroethyl Vinyl Ether  11.519   63   188941    74.6208 ug/L     100
  53) 4-Methyl-2-Pentanone       11.550   58    89678    51.2371 ug/L      99
  54) cis-1,3-Dichloropropene    11.830   75   603929    54.7275 ug/L     100
  55) Dimethyl Disulfide         12.068   79   352327    48.8784 ug/L     100
  58) Toluene                    12.234   91  1574564    51.3028 ug/L     100
  59) Ethyl Methacrylate         12.379   69   364381    47.4146 ug/L     100
  60) trans-1,3-Dichloropropene  12.431   75   527421    52.9951 ug/L     100
  61) 1,1,2-Trichloroethane      12.628   97   294224    51.5211 ug/L      99
  62) 2-Hexanone                 12.597   43   146143    48.7106 ug/L      99
  63) 1,3-Dichloropropane        12.939   76   500694    51.0931 ug/L      98
  64) Tetrachloroethene          13.042  166   472409    54.0618 ug/L      98
  65) Dibromochloromethane       13.291  129   405871    52.3777 ug/L     100
  66) 1,2-Dibromoethane          13.540  107   299243    50.2120 ug/L      99
  67) 1-Chlorohexane             13.664   91   509481    51.6559 ug/L      98
  68) Chlorobenzene              14.048  112  1090888    51.6315 ug/L      99
  69) 1,1,1,2-Tetrachloroethane  14.079  131   431360    51.1315 ug/L     100
  70) Ethylbenzene               14.079  106   599787    51.8961 ug/L     100
  71) m-,p-Xylene                14.172  106  1454250   104.6868 ug/L     100
  72) o-Xylene                   14.721  106   702754    50.8130 ug/L      99
  73) Styrene                    14.763  104  1170881    52.5815 ug/L     100
  74) Bromoform                  15.219  173   290379    48.3011 ug/L     100
  75) Isopropylbenzene           15.146  105  1790950    53.0815 ug/L     100
  77) 1,1,2,2-Tetrachloroethane  15.364   83   353510    52.5146 ug/L      99
  79) 1,2,3-Trichloropropane     15.551  110   100818    47.3895 ug/L      99
  80) trans-1,4-Dichloro-2-B...  15.613   53    87577    45.3158 ug/L      96
  81) n-Propylbenzene            15.644   91  2134404    50.9646 ug/L     100
  82) Bromobenzene               15.748  156   492174    48.9786 ug/L      95
  83) 1,3,5-Trimethylbenzene     15.841  105  1520424    48.8459 ug/L      99
  84) 2-Chlorotoluene            15.903   91  1284977    48.7999 ug/L     100
  85) 4-Chlorotoluene            15.945   91  1227857    48.9650 ug/L      99
  86) a-Methylstyrene            16.235  118   825291    43.9708 ug/L      99
  87) tert-Butylbenzene          16.287  134   332082    48.8850 ug/L     100
  88) 1,2,4-Trimethylbenzene     16.338  105  1578939    50.1677 ug/L     100
  89) sec-Butylbenzene           16.556  105  1990946    51.6894 ug/L     100
  90) p-Isopropyltoluene         16.722  119  1682544    52.6252 ug/L     100
  91) 1,3-Dichlorobenzene        16.888  146   932933    50.7675 ug/L      99
  92) 1,4-Dichlorobenzene        17.012  146   929927    52.1480 ug/L     100
  93) n-Butylbenzene             17.230   91  1486947    51.9363 ug/L     100
  94) 1,2-Dichlorobenzene        17.489  146   882270    50.5502 ug/L      99
  95) 1,2-Dibromo-3-Chloropr...  18.474   75    58985    46.6493 ug/L      99
  96) 1,2,4-Trichlorobenzene     19.604  180   708612    49.0335 ug/L      99
  97) Hexachlorobutadiene        19.769  225   397095    50.4040 ug/L      99
  98) Naphthalene                19.956  128  1176637    51.7659 ug/L     100
  99) 1,2,3-Trichlorobenzene     20.267  180   643743    48.4503 ug/L     100
 --------------------------------------------------------------------------

 (#) = qualifier out of range (m) = manual integration (+) = signals summed
```

Quantitation Report (Not Reviewed)

```
Data Path : D:\MassHunter\GCMS\1\data\122213\
Data File : 17M001841.D
Acq On    : 22 Dec 2013  17:32
Operator  : ADC
Sample    : WG457313-02 50ug/L CCV 8260
Misc      : 1,1 STD61850
ALS Vial  : 1   Sample Multiplier: 1

Quant Time: Dec 22 17:54:14 2013
Quant Method : D:\MassHunter\GCMS\1\methods\8260WTR.M
Quant Title  : 8260B/624 SOP:OVL MSV01 WATER 11/15/13 HPMS17
QLast Update : Sat Nov 16 17:30:32 2013
Response via : Initial Calibration
```



```
                         Evaluate Continuing Calibration Report

  Data Path : D:\MassHunter\GCMS\1\data\122213\
  Data File : 17M001841.D
  Acq On    : 22 Dec 2013  17:32
  Operator  : ADC
  Sample    : WG457313-02 50ug/L CCV 8260
  Misc      : 1,1 STD61850
  ALS Vial  : 1   Sample Multiplier: 1

  Quant Time: Dec 22 17:54:14 2013
  Quant Method : D:\MassHunter\GCMS\1\methods\8260WTR.M
  Quant Title  : 8260B/624 SOP:OVL MSV01 WATER 11/15/13 HPMS17
  QLast Update : Sat Nov 16 17:30:32 2013
  Response via : Initial Calibration


  Min. RRF     :   0.000  Min. Rel. Area :   50%  Max. R.T. Dev  0.500min
  Max. RRF Dev :  20%     Max. Rel. Area :  150%

         Compound                       AvgRF   CCRF      %Dev Area% Dev(min)
  -------------------------------------------------------------------------
   1 I    Fluorobenzene                 1.000   1.000       0.0   68   0.000
   2 T    Dichlorodifluoromethane       0.232   0.231       0.4   65   0.000
   3 P    Chloromethane                 0.382   0.418      -9.4   76  -0.011
   4 C    Vinyl Chloride                0.375   0.420     -12.0#  74   0.000
   5 T    1,3-Butadiene                 0.177   0.207     -16.9   82   0.000
   6 T    Bromomethane                  0.219   0.196      10.5   62  -0.010
   7 T    Chloroethane                  0.188   0.200      -6.4   73   0.000
   8 T    Trichlorofluoromethane        0.422   0.454      -7.6   71   0.000
   9 T    Diethyl ether                 0.187   0.202      -8.0   76   0.000
  10 T    Isoprene                      0.389   0.378       2.8   67   0.000
  11 T    Acrolein                      0.006   0.004      33.3#  39# -0.010
  12 T    1,1,2-Trichloro-1,2,2-Trifl   0.256   0.284     -10.9   76  -0.010
  13 T    Acetone                       0.050   0.047       6.0   71  -0.010
  14 C    1,1-Dichloroethene            0.392   0.431      -9.9#  74   0.000
  15 T    Tert-Butyl Alcohol            0.017   0.018      -5.9   77  -0.010
  16 T    Dimethyl Sulfide              0.257   0.250       2.7   67  -0.010
  17 T    Iodomethane                   0.359   0.316      12.0   59   0.000
  18 T    Methyl acetate                0.132   0.141      -6.8   77   0.000
  19 T    Methylene Chloride            0.293   0.310      -5.8   74   0.000
  20 T    Carbon Disulfide              0.852   0.862      -1.2   69  -0.011
  21 T    Acrylonitrile                 0.064   0.071     -10.9   75   0.000
  22 T    Methyl Tert Butyl Ether       0.662   0.699      -5.6   73   0.000
  23 T    trans-1,2-Dichloroethene      0.275   0.299      -8.7   74   0.000
  24 T    n-Hexane                      0.292   0.339     -16.1   78   0.000
  25 T    Diisopropyl ether             0.788   0.857      -8.8   77   0.000
  26 T    Vinyl Acetate                 0.329   0.336      -2.1   71   0.000
  27 P    1,1-Dichloroethane            0.495   0.536      -8.3   74   0.000
  28 T    Ethyl-Tert-Butyl ether        0.803   0.861      -7.2   76   0.000
  29 T    2-Butanone                    0.075   0.073       2.7   71   0.000
  30 T    Propionitrile                 0.022   0.024      -9.1   76   0.000
  31 t    2,2-Dichloropropane           0.435   0.457      -5.1   74   0.000
  32 T    cis-1,2-Dichloroethene        0.318   0.340      -6.9   74   0.000
  33 C    Chloroform                    0.517   0.556      -7.5#  73   0.000
  34 T    1-Bromopropane                0.062   0.061       1.6   66   0.000
  35 T    Bromochloromethane            0.200   0.211      -5.5   71   0.000
  36 T    Tetrahydrofuran               0.045   0.048      -6.7   76   0.000
  37 S    Dibromofluoromethane          0.311   0.323      -3.9   72   0.000
  38 T    1,1,1-Trichloroethane         0.474   0.501      -5.7   72   0.000
  39 T    Cyclohexane                   0.438   0.453      -3.4   72   0.000
  40 T    1,1-Dichloropropene           0.359   0.406     -13.1   75   0.000
  41 T    Tert-Amyl-Methyl ether        0.734   0.785      -6.9   75   0.000
  42 T    Carbon Tetrachloride          0.436   0.477      -9.4   72   0.000
  43 S    1,2-Dichloroethane-d4         0.307   0.296       3.6   69   0.000
  44 T    1,2-Dichloroethane            0.359   0.382      -6.4   72  -0.010
  45 T    Benzene                       1.090   1.163      -6.7   74   0.000
  46 T    Trichloroethene               0.330   0.343      -3.9   71   0.000
  47 T    Methylcyclohexane             0.455   0.485      -6.6   73   0.000
  48 C    1,2-Dichloropropane           0.276   0.296      -7.2#  74   0.000
  49 T    1,4-Dioxane                   0.002   0.002       0.0   83   0.000
  50 T    Bromodichloromethane          0.396   0.429      -8.3   72  -0.010
  51 T    Dibromomethane                0.170   0.179      -5.3   71   0.000
  52 T    2-Chloroethyl Vinyl Ether     0.102   0.152     -49.0#  99   0.000
  53 T    4-Methyl-2-Pentanone          0.070   0.072      -2.9   71   0.000
  54 T    cis-1,3-Dichloropropene       0.443   0.485      -9.5   73  -0.010
  55 T    Dimethyl Disulfide            0.290   0.283       2.4   69  -0.010
```

```
                           Evaluate Continuing Calibration Report

    Data Path : D:\MassHunter\GCMS\1\data\122213\
    Data File : 17M001841.D
    Acq On    : 22 Dec 2013  17:32
    Operator  : ADC
    Sample    : WG457313-02 50ug/L CCV 8260
    Misc      : 1,1 STD61850
    ALS Vial  : 1   Sample Multiplier: 1

    Quant Time: Dec 22 17:54:14 2013
    Quant Method : D:\MassHunter\GCMS\1\methods\8260WTR.M
    Quant Title  : 8260B/624 SOP:OVL MSV01 WATER 11/15/13 HPMS17
    QLast Update : Sat Nov 16 17:30:32 2013
    Response via : Initial Calibration


    Min. RRF     :   0.000  Min. Rel. Area :   50%  Max. R.T. Dev  0.500min
    Max. RRF Dev :  20%     Max. Rel. Area :  150%

           Compound                     AvgRF   CCRF      %Dev Area% Dev(min)
    -----------------------------------------------------------------------
   56 I    Chlorobenzene-d5             1.000   1.000       0.0   73   0.000
   57 S    Toluene-d8                   1.525   1.461       4.2   72   0.000
   58 C    Toluene                      1.692   1.736      -2.6#  74   0.000
   59 T    Ethyl Methacrylate           0.424   0.402       5.2   67   0.000
   60 T    trans-1,3-Dichloropropene    0.549   0.581      -5.8   73   0.000
   61 T    1,1,2-Trichloroethane        0.315   0.324      -2.9   72  -0.010
   62 T    2-Hexanone                   0.165   0.161       2.4   71   0.000
   63 T    1,3-Dichloropropane          0.540   0.552      -2.2   73   0.000
   64 T    Tetrachloroethene            0.482   0.521      -8.1   76   0.000
   65 T    Dibromochloromethane         0.427   0.447      -4.7   72   0.000
   66 T    1,2-Dibromoethane            0.328   0.330      -0.6   70   0.000
   67 T    1-Chlorohexane               0.544   0.562      -3.3   72   0.000
   68 P    Chlorobenzene                1.164   1.202      -3.3   73   0.000
   69 T    1,1,1,2-Tetrachloroethane    0.465   0.475      -2.2   72   0.000
   70 C    Ethylbenzene                 0.637   0.661      -3.8#  74  -0.010
   71 T    m-,p-Xylene                  0.766   0.802      -4.7   74   0.000
   72 T    o-Xylene                     0.762   0.775      -1.7   73   0.000
   73 T    Styrene                      1.227   1.291      -5.2   73   0.000
   74 P    Bromoform                    0.302   0.320      -6.0   73   0.000
   75 T    Isopropylbenzene             1.860   1.974      -6.1   74   0.000

   76 I    1,4-Dichlorobenzene-d4       1.000   1.000       0.0   80   0.000
   77 P    1,1,2,2-Tetrachloroethane    0.725   0.761      -5.0   76   0.000
   78 S    p-Bromofluorobenzene         1.212   0.988      18.5   65   0.000
   79 T    1,2,3-Trichloropropane       0.229   0.217       5.2   71   0.000
   80 T    trans-1,4-Dichloro-2-Butene  0.208   0.189       9.1   68   0.000
   81 T    n-Propylbenzene              4.508   4.595      -1.9   75   0.000
   82 T    Bromobenzene                 1.082   1.060       2.0   74   0.000
   83 T    1,3,5-Trimethylbenzene       3.351   3.273       2.3   74   0.000
   84 T    2-Chlorotoluene              2.834   2.766       2.4   75   0.000
   85 T    4-Chlorotoluene              2.699   2.643       2.1   75  -0.010
   86 T    a-Methylstyrene              2.020   1.777      12.0   69   0.000
   87 T    tert-Butylbenzene            0.731   0.715       2.2   74   0.000
   88 T    1,2,4-Trimethylbenzene       3.388   3.399      -0.3   76   0.000
   89 T    sec-Butylbenzene             4.146   4.286      -3.4   76   0.000
   90 T    p-Isopropyltoluene           3.442   3.622      -5.2   77   0.000
   91 T    1,3-Dichlorobenzene          1.978   2.008      -1.5   76   0.000
   92 T    1,4-Dichlorobenzene          1.920   2.002      -4.3   76   0.000
   93 T    n-Butylbenzene               2.850   3.201     -12.3   79  -0.010
   94 T    1,2-Dichlorobenzene          1.879   1.899      -1.1   74   0.000
   95 T    1,2-Dibromo-3-Chloropropane  0.136   0.127       6.6   70  -0.010
   96 T    1,2,4-Trichlorobenzene       1.373   1.526     -11.1   79   0.000
   97 T    Hexachlorobutadiene          0.746   0.855     -14.6   81   0.000
   98 T    Naphthalene                  2.447   2.533      -3.5   74   0.000
   99 T    1,2,3-Trichlorobenzene       1.252   1.386     -10.7   77   0.000
   ------------------------------------------------------------------------

      (#) = Out of Range               SPCC's out = 0  CCC's out = 6
```

```
                         Evaluate Continuing Calibration Report

     Data Path : D:\MassHunter\GCMS\1\data\122213\
     Data File : 17M001841.D
     Acq On    : 22 Dec 2013  17:32
     Operator  : ADC
     Sample    : WG457313-02 50ug/L CCV 8260
     Misc      : 1,1 STD61850
     ALS Vial  : 1   Sample Multiplier: 1

     Quant Time: Dec 22 17:54:14 2013
     Quant Method : D:\MassHunter\GCMS\1\methods\8260WTR.M
     Quant Title  : 8260B/624 SOP:OVL MSV01 WATER 11/15/13 HPMS17
     QLast Update : Sat Nov 16 17:30:32 2013
     Response via : Initial Calibration


     Min. RRF     :   0.000  Min. Rel. Area :   50%  Max. R.T. Dev  0.500min
     Max. RRF Dev :  20%     Max. Rel. Area :  150%

            Compound                      Amount  Calc.     %Dev Area% Dev(min)
     ------------------------------------------------------------------------
      1 I    Fluorobenzene               25.000  25.000       0.0   68   0.000
      2 T    Dichlorodifluoromethane     50.000  49.854       0.3   65   0.000
      3 P    Chloromethane               50.000  54.707      -9.4   76  -0.011
      4 C    Vinyl Chloride              50.000  55.978     -12.0#  74   0.000
      5 T    1,3-Butadiene               50.000  58.432     -16.9   82   0.000
      6 T    Bromomethane                50.000  44.806      10.4   62  -0.010
      7 T    Chloroethane                50.000  53.231      -6.5   73   0.000
      8 T    Trichlorofluoromethane      50.000  53.710      -7.4   71   0.000
      9 T    Diethyl ether              100.000 107.802      -7.8   76   0.000
     10 T    Isoprene                    50.000  48.645       2.7   67   0.000
     11 T    Acrolein                    50.000  27.946      44.1#  39  -0.010
     12 T    1,1,2-Trichloro-1,2,2-Trifl 50.000  55.425     -10.8   76  -0.010
     13 T    Acetone                     50.000  47.038       5.9   71  -0.010
     14 C    1,1-Dichloroethene          50.000  54.988     -10.0#  74   0.000
     15 T    Tert-Butyl Alcohol         200.000 212.835      -6.4   77  -0.010
     16 T    Dimethyl Sulfide            50.000  48.712       2.6   67  -0.010
     17 T    Iodomethane                 50.000  44.029      11.9   59   0.000
     18 T    Methyl acetate              50.000  53.456      -6.9   77   0.000
     19 T    Methylene Chloride          50.000  53.005      -6.0   74   0.000
     20 T    Carbon Disulfide            50.000  50.600      -1.2   69  -0.011
     21 T    Acrylonitrile               50.000  55.589     -11.2   75   0.000
     22 T    Methyl Tert Butyl Ether     50.000  52.720      -5.4   73   0.000
     23 T    trans-1,2-Dichloroethene    50.000  54.382      -8.8   74   0.000
     24 T    n-Hexane                    50.000  58.101     -16.2   78   0.000
     25 T    Diisopropyl ether          100.000 108.796      -8.8   77   0.000
     26 T    Vinyl Acetate               50.000  51.027      -2.1   71   0.000
     27 P    1,1-Dichloroethane          50.000  54.102      -8.2   74   0.000
     28 T    Ethyl-Tert-Butyl ether     100.000 107.246      -7.2   76   0.000
     29 T    2-Butanone                  50.000  48.249       3.5   71   0.000
     30 T    Propionitrile              100.000 109.968     -10.0   76   0.000
     31 t    2,2-Dichloropropane         50.000  52.588      -5.2   74   0.000
     32 T    cis-1,2-Dichloroethene      50.000  53.398      -6.8   74   0.000
     33 C    Chloroform                  50.000  53.727      -7.5#  73   0.000
     34 T    1-Bromopropane              50.000  49.227       1.5   66   0.000
     35 T    Bromochloromethane          50.000  52.707      -5.4   71   0.000
     36 T    Tetrahydrofuran            100.000 107.209      -7.2   76   0.000
     37 S    Dibromofluoromethane        25.000  25.897      -3.6   72   0.000
     38 T    1,1,1-Trichloroethane       50.000  52.822      -5.6   72   0.000
     39 T    Cyclohexane                 50.000  51.780      -3.6   72   0.000
     40 T    1,1-Dichloropropene         50.000  56.482     -13.0   75   0.000
     41 T    Tert-Amyl-Methyl ether     100.000 106.877      -6.9   75   0.000
     42 T    Carbon Tetrachloride        50.000  54.764      -9.5   72   0.000
     43 S    1,2-Dichloroethane-d4       25.000  24.138       3.4   69   0.000
     44 T    1,2-Dichloroethane          50.000  53.236      -6.5   72  -0.010
     45 T    Benzene                     50.000  53.385      -6.8   74   0.000
     46 T    Trichloroethene             50.000  51.897      -3.8   71   0.000
     47 T    Methylcyclohexane           50.000  53.308      -6.6   73   0.000
     48 C    1,2-Dichloropropane         50.000  53.743      -7.5#  74   0.000
     49 T    1,4-Dioxane                200.000 238.742     -19.4   83   0.000
     50 T    Bromodichloromethane        50.000  54.194      -8.4   72  -0.010
     51 T    Dibromomethane              50.000  52.555      -5.1   71   0.000
     52 T    2-Chloroethyl Vinyl Ether   50.000  74.621     -49.2#  99   0.000
     53 T    4-Methyl-2-Pentanone        50.000  51.237      -2.5   71   0.000
     54 T    cis-1,3-Dichloropropene     50.000  54.727      -9.5   73  -0.010
     55 T    Dimethyl Disulfide          50.000  48.878       2.2   69  -0.010

   8260WTR.M Sun Dec 22 18:20:04 2013                                      Page:  1
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                           Evaluate Continuing Calibration Report

  Data Path : D:\MassHunter\GCMS\1\data\122213\
  Data File : 17M001841.D
  Acq On    : 22 Dec 2013  17:32
  Operator  : ADC
  Sample    : WG457313-02 50ug/L CCV 8260
  Misc      : 1,1 STD61850
  ALS Vial  : 1   Sample Multiplier: 1

  Quant Time: Dec 22 17:54:14 2013
  Quant Method : D:\MassHunter\GCMS\1\methods\8260WTR.M
  Quant Title  : 8260B/624 SOP:OVL MSV01 WATER 11/15/13 HPMS17
  QLast Update : Sat Nov 16 17:30:32 2013
  Response via : Initial Calibration


  Min. RRF     :   0.000  Min. Rel. Area :   50%  Max. R.T. Dev  0.500min
  Max. RRF Dev :  20%     Max. Rel. Area :  150%

         Compound                     Amount  Calc.     %Dev Area% Dev(min)
  ------------------------------------------------------------------------
 56 I    Chlorobenzene-d5             25.000  25.000       0.0   73   0.000
 57 S    Toluene-d8                   25.000  23.944       4.2   72   0.000
 58 C    Toluene                      50.000  51.303      -2.6#  74   0.000
 59 T    Ethyl Methacrylate           50.000  47.415       5.2   67   0.000
 60 T    trans-1,3-Dichloropropene    50.000  52.995      -6.0   73   0.000
 61 T    1,1,2-Trichloroethane        50.000  51.521      -3.0   72  -0.010
 62 T    2-Hexanone                   50.000  48.711       2.6   71   0.000
 63 T    1,3-Dichloropropane          50.000  51.093      -2.2   73   0.000
 64 T    Tetrachloroethene            50.000  54.062      -8.1   76   0.000
 65 T    Dibromochloromethane         50.000  52.378      -4.8   72   0.000
 66 T    1,2-Dibromoethane            50.000  50.212      -0.4   70   0.000
 67 T    1-Chlorohexane               50.000  51.656      -3.3   72   0.000
 68 P    Chlorobenzene                50.000  51.632      -3.3   73   0.000
 69 T    1,1,1,2-Tetrachloroethane    50.000  51.131      -2.3   72   0.000
 70 C    Ethylbenzene                 50.000  51.896      -3.8#  74  -0.010
 71 T    m-,p-Xylene                 100.000 104.687      -4.7   74   0.000
 72 T    o-Xylene                     50.000  50.813      -1.6   73   0.000
 73 T    Styrene                      50.000  52.581      -5.2   73   0.000
 74 P    Bromoform                    50.000  48.301       3.4   73   0.000
 75 T    Isopropylbenzene             50.000  53.082      -6.2   74   0.000

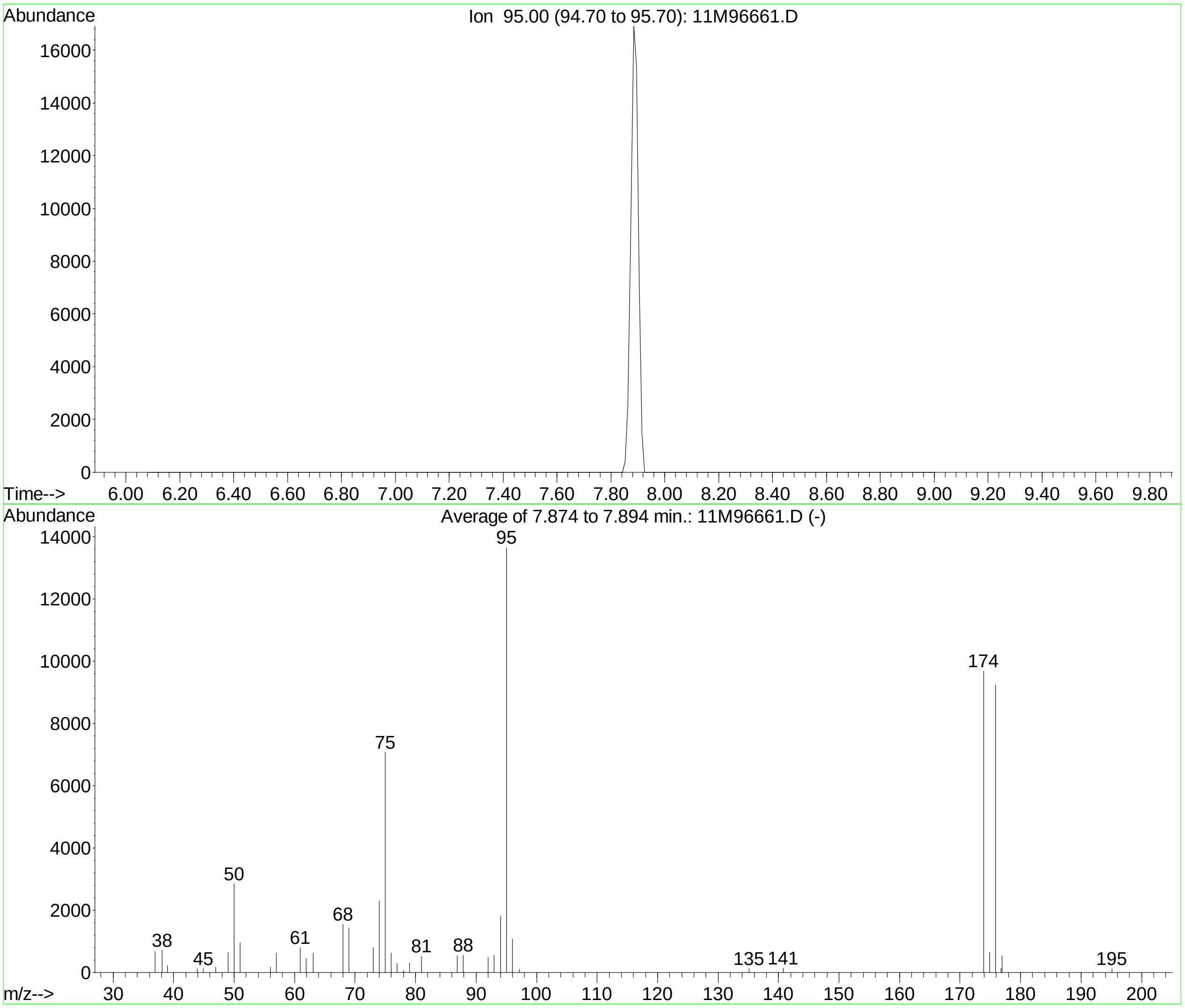
 76 I    1,4-Dichlorobenzene-d4       25.000  25.000       0.0   80   0.000
 77 P    1,1,2,2-Tetrachloroethane    50.000  52.515      -5.0   76   0.000
 78 S    p-Bromofluorobenzene         25.000  20.383      18.5   65   0.000
 79 T    1,2,3-Trichloropropane       50.000  47.389       5.2   71   0.000
 80 T    trans-1,4-Dichloro-2-Butene  50.000  45.316       9.4   68   0.000
 81 T    n-Propylbenzene              50.000  50.965      -1.9   75   0.000
 82 T    Bromobenzene                 50.000  48.979       2.0   74   0.000
 83 T    1,3,5-Trimethylbenzene       50.000  48.846       2.3   74   0.000
 84 T    2-Chlorotoluene              50.000  48.800       2.4   75   0.000
 85 T    4-Chlorotoluene              50.000  48.965       2.1   75  -0.010
 86 T    a-Methylstyrene              50.000  43.971      12.1   69   0.000
 87 T    tert-Butylbenzene            50.000  48.885       2.2   74   0.000
 88 T    1,2,4-Trimethylbenzene       50.000  50.168      -0.3   76   0.000
 89 T    sec-Butylbenzene             50.000  51.689      -3.4   76   0.000
 90 T    p-Isopropyltoluene           50.000  52.625      -5.3   77   0.000
 91 T    1,3-Dichlorobenzene          50.000  50.768      -1.5   76   0.000
 92 T    1,4-Dichlorobenzene          50.000  52.148      -4.3   76   0.000
 93 T    n-Butylbenzene               50.000  51.936      -3.9   79  -0.010
 94 T    1,2-Dichlorobenzene          50.000  50.550      -1.1   74   0.000
 95 T    1,2-Dibromo-3-Chloropropane  50.000  46.649       6.7   70  -0.010
 96 T    1,2,4-Trichlorobenzene       50.000  49.034       1.9   79   0.000
 97 T    Hexachlorobutadiene          50.000  50.404      -0.8   81   0.000
 98 T    Naphthalene                  50.000  51.766      -3.5   74   0.000
 99 T    1,2,3-Trichlorobenzene       50.000  48.450       3.1   77   0.000
 --------------------------------------------------------------------------

   (#) = Out of Range              SPCC's out = 0  CCC's out = 6
```

2.1.1.5 Raw QC Data

BFB

```
Data File : C:\MSDCHEM\1\DATA\110513\11M96661.D          Vial: 1
Acq On    :  5 Nov 2013  15:54                       Operator: FJB
Sample    : WG451178-01 BFB 50ng 8260                Inst    : hpms11
Misc      : 1,1 STD61161                             Multiplr: 1.00
MS Integration Params: rteint.p
Method   : C:\MSDCHEM\1\METHODS\BFB.M (RTE Integrator)
Title    : SOP: OVL MSV01
```



```
AutoFind: Scans 174, 175, 176; Background Corrected with Scan 169

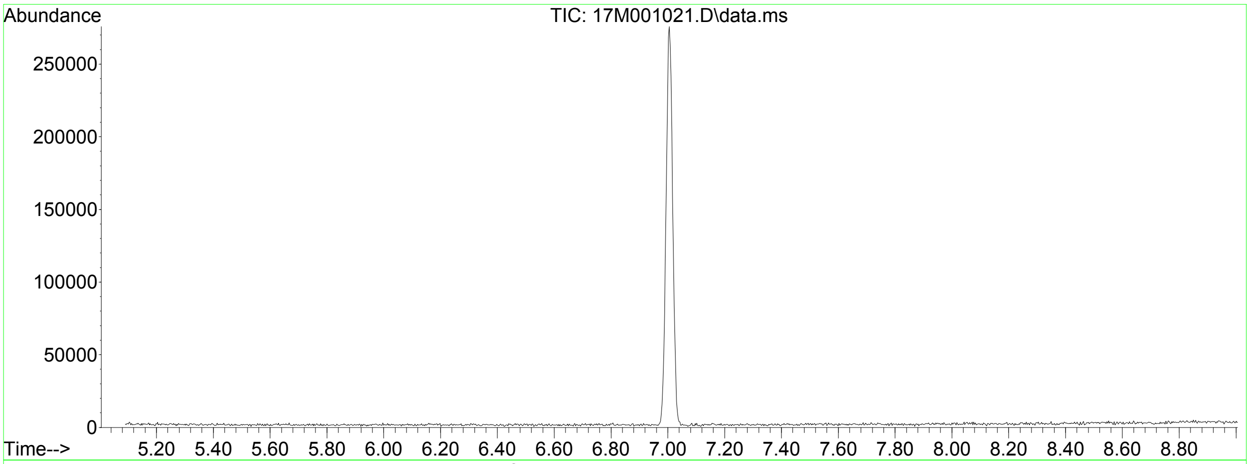
| Target | Rel. to | Lower  | Upper  |  Rel.  |     Raw    |   Result  |
|  Mass  |  Mass   | Limit% | Limit% |  Abn%  |     Abn    | Pass/Fail |
----------------------------------------------------------------------
|    50  |     95  |    15  |    40  |  20.8  |      2847 |    PASS    |
|    75  |     95  |    30  |    60  |  51.7  |      7067 |    PASS    |
|    95  |     95  |   100  |   100  | 100.0  |     13657 |    PASS    |
|    96  |     95  |     5  |     9  |   7.9  |      1078 |    PASS    |
|   173  |    174  |  0.00  |     2  |   0.0  |         0 |    PASS    |
|   174  |     95  |    50  |   100  |  70.9  |      9677 |    PASS    |
|   175  |    174  |     5  |     9  |   6.6  |       640 |    PASS    |
|   176  |    174  |    95  |   101  |  95.5  |      9240 |    PASS    |
|   177  |    176  |     5  |     9  |   5.8  |       534 |    PASS    |
----------------------------------------------------------------------

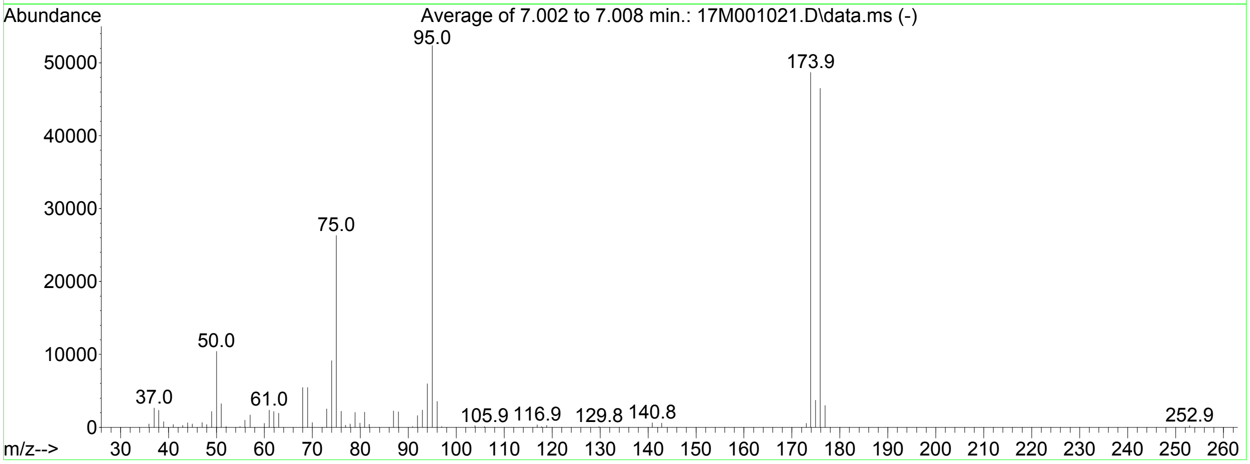
11M96661.D  BFB.M     Wed Nov 06 15:33:17 2013
```

```
Data Path : D:\MassHunter\GCMS\1\data\111513\
Data File : 17M001021.D
Acq On    : 15 Nov 2013  14:34
Operator  : adc
Sample    : WG453012-01 50ng BFB 8260
Misc      : 1,1 STD60561
ALS Vial  : 1   Sample Multiplier: 1

Integration File: rteint.p

Method    : D:\MassHunter\GCMS\1\methods\8260WTR.M
Title     : 8260B/624 SOP:OVL MSV01 WATER 11/15/13 HPMS17
Last Update  : Sat Nov 16 17:30:32 2013
```



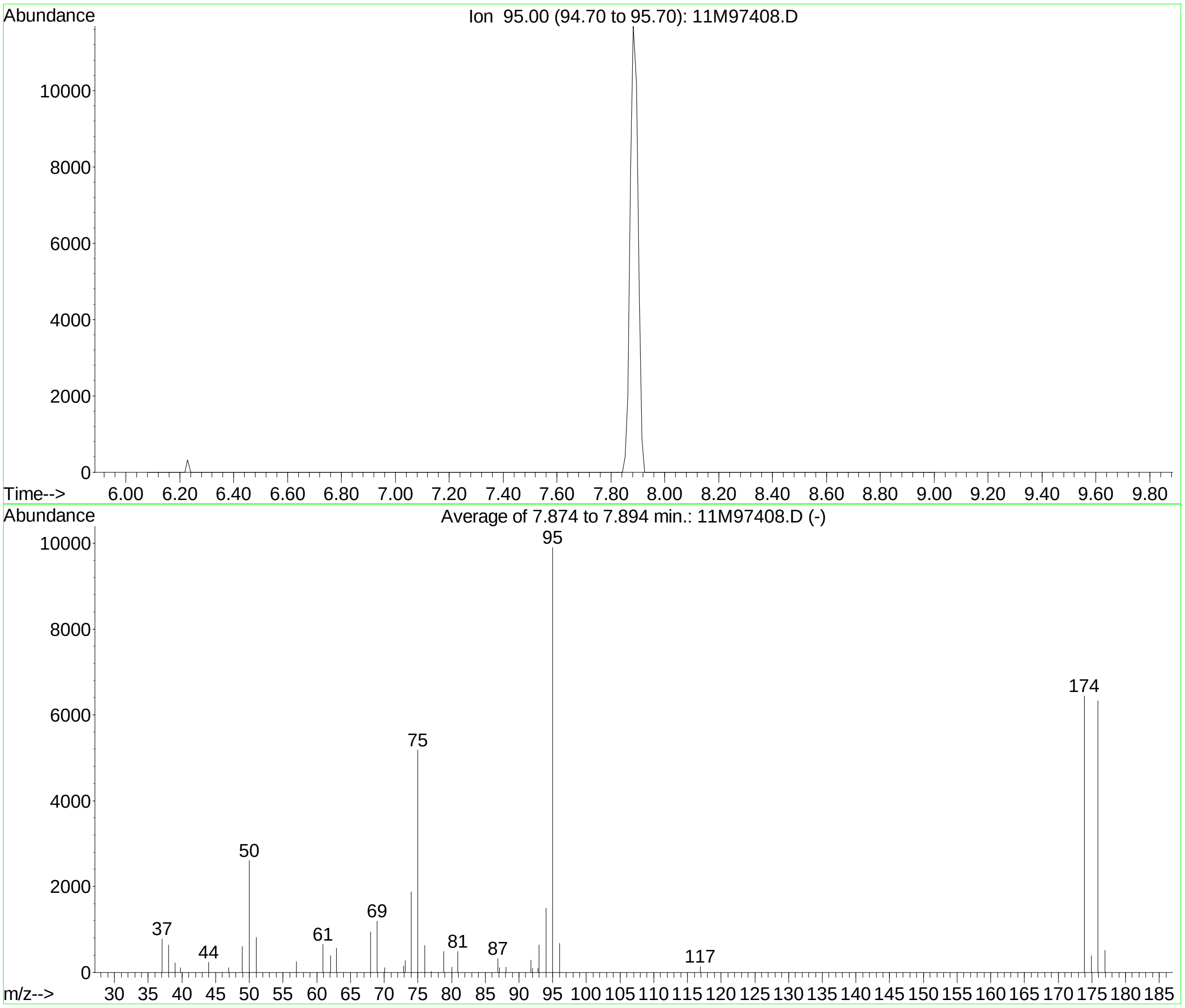


```
AutoFind: Scans 674, 675, 676; Background Corrected with Scan 659

| Target | Rel. to | Lower  | Upper  |  Rel.  |    Raw   |   Result  |
|  Mass  |  Mass   | Limit% | Limit% |  Abn%  |    Abn   | Pass/Fail |
----------------------------------------------------------------------
|   50   |    95   |    15  |    40  |  19.8  |    10400 |   PASS    |
|   75   |    95   |    30  |    60  |  50.3  |    26333 |   PASS    |
|   95   |    95   |   100  |   100  | 100.0  |    52395 |   PASS    |
|   96   |    95   |     5  |     9  |   6.7  |     3532 |   PASS    |
|  173   |   174   |  0.00  |     2  |   1.1  |      519 |   PASS    |
|  174   |    95   |    50  |   100  |  92.9  |    48693 |   PASS    |
|  175   |   174   |     5  |     9  |   7.7  |     3728 |   PASS    |
|  176   |   174   |    95  |   101  |  95.5  |    46491 |   PASS    |
|  177   |   176   |     5  |     9  |   6.4  |     2990 |   PASS    |
----------------------------------------------------------------------
```

BFB

```
Data File : C:\MSDCHEM\1\DATA\120413\11M97408.D          Vial: 1
Acq On    :  4 Dec 2013  15:09                       Operator: FJB
Sample    : WG455130-01 BFB 50ng A9FOO               Inst    : hpms11
Misc      : 1,1 STD61161                             Multiplr: 1.00
MS Integration Params: rteint.p
Method   : C:\MSDCHEM\1\METHODS\BFB.M (RTE Integrator)
Title    : SOP: OVL MSV01
```



```
AutoFind: Scans 174, 175, 176; Background Corrected with Scan 169

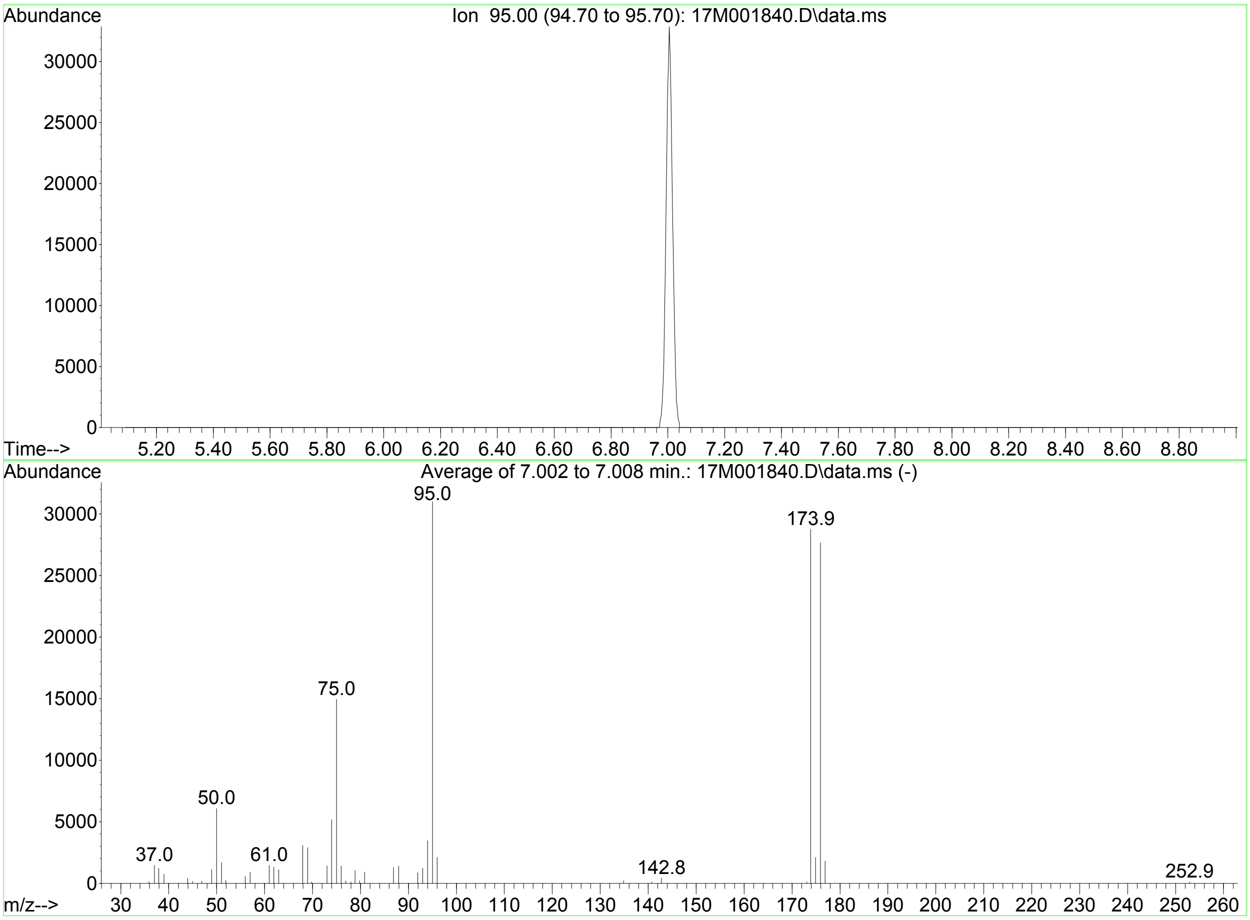
| Target | Rel. to | Lower  | Upper  |  Rel.  |    Raw    |  Result   |
|  Mass  |  Mass   | Limit% | Limit% |  Abn%  |    Abn    | Pass/Fail |
---------------------------------------------------------------------
|   50   |    95   |    15  |    40  |  26.3  |     2601  |   PASS    |
|   75   |    95   |    30  |    60  |  52.3  |     5177  |   PASS    |
|   95   |    95   |   100  |   100  | 100.0  |     9902  |   PASS    |
|   96   |    95   |     5  |     9  |   6.8  |      675  |   PASS    |
|  173   |   174   |  0.00  |     2  |   0.0  |        0  |   PASS    |
|  174   |    95   |    50  |   100  |  65.0  |     6441  |   PASS    |
|  175   |   174   |     5  |     9  |   6.0  |      384  |   PASS    |
|  176   |   174   |    95  |   101  |  98.2  |     6328  |   PASS    |
|  177   |   176   |     5  |     9  |   8.1  |      514  |   PASS    |
---------------------------------------------------------------------
```

```
11M97408.D  BFB.M     Wed Dec 18 14:07:30 2013
```

```
Data Path : D:\MassHunter\GCMS\1\data\122213\
Data File : 17M001840.D
Acq On    : 22 Dec 2013  17:09
Operator  : ADC
Sample    : WG457313-01 BFB 50ng 8260
Misc      : 1,1 STD61669
ALS Vial  : 1   Sample Multiplier: 1

Integration File: rteint.p

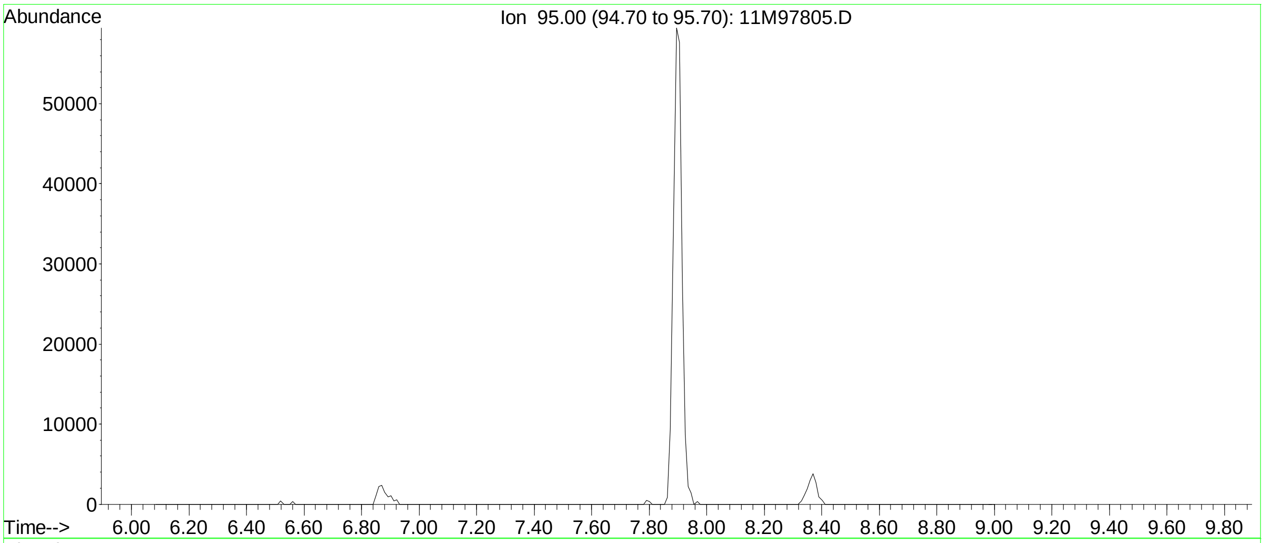
Method    : D:\MassHunter\GCMS\1\methods\8260WTR.M
Title     : 8260B/624 SOP:OVL MSV01 WATER 11/15/13 HPMS17
Last Update  : Sat Nov 16 17:30:32 2013
```

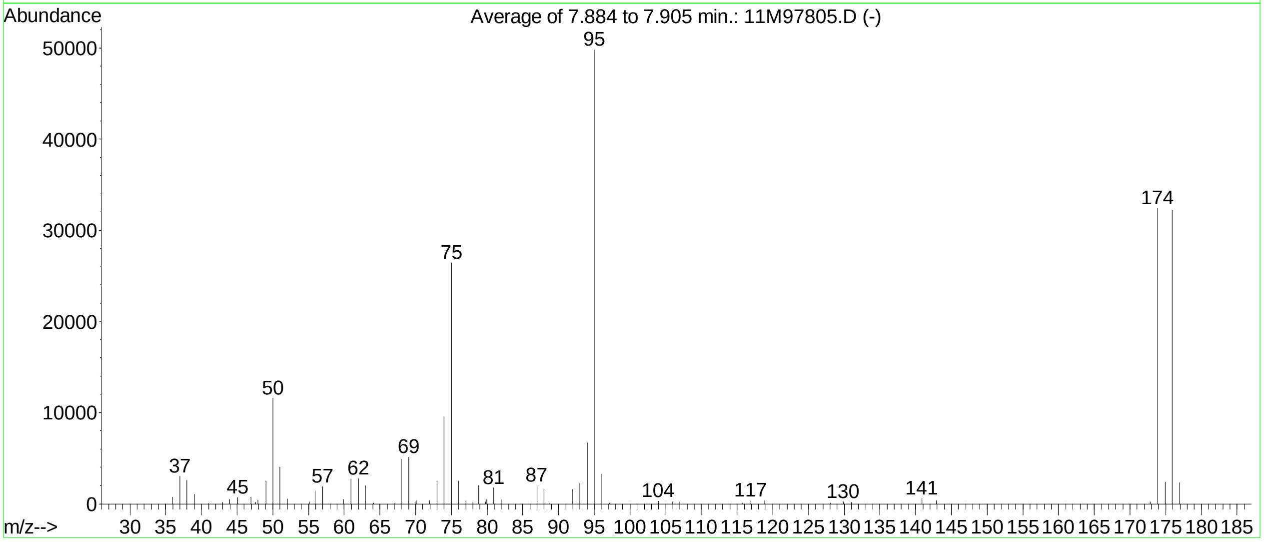


```
AutoFind: Scans 674, 675, 676; Background Corrected with Scan 661

| Target | Rel. to | Lower  | Upper  |  Rel.  |    Raw   |   Result  |
|  Mass  |  Mass   | Limit% | Limit% |  Abn%  |    Abn   | Pass/Fail |
-----------------------------------------------------------------------
|   50   |    95   |    15  |    40  |  19.6  |     6071 |   PASS    |
|   75   |    95   |    30  |    60  |  48.2  |    14959 |   PASS    |
|   95   |    95   |   100  |   100  | 100.0  |    31024 |   PASS    |
|   96   |    95   |     5  |     9  |   6.8  |     2102 |   PASS    |
|  173   |   174   |  0.00  |     2  |   0.4  |      107 |   PASS    |
|  174   |    95   |    50  |   100  |  92.7  |    28749 |   PASS    |
|  175   |   174   |     5  |     9  |   7.3  |     2109 |   PASS    |
|  176   |   174   |    95  |   101  |  96.2  |    27653 |   PASS    |
|  177   |   176   |     5  |     9  |   6.5  |     1804 |   PASS    |
-----------------------------------------------------------------------
```

```
Data File : C:\MSDCHEM\1\DATA\122313\11M97805.D          Vial: 1
Acq On    : 23 Dec 2013  15:27                       Operator: FJB
Sample    : WG457422-01 BFB 50ng 8260                Inst    : hpms11
Misc      : 1,1 PURGED STD61669                      Multiplr: 1.00
MS Integration Params: rteint.p
Method   : C:\MSDCHEM\1\METHODS\BFB.M (RTE Integrator)
Title    : SOP: OVL MSV01
```





```
AutoFind: Scans 175, 176, 177; Background Corrected with Scan 170

| Target | Rel. to | Lower  | Upper  |  Rel.  |     Raw    |   Result  |
|  Mass  |  Mass   | Limit% | Limit% |  Abn%  |     Abn    | Pass/Fail |
---------------------------------------------------------------------
|   50   |    95   |    15  |    40  |  23.3  |     11583  |   PASS    |
|   75   |    95   |    30  |    60  |  53.0  |     26416  |   PASS    |
|   95   |    95   |   100  |   100  | 100.0  |     49797  |   PASS    |
|   96   |    95   |     5  |     9  |   6.6  |      3290  |   PASS    |
|  173   |   174   |  0.00  |     2  |   0.8  |       249  |   PASS    |
|  174   |    95   |    50  |   100  |  65.1  |     32418  |   PASS    |
|  175   |   174   |     5  |     9  |   7.3  |      2373  |   PASS    |
|  176   |   174   |    95  |   101  |  99.2  |     32174  |   PASS    |
|  177   |   176   |     5  |     9  |   7.2  |      2327  |   PASS    |
---------------------------------------------------------------------

11M97805.D  BFB.M     Mon Dec 23 16:23:25 2013
```

```
                       Quantitation Report    (Not Reviewed)

Data File : C:\MSDCHEM\1\DATA\122313\11M97809.D         Vial: 5
Acq On    : 23 Dec 2013  17:30                      Operator: FJB
Sample    : WG457423-01 VBLK1223 BLANK 8260         Inst    : hpms11
Misc      : 1,1                                     Multiplr: 1.00
MS Integration Params: rteint.p
Quant Time: Dec 24 08:24:29 2013          Quant Results File: 8260_WT.RES

Quant Method : C:\MSDCHEM\1\METHODS\8260_WT.M (RTE Integrator)
Title        : 8260B/624 (SOP: OVL MSV01) Water 11/05/13 HPMS11
Last Update  : Mon Dec 16 17:06:06 2013
Response via : Initial Calibration
DataAcq Meth : 8260_WT

 Internal Standards                R.T. QIon  Response  Conc Units Dev(Min)
 ---------------------------------------------------------------------------
   1) Fluorobenzene               10.62   96  1200790    25.00 ug/L   -0.01
  56) Chlorobenzene-d5            14.26  117   920524    25.00 ug/L    0.00
  76) 1,4-Dichlorobenzene-d4      17.07  152   459528    25.00 ug/L    0.00

 System Monitoring Compounds
  37) Dibromofluoromethane         9.64  111   322437    22.1974 ug/L  0.00
   Spiked Amount     25.000   Range  86 - 118    Recovery   =   88.80%
  43) 1,2-Dichloroethane-d4       10.25   65   387322    23.6101 ug/L  0.00
   Spiked Amount     25.000   Range  80 - 120    Recovery   =   94.44%
  57) Toluene-d8                  12.48   98  1243142    26.8900 ug/L  0.00
   Spiked Amount     25.000   Range  88 - 110    Recovery   =  107.56%
  78) p-Bromofluorobenzene        15.65   95   526888    28.5499 ug/L  0.00
   Spiked Amount     25.000   Range  86 - 115    Recovery   =  114.20%

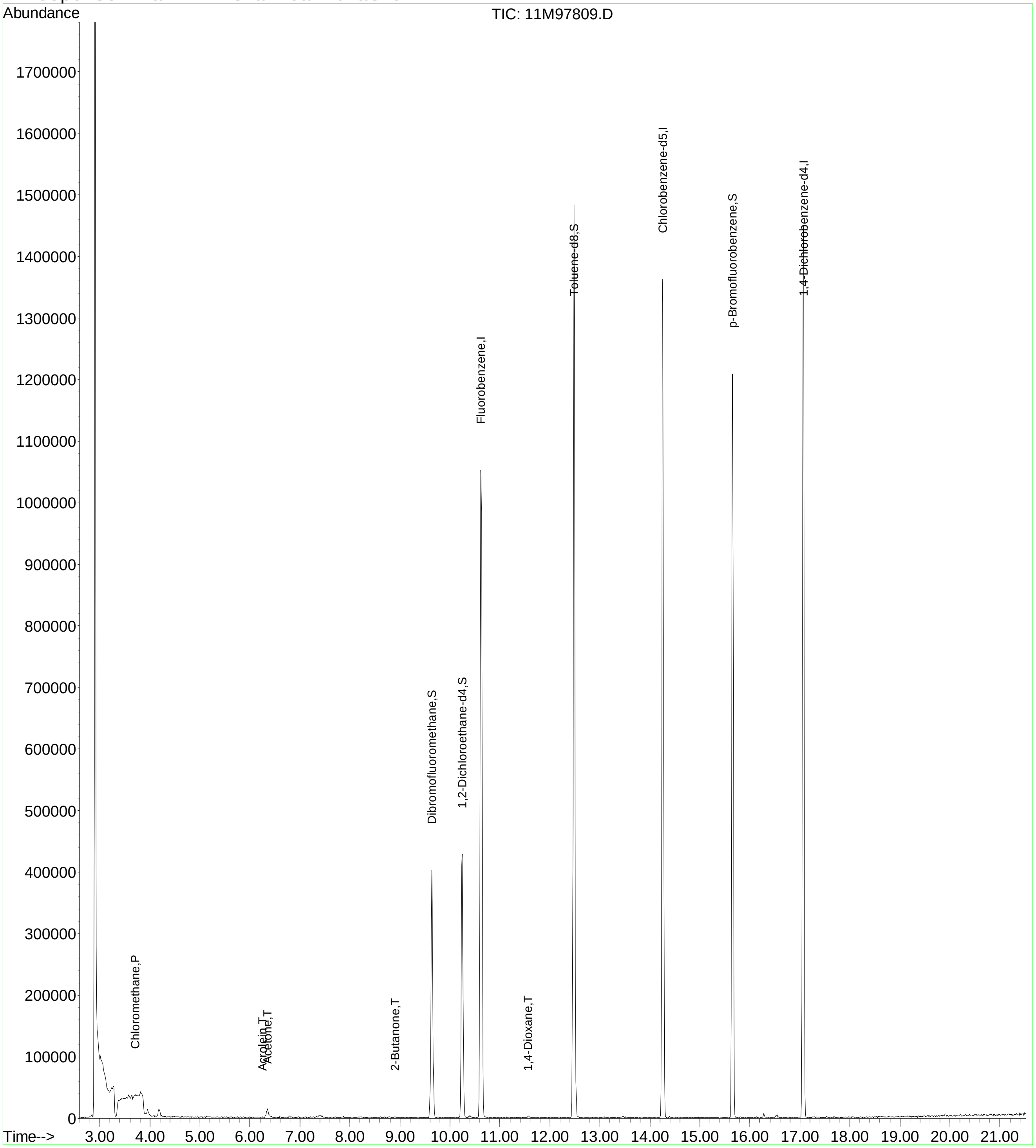
 Target Compounds                                                   Qvalue
   3) Chloromethane                3.70   50     2068     0.1237 ug/L #   1
   5) 1,3-Butadiene                3.98   54      197    Below Cal  #   1
  11) Acrolein                     6.25   56      198     1.1627 ug/L #  12
  13) Acetone                      6.35   43    27067     9.7033 ug/L #  69
  29) 2-Butanone                   8.90   43     1418     0.3498 ug/L #  59
  49) 1,4-Dioxane                 11.56   88     2391    26.8353 ug/L    77

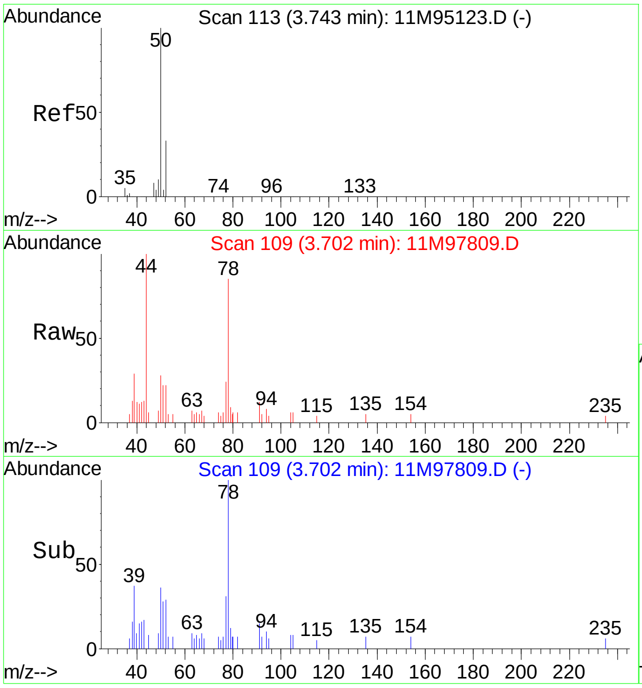
 ---------------------------------------------------------------------------
 (#) = qualifier out of range (m) = manual integration
 11M97809.D  8260_WT.M      Tue Dec 24 08:24:30 2013                           Page 1
```

Quantitation Report   (Not Reviewed)

```
Data File : C:\MSDCHEM\1\DATA\122313\11M97809.D         Vial: 5
Acq On    : 23 Dec 2013  17:30                        Operator: FJB
Sample    : WG457423-01 VBLK1223 BLANK 8260           Inst    : hpms11
Misc      : 1,1                                       Multiplr: 1.00
MS Integration Params: rteint.p
Quant Time: Dec 24  8:24 2013             Quant Results File: 8260_WT.RES

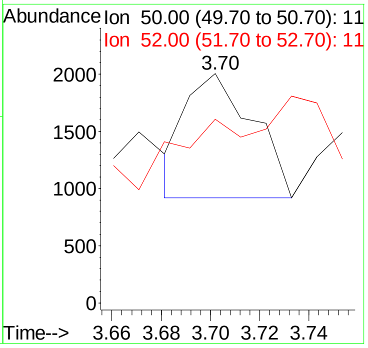
Method       : C:\MSDCHEM\1\METHODS\8260_WT.M (RTE Integrator)
Title        : 8260B/624 (SOP: OVL MSV01) Water 11/05/13 HPMS11
Last Update  : Mon Dec 16 17:06:06 2013
Response via : Initial Calibration
```

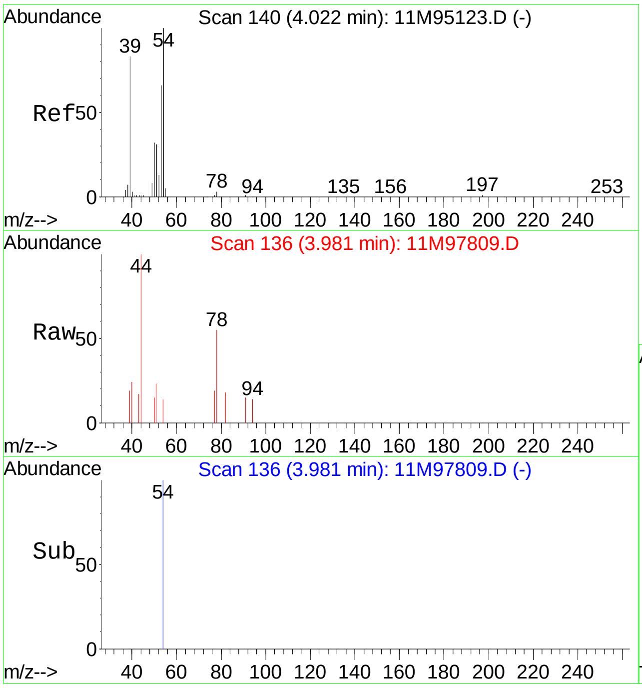




```
#3
Chloromethane
Concen:    0.12 ug/L
RT: 3.70 min   Scan# 109
Delta R.T.    -0.00 min
Lab File:   11M97809.D
Acq: 23 Dec 2013  17:30

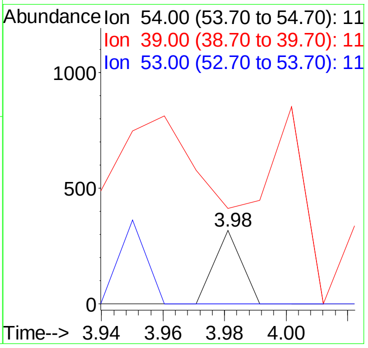
Tgt Ion: 50 Resp:    2068
Ion  Ratio  Lower  Upper
 50  100
 52  204.2   20.3   47.3#
```

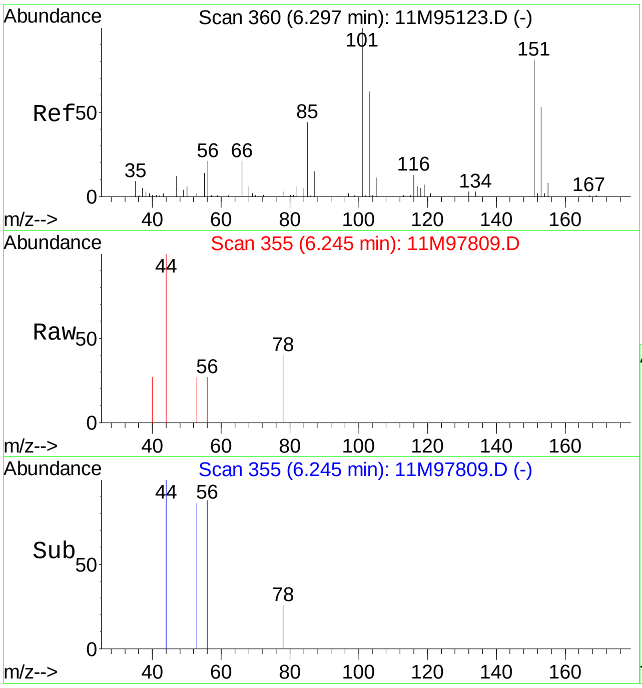




```
#5
1,3-Butadiene
Concen:   Below Cal
RT: 3.98 min   Scan# 136
Delta R.T.    0.00 min
Lab File:   11M97809.D
Acq: 23 Dec 2013  17:30

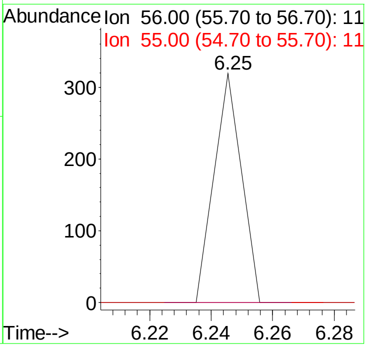
Tgt Ion: 54 Resp:     197
Ion  Ratio  Lower  Upper
 54  100
 39  284.3   58.4  136.2#
 53  114.2   42.0   98.0#
```

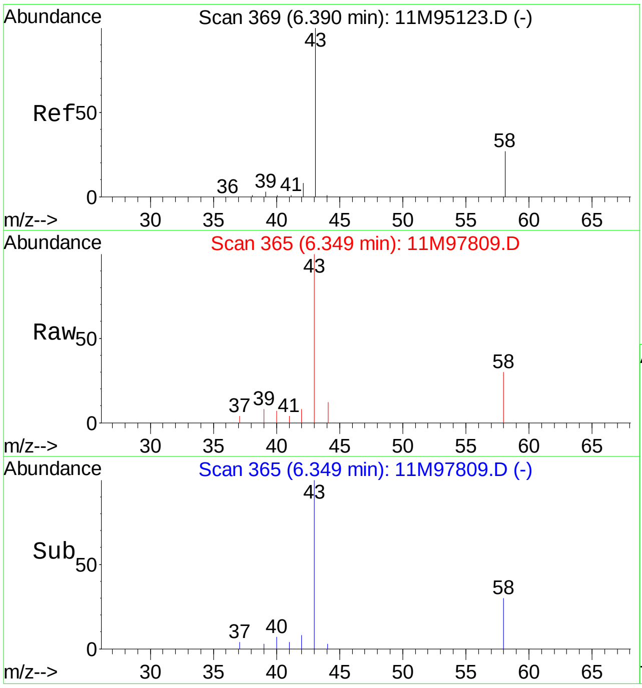




```
#11
Acrolein
Concen:    1.16 ug/L
RT: 6.25 min  Scan# 355
Delta R.T.   0.00 min
Lab File:   11M97809.D
Acq: 23 Dec 2013  17:30

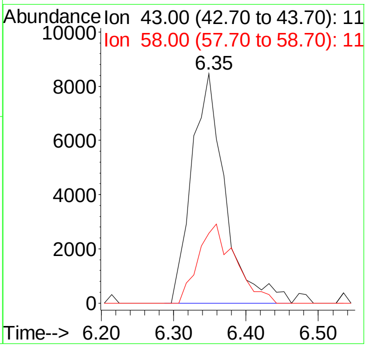
Tgt Ion: 56 Resp:     198
Ion  Ratio  Lower  Upper
 56  100
 55    0.0   44.8  104.6#
```

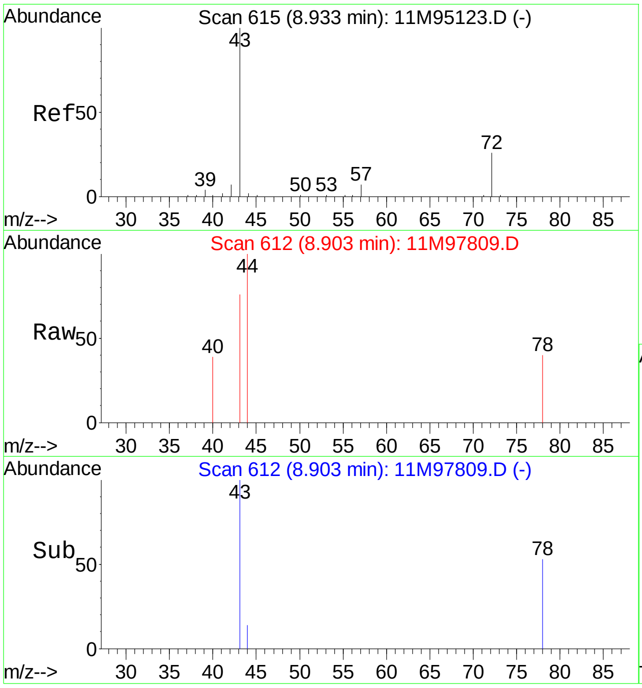




```
#13
Acetone
Concen:    9.70 ug/L
RT: 6.35 min  Scan# 365
Delta R.T.   0.00 min
Lab File:   11M97809.D
Acq: 23 Dec 2013  17:30

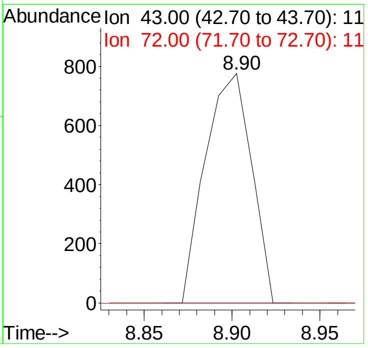
Tgt Ion: 43 Resp:   27067
Ion  Ratio  Lower  Upper
 43  100
 58   37.9   13.9   32.3#
```

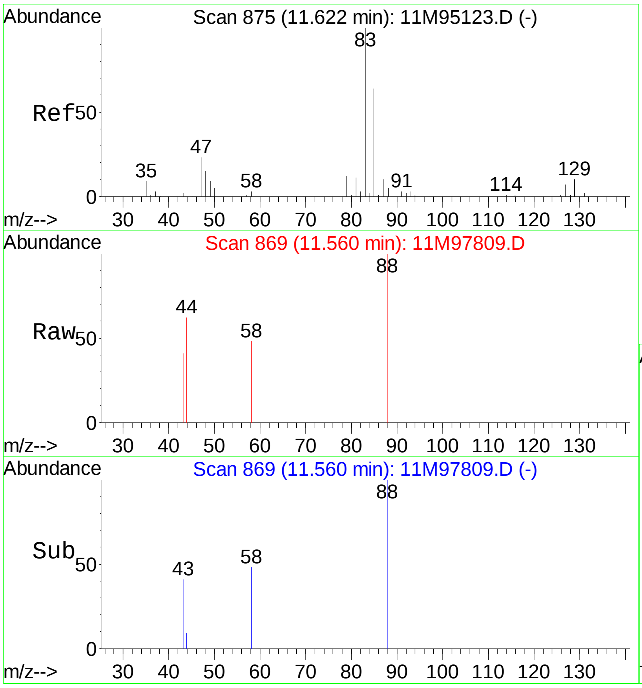




```
#29
2-Butanone
Concen:    0.35 ug/L
RT: 8.90 min   Scan# 612
Delta R.T.    0.01 min
Lab File:   11M97809.D
Acq: 23 Dec 2013  17:30

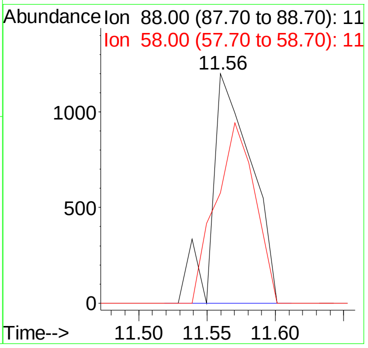
Tgt Ion: 43 Resp:     1418
Ion  Ratio  Lower   Upper
 43  100
 72    0.0   11.0    25.8#
```





```
#49
1,4-Dioxane
Concen:   26.84 ug/L
RT: 11.56 min   Scan# 869
Delta R.T.    -0.02 min
Lab File:   11M97809.D
Acq: 23 Dec 2013  17:30

Tgt Ion: 88 Resp:     2391
Ion  Ratio  Lower   Upper
 88  100
 58   78.6   36.8    85.8
```



```
                                 Quantitation Report    (Not Reviewed)

Data Path : D:\MassHunter\GCMS\1\data\122213\
Data File : 17M001843.D
Acq On    : 22 Dec 2013  19:02
Operator  : ADC
Sample    : WG457314-01 VBLK1222 BLANK 8260
Misc      : 1,1
ALS Vial  : 3   Sample Multiplier: 1

Quant Time: Dec 23 10:00:36 2013
Quant Method : D:\MassHunter\GCMS\1\methods\8260WTR.M
Quant Title  : 8260B/624 SOP:OVL MSV01 WATER 11/15/13 HPMS17
QLast Update : Sat Nov 16 17:30:32 2013
Response via : Initial Calibration

        Compound                   R.T. QIon  Response  Conc Units Dev(Min)
 -------------------------------------------------------------------------
 Internal Standards
   1) Fluorobenzene              10.181   96   612254    25.00000 ug/L    -0.0105
  56) Chlorobenzene-d5           13.996  117   429397    25.00000 ug/L     0.0000
  76) 1,4-Dichlorobenzene-d4     16.971  152   198208    25.00000 ug/L     0.0000

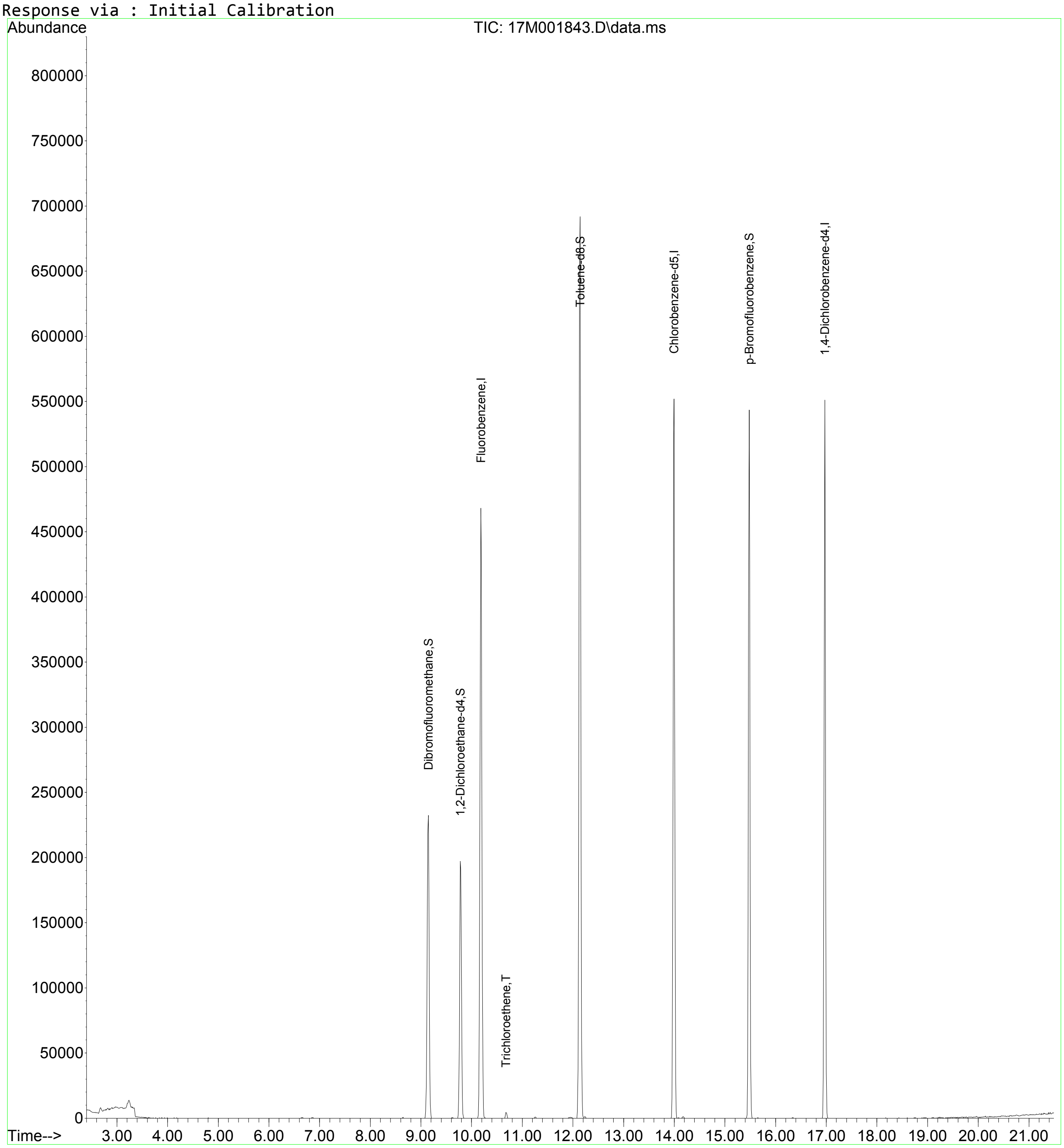
 System Monitoring Compounds
  37) Dibromofluoromethane        9.145  111   196157    25.7273 ug/L    0.0000
   Spiked Amount     25.000   Range  86 - 118    Recovery   =  102.909%
  43) 1,2-Dichloroethane-d4       9.777   65   184356    24.5353 ug/L   -0.0108
   Spiked Amount     25.000   Range  80 - 120    Recovery   =   98.141%
  57) Toluene-d8                 12.141   98   657024    25.0783 ug/L    0.0000
   Spiked Amount     25.000   Range  88 - 110    Recovery   =  100.313%
  78) p-Bromofluorobenzene       15.478   95   221910    23.0936 ug/L    0.0000
   Spiked Amount     25.000   Range  86 - 115    Recovery   =   92.374%

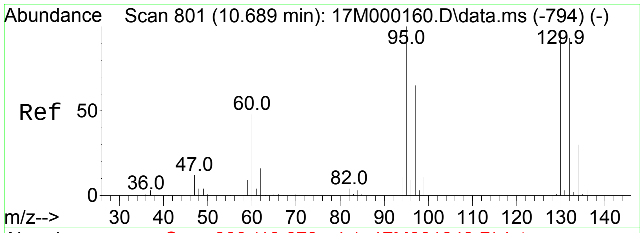
 Target Compounds                                                   Qvalue
  46) Trichloroethene            10.679  130     2348     0.2901 ug/L      78
 -------------------------------------------------------------------------

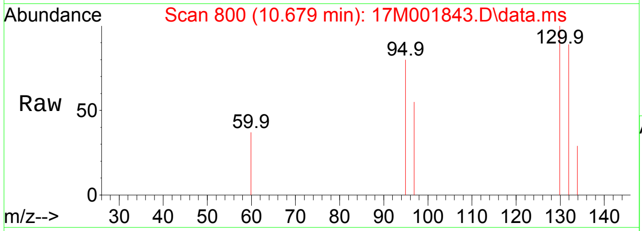
 (#) = qualifier out of range (m) = manual integration (+) = signals summed
```

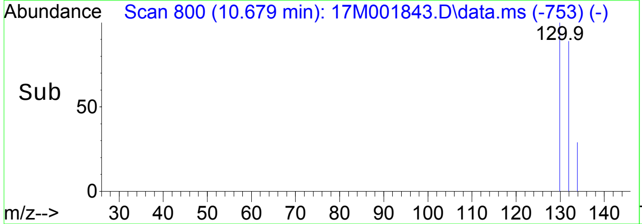
```
Data Path : D:\MassHunter\GCMS\1\data\122213\
Data File : 17M001843.D
Acq On    : 22 Dec 2013  19:02
Operator  : ADC
Sample    : WG457314-01 VBLK1222 BLANK 8260
Misc      : 1,1
ALS Vial  : 3   Sample Multiplier: 1

Quant Time: Dec 23 10:00:36 2013
Quant Method : D:\MassHunter\GCMS\1\methods\8260WTR.M
Quant Title  : 8260B/624 SOP:OVL MSV01 WATER 11/15/13 HPMS17
QLast Update : Sat Nov 16 17:30:32 2013
Response via : Initial Calibration
```



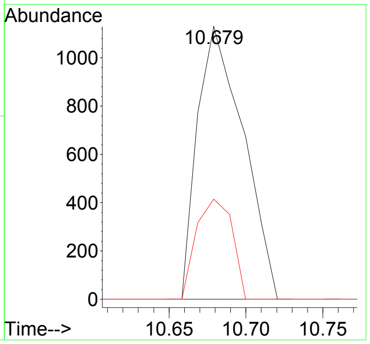






```
#46
Trichloroethene
Concen:     0.2901 ug/L
RT:  10.679 min  Scan# 800
Delta R.T.  -0.010 min
Lab File:   17M001843.D
Acq: 22 Dec 2013  19:02

Tgt Ion:130 Resp:    2348
Ion  Ratio  Lower  Upper
130  100
 60   28.7   25.6   59.6
```



```
                              Quantitation Report    (Not Reviewed)
Data File : C:\MSDCHEM\1\DATA\122313\11M97830.D          Vial: 26
Acq On    : 24 Dec 2013   4:29                       Operator: FJB
Sample    : WG457423-04 BLANK 624                    Inst    : hpms11
Misc      : 2,1                                      Multiplr: 1.00
MS Integration Params: rteint.p
Quant Time: Dec 24 08:25:49 2013           Quant Results File: 8260_WT.RES

Quant Method : C:\MSDCHEM\1\METHODS\8260_WT.M (RTE Integrator)
Title        : 8260B/624 (SOP: OVL MSV01) Water 11/05/13 HPMS11
Last Update  : Mon Dec 16 17:06:06 2013
Response via : Initial Calibration
DataAcq Meth : 8260_WT

 Internal Standards                   R.T. QIon  Response  Conc Units Dev(Min)
 -------------------------------------------------------------------------
   1) Fluorobenzene                  10.62   96  1030907    25.00 ug/L   -0.01
  56) Chlorobenzene-d5               14.26  117   772206    25.00 ug/L    0.00
  76) 1,4-Dichlorobenzene-d4         17.07  152   385277    25.00 ug/L    0.00

 System Monitoring Compounds
  37) Dibromofluoromethane            9.64  111   280786    22.5154 ug/L  0.00
   Spiked Amount     25.000   Range  86 - 118    Recovery   =   90.08%
  43) 1,2-Dichloroethane-d4          10.25   65   321841    22.8515 ug/L  0.00
   Spiked Amount     25.000   Range  80 - 120    Recovery   =   91.40%
  57) Toluene-d8                     12.48   98  1035586    26.7029 ug/L -0.01
   Spiked Amount     25.000   Range  88 - 110    Recovery   =  106.80%
  78) p-Bromofluorobenzene           15.65   95   424489    27.4341 ug/L  0.00
   Spiked Amount     25.000   Range  86 - 115    Recovery   =  109.72%

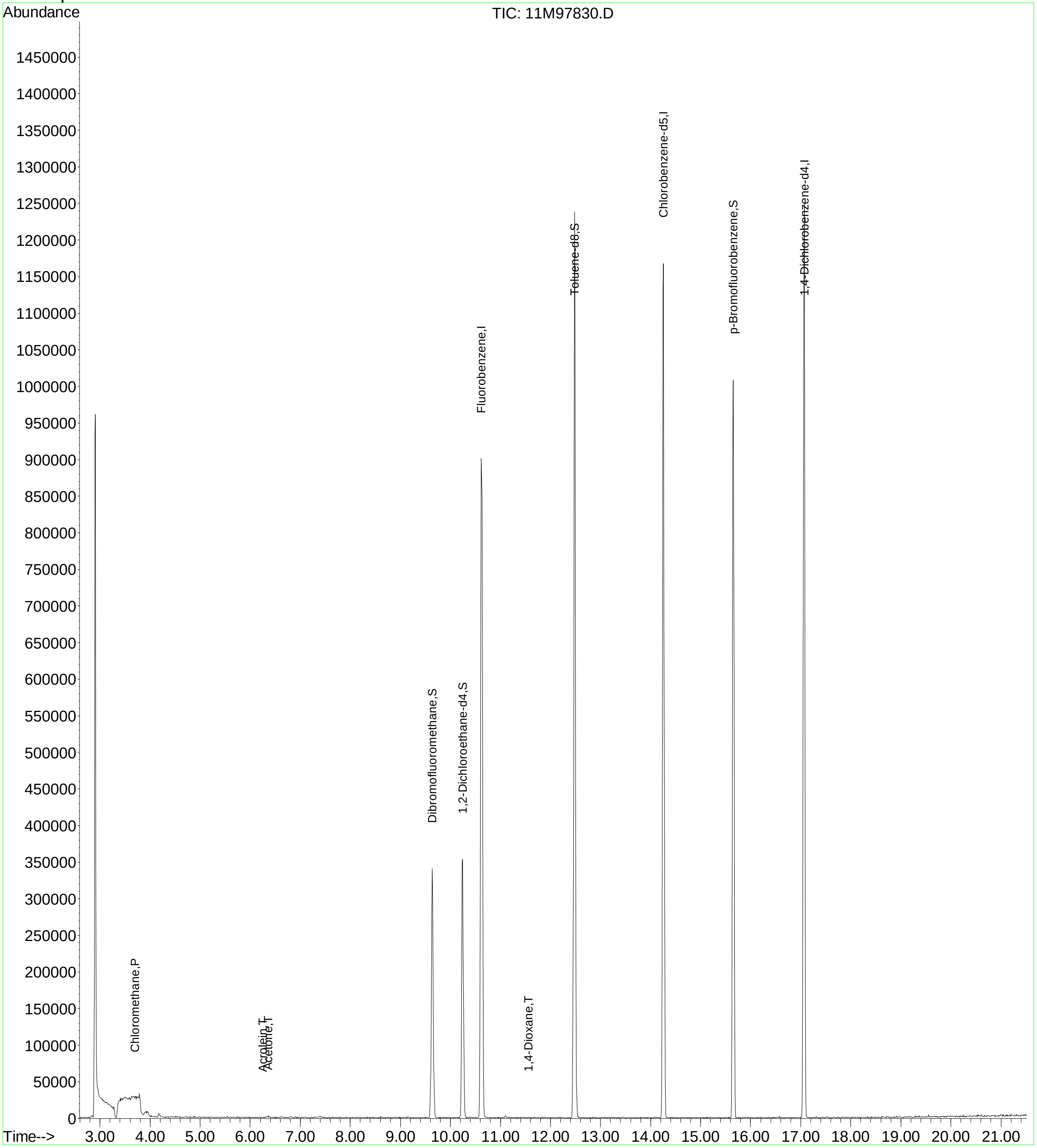
 Target Compounds                                                     Qvalue
   3) Chloromethane                   3.69   50     3004     0.2093 ug/L    83
  11) Acrolein                        6.25   56      197     1.3575 ug/L #  12
  13) Acetone                         6.36   43     4483     1.8720 ug/L #  77
  49) 1,4-Dioxane                    11.56   88      543     7.0986 ug/L    73

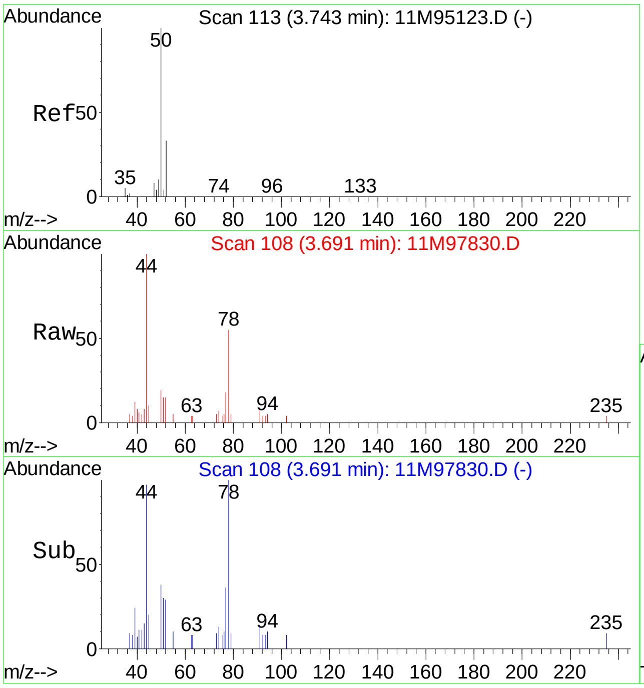
 -------------------------------------------------------------------------
 (#) = qualifier out of range (m) = manual integration
 11M97830.D  8260_WT.M      Tue Dec 24 08:25:50 2013                        Page 1
```

Quantitation Report (Not Reviewed)

```
Data File : C:\MSDCHEM\1\DATA\122313\11M97830.D          Vial: 26
Acq On    : 24 Dec 2013   4:29                        Operator: FJB
Sample    : WG457423-04 BLANK 624                     Inst    : hpms11
Misc      : 2,1                                       Multiplr: 1.00
MS Integration Params: rteint.p
Quant Time: Dec 24  8:25 2013            Quant Results File: 8260_WT.RES

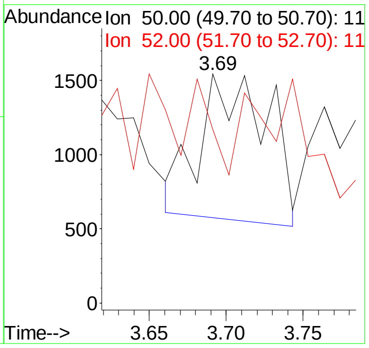
Method       : C:\MSDCHEM\1\METHODS\8260_WT.M (RTE Integrator)
Title        : 8260B/624 (SOP: OVL MSV01) Water 11/05/13 HPMS11
Last Update  : Mon Dec 16 17:06:06 2013
Response via : Initial Calibration
```

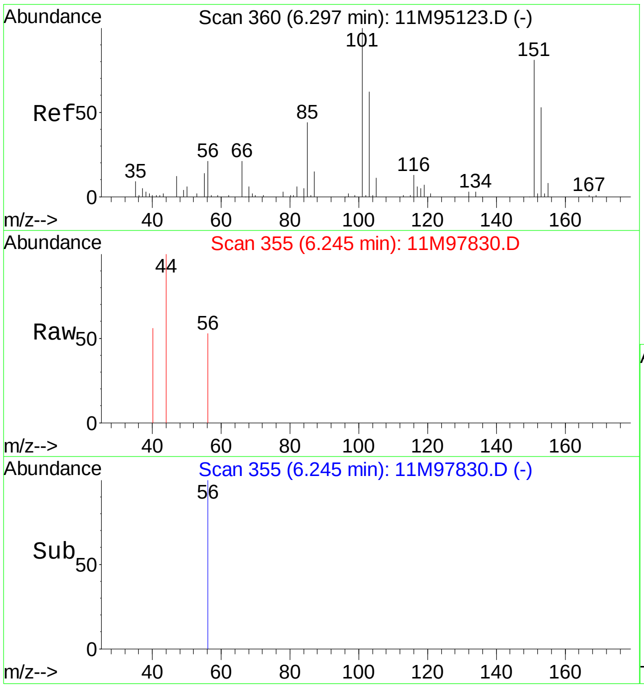




#3
Chloromethane
Concen: 0.21 ug/L
RT: 3.69 min Scan# 108
Delta R.T. -0.01 min
Lab File: 11M97830.D
Acq: 24 Dec 2013 4:29

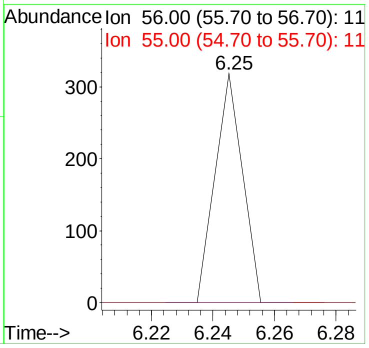
Tgt Ion: 50	Resp:		3004
Ion	Ratio	Lower	Upper
50	100		
52	24.0	20.3	47.3

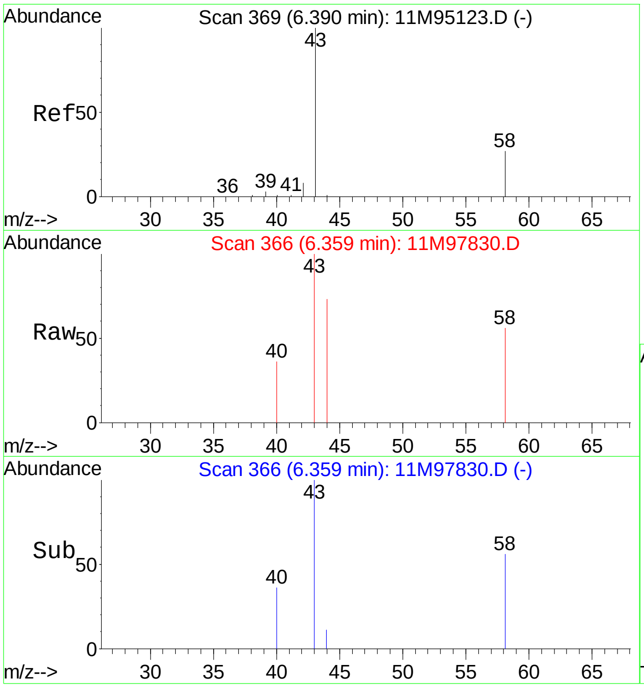




#11
Acrolein
Concen: 1.36 ug/L
RT: 6.25 min Scan# 355
Delta R.T. 0.00 min
Lab File: 11M97830.D
Acq: 24 Dec 2013 4:29

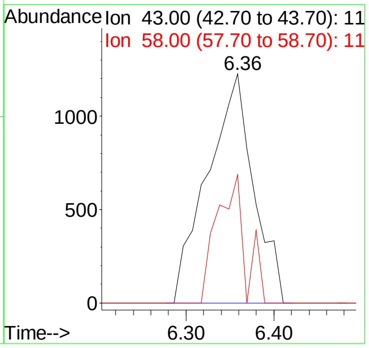
Tgt Ion: 56	Resp:		197
Ion	Ratio	Lower	Upper
56	100		
55	0.0	44.8	104.6#

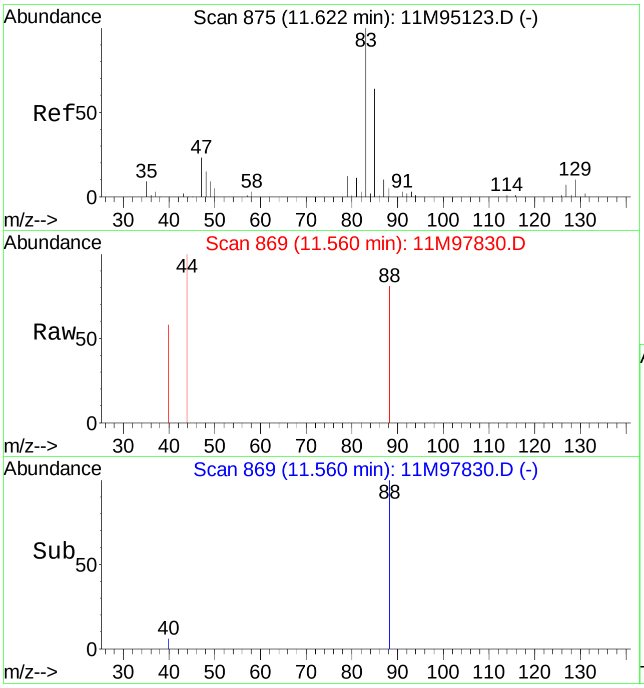




```
#13
Acetone
Concen:    1.87 ug/L
RT: 6.36 min  Scan# 366
Delta R.T.   0.01 min
Lab File:   11M97830.D
Acq: 24 Dec 2013   4:29

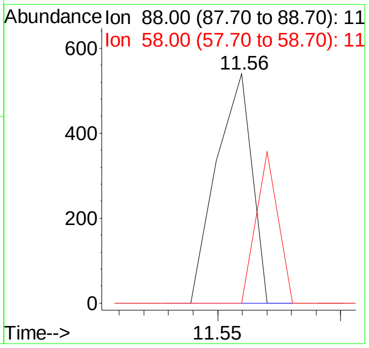
Tgt Ion: 43 Resp:    4483
Ion  Ratio  Lower  Upper
 43  100
 58   34.3   13.9   32.3#
```





```
#49
1,4-Dioxane
Concen:    7.10 ug/L
RT: 11.56 min  Scan# 869
Delta R.T.   -0.02 min
Lab File:   11M97830.D
Acq: 24 Dec 2013   4:29

Tgt Ion: 88 Resp:     543
Ion  Ratio  Lower  Upper
 88  100
 58   40.7   36.8   85.8
```



```
                          Quantitation Report    (Not Reviewed)

  Data File : C:\MSDchem\1\data\122313\11M97810.D          Vial: 6
  Acq On    : 23 Dec 2013  18:01                       Operator: FJB
  Sample    : WG457423-02 20ug/L LCS 8260              Inst    : hpms11
  Misc      : 1,1 STD61695                             Multiplr: 1.00
  MS Integration Params: rteint.p
  Quant Time: Dec 23 18:23:15 2013          Quant Results File: 8260_WT.RES

  Quant Method : C:\MSDCHEM\1\METHODS\8260_WT.M (RTE Integrator)
  Title        : 8260B/624 (SOP: OVL MSV01) Water 11/05/13 HPMS11
  Last Update  : Mon Dec 16 17:06:06 2013
  Response via : Initial Calibration
  DataAcq Meth : 8260_WT

   Internal Standards                R.T. QIon  Response  Conc Units Dev(Min)
   ------------------------------------------------------------------------
     1) Fluorobenzene               10.62   96  1225148    25.00 ug/L   -0.01
    56) Chlorobenzene-d5            14.26  117   943538    25.00 ug/L    0.00
    76) 1,4-Dichlorobenzene-d4      17.07  152   492148    25.00 ug/L    0.00

   System Monitoring Compounds
    37) Dibromofluoromethane         9.64  111   347330    23.4357 ug/L  0.00
     Spiked Amount     25.000   Range  86 - 118    Recovery   =   93.76%
    43) 1,2-Dichloroethane-d4       10.25   65   401299    23.9757 ug/L  0.00
     Spiked Amount     25.000   Range  80 - 120    Recovery   =   95.92%
    57) Toluene-d8                  12.48   98  1263852    26.6712 ug/L -0.01
     Spiked Amount     25.000   Range  88 - 110    Recovery   =  106.68%
    78) p-Bromofluorobenzene        15.65   95   550218    27.8379 ug/L  0.00
     Spiked Amount     25.000   Range  86 - 115    Recovery   =  111.36%

   Target Compounds                                                Qvalue
     2) Dichlorodifluoromethane      3.24   85   270402    22.3753 ug/L    97
     3) Chloromethane                3.70   50   423785    24.8448 ug/L    99
     4) Vinyl Chloride               3.94   62   391016    24.1906 ug/L    99
     5) 1,3-Butadiene                3.97   54   220899    20.5231 ug/L    97
     6) Bromomethane                 4.85   94   157921    22.7706 ug/L    99
     7) Chloroethane                 5.00   64   195050    20.7406 ug/L    99
     8) Trichlorofluoromethane       5.49  101   470329    20.8993 ug/L    99
     9) Diethyl ether                6.01   59  1071105   113.4382 ug/L    94
    10) Isoprene                     6.05   67   373937    20.1905 ug/L    88
    11) Acrolein                     6.23   56   100013   326.3685 ug/L    98
    12) 1,1,2-Trichloro-1,2,2-Trif   6.27  101   279433    21.2736 ug/L    79
    13) Acetone                      6.35   43   102393    35.9773 ug/L    86
    14) 1,1-Dichloroethene           6.57   61   435636    19.5956 ug/L    99
    15) Tert-Butyl Alcohol           6.66   59   161449   182.5933 ug/L    98
    16) Dimethyl Sulfide             6.82   62   289805    22.9757 ug/L    92
    17) Iodomethane                  7.07  142   209205    24.5342 ug/L    95
    18) Methyl acetate               7.07   43   166182    20.1517 ug/L    96
    19) Methylene Chloride           7.32   84   264343    18.5950 ug/L    99
    20) Carbon Disulfide             7.37   76   822974    20.3350 ug/L    99
    21) Acrylonitrile                7.51   53    81465    23.4570 ug/L    96
    22) Methyl Tert Butyl Ether      7.53   73   707294    21.3287 ug/L    95
    23) trans-1,2-Dichloroethene     7.77   96   260506    18.5536 ug/L    99
    24) n-Hexane                     7.83   57   341208    19.6512 ug/L    99
    25) Diisopropyl ether            8.16   45  5095332   114.6856 ug/L    99
    26) Vinyl Acetate                8.32   43   121137     7.2632 ug/L    99
    27) 1,1-Dichloroethane           8.35   63   526728    20.6509 ug/L    98
    28) Ethyl-Tert-Butyl ether       8.71   59  4448422   108.9025 ug/L    96
    29) 2-Butanone                   8.88   43    92530    22.3700 ug/L    95
    30) Propionitrile                8.99   54   128392   111.4399 ug/L    98
    31) 2,2-Dichloropropane          9.10   77   418230    17.1682 ug/L    99
    32) cis-1,2-Dichloroethene       9.16   96   289434    19.3219 ug/L    96
    33) Chloroform                   9.36   83   520014    20.2995 ug/L   100
    34) 1-Bromopropane               9.49  122    66947    25.0423 ug/L    98
    35) Bromochloromethane           9.58  130   167464    20.0580 ug/L    89
    36) Tetrahydrofuran              9.61   42   285920   116.4518 ug/L    99
    38) 1,1,1-Trichloroethane        9.86   97   462929    20.0728 ug/L    89
    39) Cyclohexane                  9.91   56   498286    20.6449 ug/L    99
    40) 1,1-Dichloropropene         10.05   75   391535    20.1982 ug/L    97
    41) Carbon Tetrachloride        10.19  117   423070    19.9488 ug/L    97
    42) Tert-Amyl-Methyl ether      10.14   73  3687098   109.5872 ug/L    95
   ------------------------------------------------------------------------
   (#) = qualifier out of range (m) = manual integration
   11M97810.D  8260_WT.M      Mon Dec 23 18:23:17 2013                    Page 1
```

```
                        Quantitation Report    (Not Reviewed)

Data File : C:\MSDchem\1\data\122313\11M97810.D          Vial: 6
Acq On    : 23 Dec 2013  18:01                       Operator: FJB
Sample    : WG457423-02 20ug/L LCS 8260              Inst    : hpms11
Misc      : 1,1 STD61695                             Multiplr: 1.00
MS Integration Params: rteint.p
Quant Time: Dec 23 18:23:15 2013          Quant Results File: 8260_WT.RES

Quant Method : C:\MSDCHEM\1\METHODS\8260_WT.M (RTE Integrator)
Title        : 8260B/624 (SOP: OVL MSV01) Water 11/05/13 HPMS11
Last Update  : Mon Dec 16 17:06:06 2013
Response via : Initial Calibration
DataAcq Meth : 8260_WT

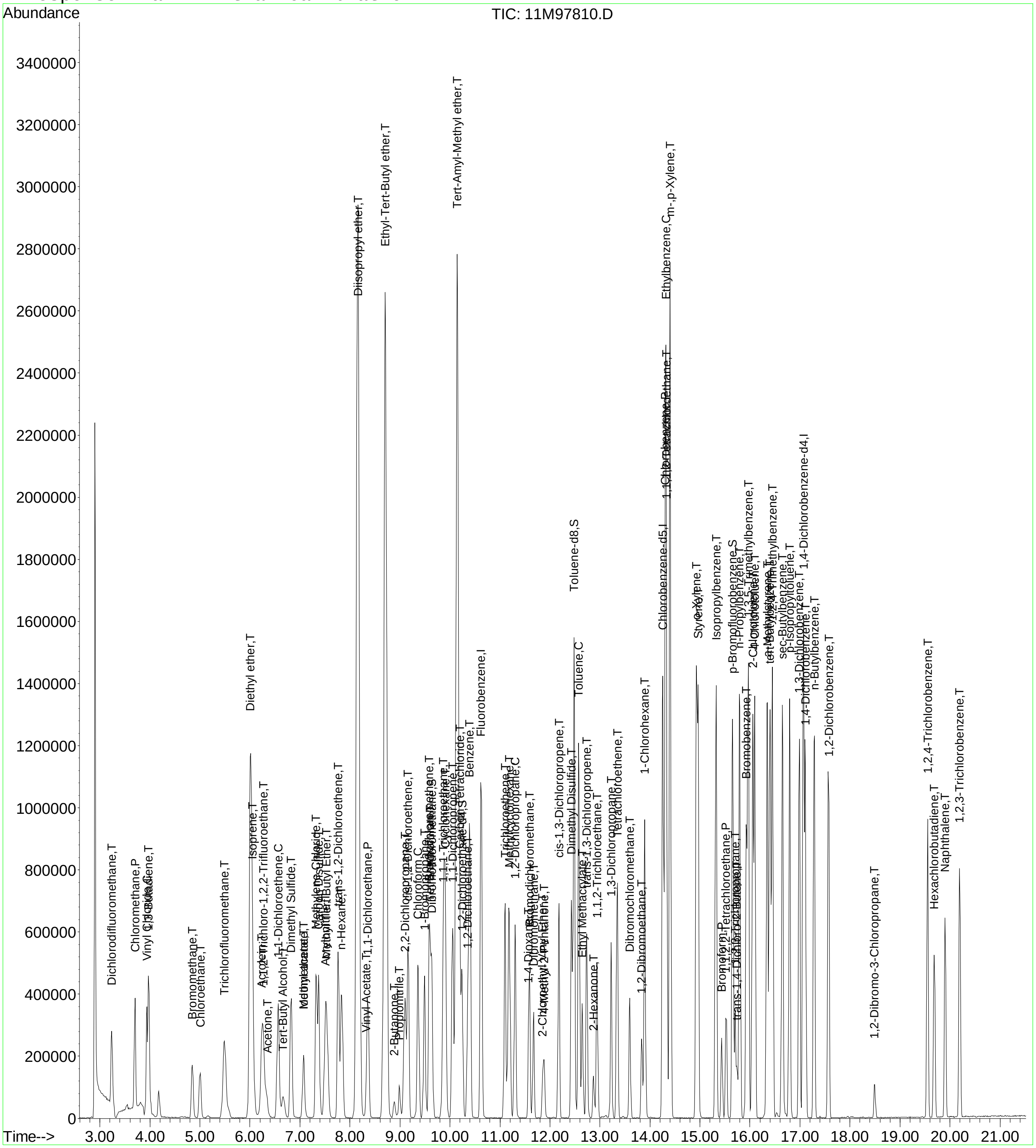

      Compound                     R.T. QIon  Response  Conc Unit   Qvalue
 -------------------------------------------------------------------------
  44) 1,2-Dichloroethane          10.35   62   391350    21.1327 ug/L    94
  45) Benzene                     10.39   78  1067993    19.9763 ug/L    99
  46) Trichloroethene             11.10  130   281357    19.1700 ug/L    99
  47) Methylcyclohexane           11.19   83   416634    20.5152 ug/L    92
  48) 1,2-Dichloropropane         11.30   63   288458    20.7418 ug/L    84
  49) 1,4-Dioxane                 11.57   88    13120   144.3243 ug/L    94
  50) Bromodichloromethane        11.59   83   377370    19.5277 ug/L    98
  51) Dibromomethane              11.67   93   159046    20.9058 ug/L    86
  52) 2-Chloroethyl Vinyl Ether   11.85   63    42505     6.5740 ug/L    99
  53) 4-Methyl-2-Pentanone        11.88   58    63016    18.7069 ug/L    98
  54) cis-1,3-Dichloropropene     12.18   75   447189    20.1625 ug/L   100
  55) Dimethyl Disulfide          12.43   79   250850    20.5721 ug/L    91
  58) Toluene                     12.57   91  1088795    20.7440 ug/L   100
  59) Ethyl Methacrylate          12.65   69   239394    18.5171 ug/L    93
  60) trans-1,3-Dichloropropene   12.74   75   364181    19.2640 ug/L    96
  61) 1,1,2-Trichloroethane       12.95   97   195907    20.5754 ug/L    93
  62) 2-Hexanone                  12.87   43   118561    19.8229 ug/L #  79
  63) 1,3-Dichloropropane         13.22   76   360587    20.7233 ug/L    96
  64) Tetrachloroethene           13.35  164   210214    18.9635 ug/L    96
  65) Dibromochloromethane        13.60  129   250458    19.6304 ug/L   100
  66) 1,2-Dibromoethane           13.83  107   195168    20.0656 ug/L    99
  67) 1-Chlorohexane              13.90   91   375145    21.1736 ug/L    92
  68) Chlorobenzene               14.30  112   762326    20.5977 ug/L    99
  69) 1,1,1,2-Tetrachloroethane   14.33  131   265386    19.2299 ug/L   100
  70) Ethylbenzene                14.32  106   400455    19.5409 ug/L    96
  71) m-,p-Xylene                 14.40  106   987016    41.5361 ug/L    91
  72) o-Xylene                    14.93  106   486874    20.0488 ug/L    91
  73) Styrene                     14.96  104   752353    19.4610 ug/L    95
  74) Bromoform                   15.44  173   137599    18.4999 ug/L    99
  75) Isopropylbenzene            15.32  105  1216724    21.7184 ug/L    97
  77) 1,1,2,2-Tetrachloroethane   15.52   83   214449    19.4600 ug/L   100
  79) 1,2,3-Trichloropropane      15.71  110    66013    20.1373 ug/L #  57
  80) trans-1,4-Dichloro-2-Buten  15.74   53    44294    11.3315 ug/L #   1
  81) n-Propylbenzene             15.79   91  1450779    21.6203 ug/L    99
  82) Bromobenzene                15.92  156   287456    19.4265 ug/L #  40
  83) 1,3,5-Trimethylbenzene      15.96  105  1034923    21.8008 ug/L    96
  84) 2-Chlorotoluene             16.06   91  1028688    23.4739 ug/L    91
  85) 4-Chlorotoluene             16.10   91   822527    18.3496 ug/L    89
  86) a-Methylstyrene             16.35  118   546667    21.5273 ug/L    91
  87) tert-Butylbenzene           16.40  134   207438    20.6238 ug/L    91
  88) 1,2,4-Trimethylbenzene      16.45  105  1035902    21.4956 ug/L    96
  89) sec-Butylbenzene            16.65  105  1233345    22.6646 ug/L    99
  90) p-Isopropyltoluene          16.79  119  1001415    21.5343 ug/L    98
  91) 1,3-Dichlorobenzene         16.99  146   576310    20.8282 ug/L    97
  92) 1,4-Dichlorobenzene         17.11  146   559685    19.2537 ug/L    97
  93) n-Butylbenzene              17.29   91   928533    22.4166 ug/L    99
  94) 1,2-Dichlorobenzene         17.58  146   547071    21.0149 ug/L    97
  95) 1,2-Dibromo-3-Chloropropan  18.49   75    34971    17.1665 ug/L    98
  96) 1,2,4-Trichlorobenzene      19.55  180   333986    18.9771 ug/L    98
  97) Hexachlorobutadiene         19.69  225   119590    17.5898 ug/L    93
  98) Naphthalene                 19.90  128   587272    17.2583 ug/L    98
  99) 1,2,3-Trichlorobenzene      20.19  180   284541    17.5589 ug/L    99


 -------------------------------------------------------------------------
 (#) = qualifier out of range (m) = manual integration
 11M97810.D  8260_WT.M      Mon Dec 23 18:23:17 2013                     Page 2
```

```
                         Quantitation Report    (Not Reviewed)

Data File : C:\MSDchem\1\data\122313\11M97810.D          Vial: 6
Acq On    : 23 Dec 2013  18:01                       Operator: FJB
Sample    : WG457423-02 20ug/L LCS 8260              Inst    : hpms11
Misc      : 1,1 STD61695                             Multiplr: 1.00
MS Integration Params: rteint.p
Quant Time: Dec 23 18:23 2013              Quant Results File: 8260_WT.RES

Method       : C:\MSDCHEM\1\METHODS\8260_WT.M (RTE Integrator)
Title        : 8260B/624 (SOP: OVL MSV01) Water 11/05/13 HPMS11
Last Update  : Mon Dec 16 17:06:06 2013
Response via : Initial Calibration
```



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11M97810.D  8260_WT.M       Mon Dec 23 18:23:17 2013                    Page 3
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```
                                Quantitation Report    (Not Reviewed)

   Data Path : D:\MassHunter\GCMS\1\data\122213\
   Data File : 17M001844.D
   Acq On    : 22 Dec 2013  19:32
   Operator  : ADC
   Sample    : WG457314-02 20ug/L LCS 8260
   Misc      : 1,1 STD61695
   ALS Vial  : 4   Sample Multiplier: 1

   Quant Time: Dec 22 19:53:46 2013
   Quant Method : D:\MassHunter\GCMS\1\methods\8260WTR.M
   Quant Title  : 8260B/624 SOP:OVL MSV01 WATER 11/15/13 HPMS17
   QLast Update : Sat Nov 16 17:30:32 2013
   Response via : Initial Calibration

           Compound                   R.T. QIon  Response  Conc Units Dev(Min)
    --------------------------------------------------------------------------
    Internal Standards
      1) Fluorobenzene              10.181   96   575701    25.00000 ug/L    -0.0106
     56) Chlorobenzene-d5           13.996  117   411202    25.00000 ug/L     0.0000
     76) 1,4-Dichlorobenzene-d4     16.971  152   200281    25.00000 ug/L     0.0000

    System Monitoring Compounds
     37) Dibromofluoromethane        9.135  111   190954    26.6351 ug/L   -0.0104
      Spiked Amount     25.000   Range  86 - 118    Recovery   =  106.540%
     43) 1,2-Dichloroethane-d4       9.777   65   178308    25.2371 ug/L   -0.0108
      Spiked Amount     25.000   Range  80 - 120    Recovery   =  100.948%
     57) Toluene-d8                 12.140   98   629967    25.1095 ug/L    0.0000
      Spiked Amount     25.000   Range  88 - 110    Recovery   =  100.438%
     78) p-Bromofluorobenzene       15.478   95   219799    22.6372 ug/L    0.0000
      Spiked Amount     25.000   Range  86 - 115    Recovery   =   90.549%

    Target Compounds                                                 Qvalue
      2) Dichlorodifluoromethane     2.563   85   133022    24.9081 ug/L      99
      3) Chloromethane               2.967   50   203962    23.1762 ug/L      99
      4) Vinyl Chloride              3.175   62   183441    21.2218 ug/L     100
      5) 1,3-Butadiene               3.216   54    75530    18.5556 ug/L      99
      6) Bromomethane                4.024   94    85852    17.0191 ug/L      99
      7) Chloroethane                4.201   64    87305    20.1629 ug/L      99
      8) Trichlorofluoromethane      4.709  101   216041    22.2124 ug/L     100
      9) Diethyl ether               5.299   59   472229   109.5897 ug/L     100
     10) Isoprene                    5.310   67   170832    19.0936 ug/L     100
     11) Acrolein                    5.527   56    54125   362.4569 ug/L      94
     12) 1,1,2-Trichloro-1,2,2-...   5.548  101   132568    22.4804 ug/L      97
     13) Acetone                     5.652   43    33250    28.8434 ug/L      98
     14) 1,1-Dichloroethene          5.849   61   173374    19.2043 ug/L      99
     15) Tert-Butyl Alcohol          6.025   59    94262   239.6709 ug/L      93
     16) Dimethyl Sulfide            6.118   62   129641    21.9057 ug/L      99
     17) Iodomethane                 6.357  142    98231    11.8928 ug/L      98
     18) Methyl acetate              6.450   43    73550    24.1774 ug/L      98
     19) Methylene Chloride          6.678   84   136623    20.2642 ug/L      98
     20) Carbon Disulfide            6.647   76   365457    18.6337 ug/L     100
     21) Acrylonitrile               6.885   53    35147    23.9098 ug/L      98
     22) Methyl Tert Butyl Ether     6.916   73   361391    23.6891 ug/L     100
     23) trans-1,2-Dichloroethene    7.134   96   125849    19.9041 ug/L      98
     24) n-Hexane                    7.238   57   118263    17.6133 ug/L      99
     25) Diisopropyl ether           7.621   45  1918843   105.7849 ug/L      99
     26) Vinyl Acetate               7.797   43   143829    18.9805 ug/L      99
     27) 1,1-Dichloroethane          7.787   63   233460    20.4700 ug/L     100
     28) Ethyl-Tert-Butyl ether      8.212   59  2011652   108.8136 ug/L     100
     29) 2-Butanone                  8.378   43    40086    23.1364 ug/L      99
     30) Propionitrile               8.482   54    62138   122.4525 ug/L     100
     31) 2,2-Dichloropropane         8.575   77   183911    18.3724 ug/L      95
     32) cis-1,2-Dichloroethene      8.637   96   148277    20.2171 ug/L      97
     33) Chloroform                  8.855   83   252031    21.1671 ug/L      99
     34) 1-Bromopropane              8.979  122    34342    23.8996 ug/L      98
     35) Bromochloromethane          9.072  130    98471    21.3757 ug/L     100
     36) Tetrahydrofuran             9.114   42   121916   118.4830 ug/L      99
     38) 1,1,1-Trichloroethane       9.373   97   223421    20.4586 ug/L      99
     39) Cyclohexane                 9.394   56   190545    18.8957 ug/L      99
     40) 1,1-Dichloropropene         9.580   75   167290    20.2148 ug/L      98
     41) Tert-Amyl-Methyl ether      9.705   73  1933707   114.3463 ug/L      99
     42) Carbon Tetrachloride        9.705  117   210772    21.0162 ug/L     100
     44) 1,2-Dichloroethane          9.902   62   170069    20.5923 ug/L      99
     45) Benzene                     9.922   78   509664    20.3131 ug/L     100
     46) Trichloroethene            10.679  130   148899    19.5671 ug/L      97
     47) Methylcyclohexane          10.762   83   202001    19.2658 ug/L     100
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                         Quantitation Report    (Not Reviewed)

Data Path : D:\MassHunter\GCMS\1\data\122213\
Data File : 17M001844.D
Acq On    : 22 Dec 2013  19:32
Operator  : ADC
Sample    : WG457314-02 20ug/L LCS 8260
Misc      : 1,1 STD61695
ALS Vial  : 4   Sample Multiplier: 1

Quant Time: Dec 22 19:53:46 2013
Quant Method : D:\MassHunter\GCMS\1\methods\8260WTR.M
Quant Title  : 8260B/624 SOP:OVL MSV01 WATER 11/15/13 HPMS17
QLast Update : Sat Nov 16 17:30:32 2013
Response via : Initial Calibration

        Compound                   R.T. QIon  Response  Conc Units Dev(Min)
 --------------------------------------------------------------------------
  48) 1,2-Dichloropropane        10.897   63   129711    20.4320 ug/L      99
  49) 1,4-Dioxane                11.197   88     8809   188.2038 ug/L      97
  50) Bromodichloromethane       11.187   83   185471    20.3503 ug/L      99
  51) Dibromomethane             11.259   93    83806    21.4163 ug/L      98
  52) 2-Chloroethyl Vinyl Ether  11.519   63    64580    27.5768 ug/L      99
  53) 4-Methyl-2-Pentanone       11.550   58    36704    22.6738 ug/L      99
  54) cis-1,3-Dichloropropene    11.830   75   213122    20.8814 ug/L     100
  55) Dimethyl Disulfide         12.068   79   130544    19.5812 ug/L     100
  58) Toluene                    12.234   91   544663    19.5761 ug/L      99
  59) Ethyl Methacrylate         12.369   69   145722    20.9170 ug/L      98
  60) trans-1,3-Dichloropropene  12.431   75   175632    19.4670 ug/L     100
  61) 1,1,2-Trichloroethane      12.628   97   109702    21.1904 ug/L     100
  62) 2-Hexanone                 12.597   43    60562    22.2671 ug/L      98
  63) 1,3-Dichloropropane        12.928   76   184032    20.7158 ug/L      97
  64) Tetrachloroethene          13.032  166   162629    20.5300 ug/L      97
  65) Dibromochloromethane       13.291  129   148738    21.1738 ug/L     100
  66) 1,2-Dibromoethane          13.540  107   111728    20.6806 ug/L      99
  67) 1-Chlorohexane             13.664   91   173542    19.4095 ug/L      99
  68) Chlorobenzene              14.037  112   391402    20.4351 ug/L      99
  69) 1,1,1,2-Tetrachloroethane  14.079  131   148748    19.4499 ug/L      99
  70) Ethylbenzene               14.079  106   197459    18.8466 ug/L      99
  71) m-,p-Xylene                14.172  106   493301    39.1726 ug/L      99
  72) o-Xylene                   14.721  106   248100    19.7887 ug/L     100
  73) Styrene                    14.763  104   390785    19.3587 ug/L     100
  74) Bromoform                  15.219  173   107610    20.0039 ug/L     100
  75) Isopropylbenzene           15.146  105   627654    20.5210 ug/L     100
  77) 1,1,2,2-Tetrachloroethane  15.364   83   132648    22.8506 ug/L     100
  79) 1,2,3-Trichloropropane     15.551  110    39055    21.2882 ug/L     100
  80) trans-1,4-Dichloro-2-B...  15.603   53    21517    12.9110 ug/L      98
  81) n-Propylbenzene            15.644   91   704364    19.5032 ug/L      99
  82) Bromobenzene               15.748  156   177121    20.4397 ug/L      97
  83) 1,3,5-Trimethylbenzene     15.831  105   517612    19.2835 ug/L      99
  84) 2-Chlorotoluene            15.893   91   459779    20.2484 ug/L      99
  85) 4-Chlorotoluene            15.945   91   408106    18.8725 ug/L     100
  86) a-Methylstyrene            16.235  118   290536    17.9504 ug/L     100
  87) tert-Butylbenzene          16.287  134   118071    20.1554 ug/L      97
  88) 1,2,4-Trimethylbenzene     16.338  105   522151    19.2386 ug/L      99
  89) sec-Butylbenzene           16.556  105   672457    20.2453 ug/L     100
  90) p-Isopropyltoluene         16.712  119   538991    19.5491 ug/L     100
  91) 1,3-Dichlorobenzene        16.877  146   319904    20.1871 ug/L      98
  92) 1,4-Dichlorobenzene        17.012  146   306372    19.9230 ug/L      99
  93) n-Butylbenzene             17.230   91   448896    18.2884 ug/L     100
  94) 1,2-Dichlorobenzene        17.489  146   321487    21.3601 ug/L      99
  95) 1,2-Dibromo-3-Chloropr...  18.474   75    22678    20.7982 ug/L      98
  96) 1,2,4-Trichlorobenzene     19.604  180   233312    18.8801 ug/L      99
  97) Hexachlorobutadiene        19.769  225   121733    18.0868 ug/L     100
  98) Naphthalene                19.956  128   446807    22.7950 ug/L     100
  99) 1,2,3-Trichlorobenzene     20.267  180   232012    20.3470 ug/L      99
 --------------------------------------------------------------------------

 (#) = qualifier out of range (m) = manual integration (+) = signals summed
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                         Quantitation Report    (Not Reviewed)

Data Path : D:\MassHunter\GCMS\1\data\122213\
Data File : 17M001844.D
Acq On    : 22 Dec 2013  19:32
Operator  : ADC
Sample    : WG457314-02 20ug/L LCS 8260
Misc      : 1,1 STD61695
ALS Vial  : 4   Sample Multiplier: 1

Quant Time: Dec 22 19:53:46 2013
Quant Method : D:\MassHunter\GCMS\1\methods\8260WTR.M
Quant Title  : 8260B/624 SOP:OVL MSV01 WATER 11/15/13 HPMS17
QLast Update : Sat Nov 16 17:30:32 2013
Response via : Initial Calibration
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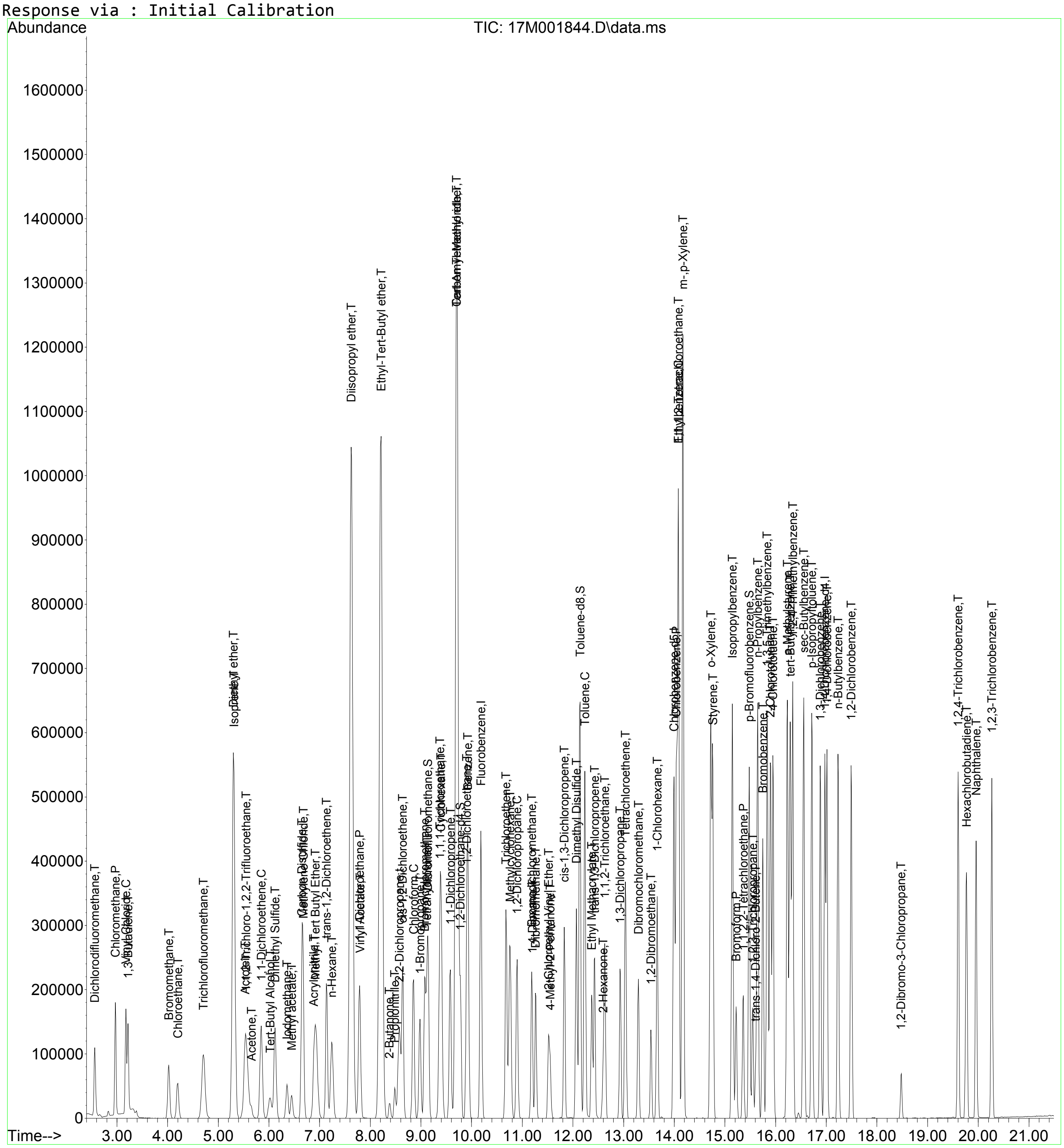

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8260WTR.M Sun Dec 22 19:53:47 2013                                    Page: 3
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                          Quantitation Report    (Not Reviewed)

Data File : C:\MSDchem\1\data\122313\11M97811.D          Vial: 7
Acq On    : 23 Dec 2013  18:32                       Operator: FJB
Sample    : WG457423-03 20ug/L LCS DUP 8260          Inst    : hpms11
Misc      : 1,1 STD61695                             Multiplr: 1.00
MS Integration Params: rteint.p
Quant Time: Dec 23 18:54:38 2013          Quant Results File: 8260_WT.RES

Quant Method : C:\MSDCHEM\1\METHODS\8260_WT.M (RTE Integrator)
Title        : 8260B/624 (SOP: OVL MSV01) Water 11/05/13 HPMS11
Last Update  : Mon Dec 16 17:06:06 2013
Response via : Initial Calibration
DataAcq Meth : 8260_WT

 Internal Standards                   R.T. QIon  Response  Conc Units Dev(Min)
--------------------------------------------------------------------------
   1) Fluorobenzene                 10.62   96  1259386    25.00 ug/L   -0.01
  56) Chlorobenzene-d5              14.26  117   958814    25.00 ug/L    0.00
  76) 1,4-Dichlorobenzene-d4        17.07  152   502280    25.00 ug/L    0.00

 System Monitoring Compounds
  37) Dibromofluoromethane           9.64  111   350973    23.0377 ug/L  0.00
   Spiked Amount     25.000   Range  86 - 118    Recovery   =   92.16%
  43) 1,2-Dichloroethane-d4         10.25   65   404096    23.4865 ug/L  0.00
   Spiked Amount     25.000   Range  80 - 120    Recovery   =   93.96%
  57) Toluene-d8                    12.48   98  1273605    26.4488 ug/L -0.01
   Spiked Amount     25.000   Range  88 - 110    Recovery   =  105.80%
  78) p-Bromofluorobenzene          15.65   95   548372    27.1849 ug/L  0.00
   Spiked Amount     25.000   Range  86 - 115    Recovery   =  108.72%

 Target Compounds                                                   Qvalue
   2) Dichlorodifluoromethane        3.24   85   282571    22.7466 ug/L    94
   3) Chloromethane                  3.70   50   431913    24.6330 ug/L    98
   4) Vinyl Chloride                 3.93   62   391277    23.5486 ug/L    99
   5) 1,3-Butadiene                  3.97   54   221808    19.9437 ug/L    96
   6) Bromomethane                   4.85   94   148851    20.8793 ug/L    97
   7) Chloroethane                   5.00   64   198993    20.5846 ug/L    98
   8) Trichlorofluoromethane         5.49  101   479575    20.7308 ug/L   100
   9) Diethyl ether                  6.01   59  1109230   114.2822 ug/L    95
  10) Isoprene                       6.05   67   386768    20.3156 ug/L    87
  11) Acrolein                       6.23   56   111804   345.4982 ug/L    94
  12) 1,1,2-Trichloro-1,2,2-Trif     6.27  101   276245    20.4592 ug/L    82
  13) Acetone                        6.34   43   102188    34.9292 ug/L    87
  14) 1,1-Dichloroethene             6.57   61   438394    19.1836 ug/L    99
  15) Tert-Butyl Alcohol             6.66   59   181884   200.1123 ug/L    99
  16) Dimethyl Sulfide               6.82   62   299475    23.0969 ug/L    90
  17) Iodomethane                    7.07  142   202723    23.4877 ug/L    96
  18) Methyl acetate                 7.07   43   181273    21.3841 ug/L    96
  19) Methylene Chloride             7.32   84   269678    18.4546 ug/L    98
  20) Carbon Disulfide               7.37   76   827832    19.8989 ug/L   100
  21) Acrylonitrile                  7.50   53    84112    23.5608 ug/L    97
  22) Methyl Tert Butyl Ether        7.53   73   726553    21.3138 ug/L    97
  23) trans-1,2-Dichloroethene       7.77   96   259391    17.9720 ug/L    98
  24) n-Hexane                       7.84   57   349105    19.5594 ug/L    99
  25) Diisopropyl ether              8.16   45  5215468   114.1983 ug/L    99
  26) Vinyl Acetate                  8.32   43   138407     8.0731 ug/L    98
  27) 1,1-Dichloroethane             8.35   63   525451    20.0408 ug/L    97
  28) Ethyl-Tert-Butyl ether         8.71   59  4581785   109.1179 ug/L    97
  29) 2-Butanone                     8.88   43    98473    23.1596 ug/L    96
  30) Propionitrile                  9.00   54   140283   118.4507 ug/L    96
  31) 2,2-Dichloropropane            9.10   77   412493    16.4723 ug/L   100
  32) cis-1,2-Dichloroethene         9.16   96   288673    18.7472 ug/L    95
  33) Chloroform                     9.36   83   512761    19.4722 ug/L    99
  34) 1-Bromopropane                 9.49  122    65760    23.9295 ug/L    99
  35) Bromochloromethane             9.58  130   171136    19.9406 ug/L    90
  36) Tetrahydrofuran                9.61   42   303642   120.3076 ug/L    99
  38) 1,1,1-Trichloroethane          9.86   97   465351    19.6293 ug/L    89
  39) Cyclohexane                    9.90   56   507811    20.4676 ug/L    99
  40) 1,1-Dichloropropene           10.05   75   382120    19.1766 ug/L    99
  41) Carbon Tetrachloride          10.19  117   428088    19.6366 ug/L    98
  42) Tert-Amyl-Methyl ether        10.14   73  3800292   109.8808 ug/L    94
--------------------------------------------------------------------------
(#) = qualifier out of range (m) = manual integration
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                              Quantitation Report    (Not Reviewed)

      Data File : C:\MSDchem\1\data\122313\11M97811.D          Vial: 7
      Acq On    : 23 Dec 2013  18:32                         Operator: FJB
      Sample    : WG457423-03 20ug/L LCS DUP 8260            Inst    : hpms11
      Misc      : 1,1 STD61695                               Multiplr: 1.00
      MS Integration Params: rteint.p
      Quant Time: Dec 23 18:54:38 2013          Quant Results File: 8260_WT.RES

      Quant Method : C:\MSDCHEM\1\METHODS\8260_WT.M (RTE Integrator)
      Title        : 8260B/624 (SOP: OVL MSV01) Water 11/05/13 HPMS11
      Last Update  : Mon Dec 16 17:06:06 2013
      Response via : Initial Calibration
      DataAcq Meth : 8260_WT


            Compound                     R.T. QIon  Response  Conc Unit   Qvalue
       -------------------------------------------------------------------------
        44) 1,2-Dichloroethane          10.35   62   386940    20.3266 ug/L    94
        45) Benzene                     10.39   78  1068040    19.4341 ug/L    99
        46) Trichloroethene             11.10  130   282535    18.7269 ug/L    99
        47) Methylcyclohexane           11.18   83   425251    20.3703 ug/L    92
        48) 1,2-Dichloropropane         11.30   63   284557    19.9051 ug/L    84
        49) 1,4-Dioxane                 11.57   88    17748   189.9261 ug/L    90
        50) Bromodichloromethane        11.59   83   376346    18.9453 ug/L    98
        51) Dibromomethane              11.67   93   158788    20.3045 ug/L    88
        52) 2-Chloroethyl Vinyl Ether   11.85   63    40900     6.1537 ug/L   100
        53) 4-Methyl-2-Pentanone        11.88   58    67918    19.6140 ug/L    94
        54) cis-1,3-Dichloropropene     12.18   75   447797    19.6410 ug/L   100
        55) Dimethyl Disulfide          12.43   79   247808    19.7701 ug/L    88
        58) Toluene                     12.57   91  1093761    20.5066 ug/L   100
        59) Ethyl Methacrylate          12.65   69   247293    18.8233 ug/L    93
        60) trans-1,3-Dichloropropene   12.74   75   364732    18.9858 ug/L    98
        61) 1,1,2-Trichloroethane       12.93   97   197326    20.3942 ug/L    95
        62) 2-Hexanone                  12.87   43   121931    20.0616 ug/L #  81
        63) 1,3-Dichloropropane         13.22   76   364859    20.6348 ug/L    95
        64) Tetrachloroethene           13.35  164   207508    18.4211 ug/L    93
        65) Dibromochloromethane        13.60  129   252248    19.4557 ug/L    96
        66) 1,2-Dibromoethane           13.83  107   197701    20.0022 ug/L   100
        67) 1-Chlorohexane              13.90   91   381102    21.1671 ug/L    89
        68) Chlorobenzene               14.30  112   775348    20.6158 ug/L    99
        69) 1,1,1,2-Tetrachloroethane   14.33  131   267798    19.0955 ug/L    99
        70) Ethylbenzene                14.32  106   400837    19.2479 ug/L    95
        71) m-,p-Xylene                 14.40  106   975272    40.3880 ug/L    93
        72) o-Xylene                    14.93  106   483261    19.5830 ug/L    92
        73) Styrene                     14.96  104   757572    19.2837 ug/L    94
        74) Bromoform                   15.44  173   141767    18.7566 ug/L    98
        75) Isopropylbenzene            15.32  105  1213156    21.3097 ug/L    97
        77) 1,1,2,2-Tetrachloroethane   15.52   83   218968    19.4693 ug/L    96
        79) 1,2,3-Trichloropropane      15.71  110    67867    20.2852 ug/L #  59
        80) trans-1,4-Dichloro-2-Buten  15.74   53    42793    10.7609 ug/L #   1
        81) n-Propylbenzene             15.79   91  1441421    21.0476 ug/L   100
        82) Bromobenzene                15.93  156   289338    19.1592 ug/L #  42
        83) 1,3,5-Trimethylbenzene      15.96  105  1020806    21.0696 ug/L    94
        84) 2-Chlorotoluene             16.06   91  1038022    23.2091 ug/L    90
        85) 4-Chlorotoluene             16.10   91   827716    18.0929 ug/L    89
        86) a-Methylstyrene             16.35  118   541055    20.8766 ug/L    92
        87) tert-Butylbenzene           16.40  134   203481    19.8223 ug/L    90
        88) 1,2,4-Trimethylbenzene      16.45  105  1039254    21.1302 ug/L    96
        89) sec-Butylbenzene            16.65  105  1247506    22.4624 ug/L    98
        90) p-Isopropyltoluene          16.79  119  1011079    21.3035 ug/L    99
        91) 1,3-Dichlorobenzene         16.99  146   575745    20.3881 ug/L    97
        92) 1,4-Dichlorobenzene         17.11  146   562907    18.9739 ug/L    96
        93) n-Butylbenzene              17.28   91   927140    21.9314 ug/L    99
        94) 1,2-Dichlorobenzene         17.57  146   541472    20.3802 ug/L    98
        95) 1,2-Dibromo-3-Chloropropan  18.50   75    38258    18.4012 ug/L    86
        96) 1,2,4-Trichlorobenzene      19.55  180   336617    18.7408 ug/L   100
        97) Hexachlorobutadiene         19.69  225   119649    17.2435 ug/L    91
        98) Naphthalene                 19.90  128   611590    17.6104 ug/L    98
        99) 1,2,3-Trichlorobenzene      20.19  180   294855    17.8283 ug/L    99

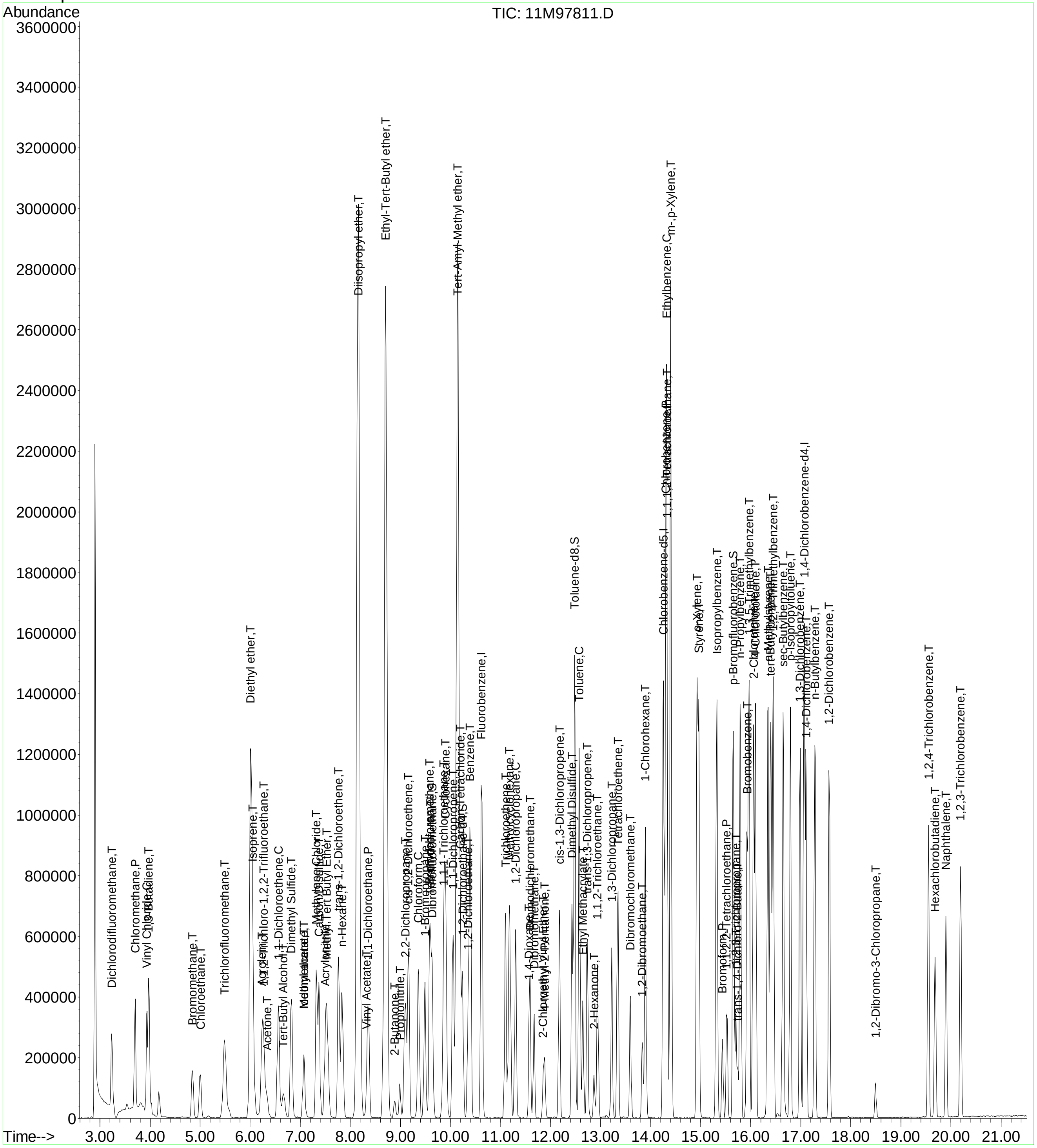

       -------------------------------------------------------------------------
       (#) = qualifier out of range (m) = manual integration
       11M97811.D  8260_WT.M      Mon Dec 23 18:54:40 2013                          Page 2
```

Quantitation Report   (Not Reviewed)

00193104

```
Data File : C:\MSDchem\1\data\122313\11M97811.D         Vial: 7
Acq On    : 23 Dec 2013  18:32                      Operator: FJB
Sample    : WG457423-03 20ug/L LCS DUP 8260         Inst    : hpms11
Misc      : 1,1 STD61695                            Multiplr: 1.00
MS Integration Params: rteint.p
Quant Time: Dec 23 18:54 2013            Quant Results File: 8260_WT.RES

Method        : C:\MSDCHEM\1\METHODS\8260_WT.M (RTE Integrator)
Title         : 8260B/624 (SOP: OVL MSV01) Water 11/05/13 HPMS11
Last Update   : Mon Dec 16 17:06:06 2013
Response via  : Initial Calibration
```



```
11M97811.D  8260_WT.M       Mon Dec 23 18:54:40 2013                  Page 3
```

3.0 Attachments

Microbac Laboratories Inc.
Ohio Valley Division Analyst List
December 26, 2013

---

001 - BIO-CHEM TESTING WVDEP 220
002 - REIC Consultants, Inc. WVDEP 060
003 - Sturm Environmental
004 - MICROBAC PITTSBURGH
005 - ES LABORATORIES
ADC - ANTHONY D. CANTER
ADG - APRIL D. GREENE
AJF - AMANDA J. FICKIESEN
AML - TONY M. LONG
AZH - AFTER HOURS
BAF - BRICE A. FENTON
BJO - BRIAN J. OGDEN
BLG - BRENDA L. GREENWALT
BRG - BRENDA R. GREGORY
CAA - CASSIE A. AUGENSTEIN
CAF - CHERYL A. FLOWERS
CEB - CHAD E. BARNES
CLC - CHRYS L. CRAWFORD
CLS - CARA L. STRICKLER
CLW - CHARISSA L. WINTERS
CPD - CHAD P. DAVIS
CRW - CHRISTINA R. WILSON
CSH - CHRIS S. HILL
CTB - CHRIS T. BUCINA
DAK - DEAN A. K
DCM - DAVID C. MERCKLE
DDE - DEBRA D. ELLIOTT
DEV - DAVID E. VANDENBERG
DIH - DEANNA I. HESSON
DLB - DAVID L. BUMGARNER
DLP - DOROTHY L. PAYNE
DLR - DIANNA L. RAUCH
DSM - DAVID S. MOSSOR
ECL - ERIC C. LAWSON
EDL - ERIN D. LONG
ENY - EMILY N. YOAK
EPT - ETHAN P. TIDD
ERP - ERIN R. PORTER
FJB - FRANCES J. BOLDEN
HCB - HEIDI C. BROWN
HJR - HOLLY J. REED
JBK - JEREMY B. KINNEY
JDH - JUSTIN D. HESSON
JKS - JANE K. SCHAAD
JLL - JOHN L. LENT
JWR - JOHN W. RICHARDS
JWS - JACK W. SHEAVES
JYH - JI Y. HU
KDW - KATHRYN D. WELCH
KEB - KATIE E. BARNES
KHR - KIM H. RHODES
KRA - KATHY R. ALBERTSON
KRB - KAELY R. BECKER
KSC - KELLY S. CUNNINGHAM
LKN - LINDA K. NEDEFF
LLS - LARRY L. STEPHENS
LSB - LESLIE S. BUCINA
MBK - MORGAN B. KNOWLTON
MDA - MIKE D. ALBERTSON
MDC - MIKE D. COCHRAN
MES - MARY E. SCHILLING
MLW - MATTHEW L. WARREN
MMB - MAREN M. BEERY
MRT - MICHELLE R. TAYLOR
MSW - MATT S. WILSON
PDM - PIERCE D. MORRIS
PIT - MICROBAC WARRENDALE
PSW - PEGGY S. WEBB
QX - QIN XU
RAH - ROY A. HALSTEAD
REK - BOB E. KYER
RLB - BOB BUCHANAN
RM - RAYMOND MALEKE
RNP - RICK N. PETTY
RS - ROSEMARY SCOTT
RWC - RODNEY W. CAMPBELL
SAV - SARAH A. VANDENBERG
SEP - SUZANNE J. PAUGH
SLM - STEPHANIE L. MOSSBURG
SLP - SHERI L. PFALZGRAF
TLC - TYLER L. CORDELL
TMB - TIFFANY M. BAILEY
TMM - TAMMY M. MORRIS
TPA - TYLER P. AMRINE
VC - VICKI COLLIER
WJB - WILL J. BEASLEY
WTD - WADE T. DELONG
XXX - UNAVAILABLE OR SUBCONTRACT

Microbac Laboratories Inc.
List of Valid Qualifiers
December 26, 2013

Qualkey: DOD

Qualifier	Description
*	Surrogate or spike compound out of range
+	Correlation coefficient for the MSA is less than 0.995
<	Result is less than the associated numerical value.
>	Greater than
A	See the report narrative
B	The reported result is associated with a contaminated method blank.
B1	Target analyte detected in method blank at or above the method reporting limit
B3	Target analyte detected in calibration blank at or above the method reporting limit
B4	The BOD unseeded dilution water blank exceeded 0.2 mg/L
C	Confirmed by GC/MS
CG	Confluent growth
CT1	The cooler temperature at receipt exceeded regulatory guidelines for requested testing.
DL	Surrogate or spike compound was diluted out
E	Estimated concentration due to sample matrix interference
EDL	Elevated sample reporting limits, presence of non-target analytes
EMPC	Estimated Maximum Possible Concentration
F, S	Estimated result below quantitation limit; method of standard additions(MSA)
F,CT1	Estimated value; the analyte concentration was less than the RL/LOQ. The cooler temperature at receipt exceeded regula
FL	Free Liquid
H1	Sample analysis performed past holding time.
I	Semiquantitative result (out of instrument calibration range)
J	Estimated concentration; sample matrix interference.
J	Estimated value ; the analyte concentration was greater than the highest standard
J	Estimated value ; the analyte concentration was less than the LOQ.
J	The reported result is an estimated value.
J,B	Analyte detected in both the method blank and sample above the MDL.
J,CT1	Estimated value; the analyte concentration was less than the RL/LOQ.
J,CT1	Estimated value; the analyte concentration was less than the RL/LOQ. The cooler temperature at receipt exceeded regula
J,P	Estimate; columns don't agree to within 40%
J,S	Estimated concentration; analyzed by method of standard addition (MSA)
JB	The reported result is an estimated value. The reported result is also associated with a contaminated method blank.
JQ	The reported result is an estimated value and one or more quality control criteria failed. See narrative.
L	Sample reporting limits elevated due to matrix interference
L1	The associated blank spike (LCS) recovery was above the laboratory acceptance limits.
L2	The associated blank spike (LCS) recovery was below the laboratory acceptance limits.
M	Matrix effect; the concentration is an estimate due to matrix effect.
N	Nontarget analyte; the analyte is a tentativlely identified compound (TIC) by GC/MS
NA	Not applicable
ND	Not detected at or above the reporting limit (RL/MDL).
ND, CT1	Analyte was not detected. The concentration is below the reported LOD. The cooler temperature at receipt exceeded reg
ND, H1	Not detected; Sample analysis performed past holding time.
ND, L	Not detected; sample reporting limit (RL) elevated due to interference
ND, S	Not detected; analyzed by method of standard addition (MSA)
NF	Not found by library search
NFL	No free liquid
NI	Non-ignitable
NR	Analyte is not required to be analyzed
NS	Not spiked
P	Concentrations >40% difference between the two GC columns
Q	One or more quality control criteria failed. See narrative.
QNS	Quantity of sample not sufficient to perform analysis
RA	Reanalysis confirms reported results
RE	Reanalysis confirms sample matrix interference
S	Analyzed by method of standard addition (MSA)
SMI	Sample matrix interference on surrogate
SP	Reported results are for spike compounds only
TIC	Library Search Compound
TNTC	Too numerous to count
U	Analyte was not detected. The concentration is below the reported LOD.
UJ	Undetected; the MDL and RL are estimated due to quality control discrepancies.
UQ	Undetected; the analyte was analyzed for, but not detected.
W	Post-digestion spike for furnace AA out of control limits
X	Exceeds regulatory limit
X, S	Exceeds regulatory limit; method of standard additions (MSA)
Z	Cannot be resolved from isomer - see below

AECOM

Chain of Custody Record

COC Number:

Laboratory: Microbac POC: Kathy Albertson
Address: 158 Starlite Drive
Marietta, OH 45750
Phone: 1-800-373-4071
Client: AECOM
Address: 112 East Pecan Ste. 400
San Antonio, TX 78205
Turn Around Time: STANDARD
Project Name/Location: Longhorn
Project Number: 60256135.0005AA

Project Manager: Dave Wacker
Phone/Fax Number: 210-296-2000
Sampler (print): Scott Beesinger
Signature: Scott Beesinger
pH:

Mail to: Linda Raabe
112 East Pecan STE. 400
San Antonio, TX 78205
210-296-2000
Fed Ex Airbill No:
Program:

Site Name	Sample ID/Location ID	SBD	SED	Date	Time	Comp*	Grab	Matrix	Number of Containers	VOC								SA CODE	Cooler ID	ABLOT	EBLOT	TBLOT
																		ERPIMS REQUIRED FIELDS		LOT CONTROL NUMBERS		
SITE 12	12WW24-121113			12/11/13	0730		✓	W	3	✓												
	Trip Blank			12/11/13			✓	W	2	✓												

Comments: STANDARD TAT

Relinquished by: (Signature) Scott Beesinger	Date 12/12/13	Time 1500		Date	Time	Relinquished by: (Signature)
Relinquished by: (Signature)	Date	Time			Time	Remarks:

Microbac OVD
Received: 12/13/2013 10:21
By: ROSEMARY SCOTT 221000046819
Rosemary Scott

*Homogenize all composite samples prior to analysis

Distribution: White to Laboratory, Canary to Project Manager, Pink QA/QC Manager

Microbac Laboratories Inc.

Internal Chain of Custody Report

Login: L13120825
Account: 2551
Project: 2551.096
Samples: 2
Due Date: 24-DEC-2013

Samplenum	**Container ID**	**Products**
L13120825-01	292797	826-LOW

Bottle: 1

Seq.	Purpose	From	To	Date/Time	Accept	Relinquish	pH
1	LOGIN	COOLER	V1	13-DEC-2013 14:29	RS		<2
2	ANALYZ	V1	ORG4	13-DEC-2013 17:42	FJB	AZH	

Bottle: 2

Seq.	Purpose	From	To	Date/Time	Accept	Relinquish	pH
1	LOGIN	COOLER	V1	13-DEC-2013 14:29	RS		<2
2	ANALYZ	V1	ORG4	13-DEC-2013 17:42	FJB	AZH	

Bottle: 3

Seq.	Purpose	From	To	Date/Time	Accept	Relinquish	pH
1	LOGIN	COOLER	V1	13-DEC-2013 14:29	RS		<2
2	ANALYZ	V1	ORG4	13-DEC-2013 17:42	FJB	AZH	

Samplenum	**Container ID**	**Products**
L13120825-02	292798	826-LOW

Bottle: 1

Seq.	Purpose	From	To	Date/Time	Accept	Relinquish	pH
1	LOGIN	COOLER	V1	13-DEC-2013 14:29	RS		<2
2	ANALYZ	V1	ORG4	13-DEC-2013 17:42	FJB	AZH	

Bottle: 2

Seq.	Purpose	From	To	Date/Time	Accept	Relinquish	pH
1	LOGIN	COOLER	V1	13-DEC-2013 14:29	RS		<2
2	ANALYZ	V1	ORG4	13-DEC-2013 17:42	FJB	AZH	

A1 - Sample Archive (COLD)
A2 - Sample Archive (AMBIENT)
F1 - Volatiles Freezer in Login
V1 - Volatiles Refrigerator in Login
W1 - Walkin Cooler in Login

NELAP Addendum - November 13, 2013

Non-NELAP LIMS Product and Description

The following is a list of those tests that are not included in the Microbac – OVL NELAP Scope of Accreditation:

Heat of Combustion (BTU)
Total Halide by Bomb Combustion (TX)
Particle Sizing - 200 Mesh (PS200)
Specific Gravity/Density (SPGRAV)
Total Residual Chlorine (CL-TRL)
Total Volatile Solids (all forms) (TVS)
Total Coliform Bacteria (all methods)
Fecal Coliform Bacteria (all methods)
Sulfite (SO3)
Thiodiglycol (TDG-LCMS)

NELAP Accreditation by Laboratory SOP

NONPOTABLE WATER

OVL HPLC02/HPLC-UV

Nitroglycerin
Nitroguanidine
Acetic acid
Butyric acid
Lactic acid
Propionic acid
Pyruvic acid

OVL KNITRO-C-WUV-VIS

Nitrocellulose

OVL MSS01/GC-MS

1,4-Phenylenediamine
1-Methylnaphthalene
1,4-Dioxane
Atrazine
Benzaldehyde
Biphenyl
Caprolactam
Hexamethylphosphoramide (HMPA)
Pentachlorobenzene
Pentachloroethane

NELAP Accreditation by Laboratory SOP

NONPOTABLE WATER

OVL MSV0I/GC-MS

1, 1, 2-Trichloro-1,2,2-trifluoroethane
1,3-Butadiene
Cyclohexane
Cyclohexanone
Dimethyl disulfide
Dimethylsulfide
Ethyl-t-butylether (ETBE)
Isoprene
Methylacetate
Methylcyclohexane
T-amylmethylether (TAME)
Tetrahydrofuran (THF)

OVL RSKOI/GC-FID

Isobutane
n-Butane
Propane
Propylene
Propyne

OVL HPLC07/HPLC-MS-MS

Hexamethylphosphoramide (XMPA-LCMS)

SOLID AND HAZARDOUS CHEMICALS

OVL HPLCOS-HPLC-UV

Nitroguanidine

OVL KNITRO-C-S/UV-VIS

Nitrocellulose

OVL MSS0I/GC-MS

1-Methylnaphthalene
Benzaldehyde
Biphenyl
Caprolactam
Pentachloroethane

NELAP Accreditation by Laboratory SOP

SOLID AND HAZARDOUS CHEMICALS

OVL MSV0I/GC-MS

1.3-Butadiene
Cyclohexane
Cyclohexanone
Dimethyl disulfide
Dimethylsulfide
Ethyl-t-butylether (ETBE)
Isoprene
Methylacetate
Methylcyclohexane
n-Hexane
T-amylmethylether (TAME)

Microbac

Laboratory Report Number: L14010285

Linda Raabe
AECOM Technical Services, Inc.
112 East Pecan
San Antonio, TX 78205

Please find enclosed the analytical results for the samples you submitted to Microbac Laboratories. Review and compilation of your report was completed by Microbac's Ohio Valley Division (OVD). If you have any questions, comments, or require further assistance regarding this report, please contact your service representative listed below.

Laboratory Contact:
Kathy Albertson – Team Chemist/Data Specialist
(740) 373-4071
Kathy.Albertson@microbac.com

I certify that all test results meet all of the requirements of the DoD QSM and other applicable contract terms and conditions. Any exceptions are attached to this cover page or addressed in the method narratives presented in the report. All results for soil samples are reported on a 'dry-weight' basis unless specified otherwise. Analytical results for water and wastes are reported on a 'as received' basis unless specified otherwise. A statement of uncertainty for each analysis is available upon request. This laboratory report shall not be reproduced, except in full, without the written approval of Microbac Laboratories, DoD ELAP certification number 2936.01. The reported results are related only to the samples analyzed as received.

This report was certified on January 20 2014

David E. Vandenberg

David Vandenberg – Managing Director

State of Origin: TX
Accrediting Authority: Texas Commission on Environmental Quality ID:T104704252-07-TX
QAPP: DOD Ver 4.1

Ethics Service Quality
ACIL
2010 Seal of Excellence Program

ACCREDITED IN ACCORDANCE WITH
nelac

Microbac

Lab Report #: L14010285
Lab Project #: 2551.096
Project Name: Longhorn Army Ammunition
Lab Contact: Kathy Albertson

Record of Sample Receipt and Inspection

Comments/Discrepancies

This is the record of the shipment conditions and the inspection records for the samples received and reported as a sample delivery group (SDG). All of the samples were inspected and observed to conform to our receipt policies, except as noted below.

The following discrepancies were noted:

Discrepancy	Resolution
Trip blank: both vials have headspace >6mm. CLS	Proceed with login. KRA

Coolers

Cooler #	Temperature Gun	Temperature	COC #	Airbill #	Temp Required?
0018742	H	0.0		J2317155332	X

Inspection Checklist

#	Question	Result
1	Were shipping coolers sealed?	Yes
2	Were custody seals intact?	Yes
3	Were cooler temperatures in range of 0-6?	Yes
4	Was ice present?	Yes
5	Were COC's received/information complete/signed and dated?	Yes
6	Were sample containers intact and match COC?	Yes
7	Were sample labels intact and match COC?	Yes
8	Were the correct containers and volumes received?	Yes
9	Were samples received within EPA hold times?	Yes
10	Were correct preservatives used? (water only)	Yes
11	Were pH ranges acceptable? (voa's excluded)	NA
12	Were VOA samples free of headspace (less than 6mm)?	No

Samples Received

Client ID	Laboratory ID	Date Collected	Date Received
12WW23-010814	L14010285-01	01/08/2014 09:25	01/09/2014 10:17
12WW22-010814	L14010285-02	01/08/2014 10:45	01/09/2014 10:17
12WW21-010814	L14010285-03	01/08/2014 13:15	01/09/2014 10:17
12WW20-010814	L14010285-04	01/08/2014 14:30	01/09/2014 10:17
TRIP BLANK	L14010285-05	01/08/2014 00:01	01/09/2014 10:17

Microbac REPORT L14010285
PREPARED FOR AECOM Technical Services, Inc.
WORK ID:

1.0 Summary Data

1.1 Narratives

Microbac

Texas Risk Reduction Program (TRRP) Checklist

Laboratory Name:	Microbac OVD	**Laboratory Log Number:**	L14010285
Project Name:		**Method:**	8260
Prep Batch Number(s):	459903	**Reviewer Name:**	Michael Albertson
LRC Date:	2014-01-20 00:00:00		

Laboratory Data Package Cover Page

X	R1	Field chain-of-custody documentation;
X	R2	Sample identification cross-reference;
X	R3	Test reports (analytical data sheets) for each environmental sample that includes: (a) Items consistent with NELAC Chapter 5, (b) dilution factors, (c) preparation methods, (d) cleanup methods, and (e) a.if required for the project, tentatively identified compounds (TICs).
X	R4	Surrogate recovery data including: (a) Calculated recovery (%R), and (b) the laboratory's surrogate QC limits.
X	R5	Test reports/summary forms for blank samples;
X	R6	Test reports/summary forms for laboratory control samples (LCSs) including: (a) LCS spiking amounts, (b) calculated %R for each analyte, and (c) the laboratory's LCS QC limits.
X	R7	Test reports for project matrix spike/matrix spike duplicates (MS/MSDs) including: (a) samples associated with the MS/MSD clearly identified, (b) MS/MSD spiking compounds, (c) concentration of each MS/MSD analyte measured in the parent and spiked samples, (d) calculated %Rs and relative percent differences (RPDs), and (e) the laboratory's MS/MSD QC limits.
X	R8	Laboratory analytical duplicate (if applicable) recovery and precision: (a) the amount of analyte measured in the duplicate, (b) the calculated RPD, and (c) the laboratory's QC limits for analytical duplicates.
X	R9	List of method quantitation limits (MQLs) and detectability check sample results for each analyte for each method and matrix.
X	R10	Other problems or anomalies.

Name (Printed)	Signature	Official Title (Printed)	Date
Michael Albertson		Volatiles Supervisor	2014-01-20 20:39:45

RG-366/TRRP-13 May 2010 **ID:** 4399

Microbac

Texas Risk Reduction Program (TRRP) Checklist

Laboratory Name:	Microbac OVD	**Laboratory Log Number:**	L14010285
Project Name:		**Method:**	8260
Prep Batch Number(s):	459903	**Reviewer Name:**	Michael Albertson
LRC Date:	2014-01-20 00:00:00		

Description	Yes	No	NA	NR	ER#
Chain-of-custody (C-O-C)					
Did samples meet the laboratory's standard conditions of sample acceptability upon receipt?	X				
Were all departures from standard conditions described in an exception report?	X				
Sample and quality control (QC) identification	X				
Are all field sample ID numbers cross-referenced to the laboratory ID numbers?	X				
Are all laboratory ID numbers cross-referenced to the corresponding QC data?	X				
Test reports					
Were all samples prepared and analyzed within holding times?	X				
Other than those results < MQL, were all other raw values bracketed by calibration standards?	X				
Were calculations checked by a peer or supervisor?	X				
Were all analyte identifications checked by a peer or supervisor?	X				
Were sample detection limits reported for all analytes not detected?	X				
Were all results for soil and sediment samples reported on a dry weight basis?	X				
Were % moisture (or solids) reported for all soil and sediment samples?	X				
Were bulk soils/solids samples for volatile analysis extracted with methanol per SW846 Method 5035?			X		
If required for the project, are TICs reported?			X		
Surrogate recovery data					
Were surrogates added prior to extraction?	X				
Were surrogate percent recoveries in all samples within the laboratory QC limits?	X				
Test reports/summary forms for blank samples	X				
Were appropriate type(s) of blanks analyzed?	X				
Were blanks analyzed at the appropriate frequency?	X				
Were method blanks taken through the entire analytical process, including preparation and, if applicable, cleanup procedures?	X				
Were blank concentrations < MQL?	X				
Laboratory control samples (LCS):					
Were all COCs included in the LCS?	X				

RG-366/TRRP-13 May 2010 **ID:** 4399

Texas Risk Reduction Program (TRRP) Checklist

Laboratory Name:	Microbac OVD	**Laboratory Log Number:**	L14010285
Project Name:		**Method:**	8260
Prep Batch Number(s):	459903	**Reviewer Name:**	Michael Albertson
LRC Date:	2014-01-20 00:00:00		

Was each LCS taken through the entire analytical procedure, including prep and cleanup steps?	X				
Were LCSs analyzed at the required frequency?	X				
Were LCS (and LCSD, if applicable) %Rs within the laboratory QC limits?		X			1
Does the detectability check sample data document the laboratory's capability to detect the COCs at the MDL used to calculate the SDLs?	X				
Was the LCSD RPD within QC limits?	X				
Matrix spike (MS) and matrix spike duplicate (MSD) data					
Were the project/method specified analytes included in the MS and MSD?			X		
Were MS/MSD analyzed at the appropriate frequency?			X		
Were MS (and MSD, if applicable) %Rs within the laboratory QC limits?			X		
Were MS/MSD RPDs within laboratory QC limits?			X		
Analytical duplicate data					
Were appropriate analytical duplicates analyzed for each matrix?			X		
Were analytical duplicates analyzed at the appropriate frequency?			X		
Were RPDs or relative standard deviations within the laboratory QC limits?			X		
Method quantitation limits (MQLs):					
Are the MQLs for each method analyte included in the laboratory data package?	X				
Do the MQLs correspond to the concentration of the lowest non-zero calibration standard?	X				
Are unadjusted MQLs and DCSs included in the laboratory data package?	X				
Other problems/anomalies					
Are all known problems/anomalies/special conditions noted in this LRC and ER?	X				
Was applicable and available technology used to lower the SDL to minimize the matrix interference effects on the sample results?	X				
Is the laboratory NELAC-accredited under the Texas Laboratory Accreditation Program for the analytes, matrices and methods associated with this laboratory data package?	X				
Initial calibration (ICAL)					
Were response factors and/or relative response factors for each analyte within QC limits?	X				
Were percent RSDs or correlation coefficient criteria met?	X				

Texas Risk Reduction Program (TRRP) Checklist

Laboratory Name:	Microbac OVD	**Laboratory Log Number:**	L14010285
Project Name:		**Method:**	8260
Prep Batch Number(s):	459903	**Reviewer Name:**	Michael Albertson
LRC Date:	2014-01-20 00:00:00		

Was the number of standards recommended in the method used for all analytes?	X				
Were all points generated between the lowest and highest standard used to calculate the curve?	X				
Are ICAL data available for all instruments used?	X				
Has the initial calibration curve been verified using an appropriate second source standard?	X				
Initial and continuing calibration verification (ICCV and CCV) and continuing calibration blank (CCB):					
Was the CCV analyzed at the method-required frequency?	X				
Were percent differences for each analyte within the method-required QC limits?					3
Was the ICAL curve verified for each analyte?					2
Was the absolute value of the analyte concentration in the inorganic CCB < MDL?			X		
Mass spectral tuning					
Was the appropriate compound for the method used for tuning?	X				
Were ion abundance data within the method-required QC limits?	X				
Internal standards (IS)					
Were IS area counts and retention times within the method-required QC limits?	X				
Raw data (NELAC Section 5.5.10)					
Were the raw data (for example, chromatograms, spectral data) reviewed by an analyst?	X				
Were data associated with manual integrations flagged on the raw data?	X				
Dual column confirmation					
Did dual column confirmation results meet the method-required QC?			X		
Tentatively identified compounds (TICs)					
If TICs were requested, were the mass spectra and TIC data subject to appropriate checks?			X		
Interference Check Sample (ICS) results					
Were percent recoveries within method QC limits?			X		
Serial dilutions, post digestion spikes, and method of standard additions					
Were percent differences, recoveries, and the linearity within the QC limits specified in the method?			X		
Method detection limit (MDL) studies					

Texas Risk Reduction Program (TRRP) Checklist

Laboratory Name:	Microbac OVD	**Laboratory Log Number:**	L14010285
Project Name:		**Method:**	8260
Prep Batch Number(s):	459903	**Reviewer Name:**	Michael Albertson
LRC Date:	2014-01-20 00:00:00		

Was a MDL study performed for each reported analyte?	X				
Is the MDL either adjusted or supported by the analysis of DCSs?	X				
Proficiency test reports					
Was the laboratory's performance acceptable on the applicable proficiency tests or evaluation studies?	X				
Standards documentation					
Are all standards used in the analyses NIST-traceable or obtained from other appropriate sources?	X				
Compound/analyte identification procedures					
Are the procedures for compound/analyte identification documented?	X				
Demonstration of analyst competency (DOC)					
Was DOC conducted consistent with NELAC Chapter 5?	X				
Is documentation of the analyst's competency up-to-date and on file?	X				
Verification/validation documentation for methods (NELAC Chapter 5)					
Are all the methods used to generate the data documented, verified, and validated, where applicable?	X				
Laboratory standard operating procedures (SOPs)					
Are laboratory SOPs current and on file for each method performed	X				

1. Items identified by the letter “R” must be included in the laboratory data package submitted in the TRRP-required report(s). Items identified by the letter “S” should be retained and made available upon request for the appropriate retention period;

2. O = organic analyses; I = inorganic analyses (and general chemistry, when applicable);

3. NA = Not applicable;

4. NR = Not reviewed;

5. ER# = Exception Report identification number (an Exception Report should be completed for an item if “NR” or “No” is checked).

The Exception Report for each “No” or “Not Reviewed (NR)” item in Laboratory Review Checklist and for each analyte, matrix, and method for which the laboratory does not hold NELAC accreditation under the Texas Laboratory Accreditation Program.

Release Statement: I am responsible for the release of this laboratory data package. This laboratory is NELAC accredited under the Texas Laboratory Accreditation Program for all the methods, analytes, and matrices reported in this data package except as noted in the Exception Reports. The data have been reviewed and are technically compliant with the requirements of the methods used, except where noted by the laboratory in the Exception Reports. By my signature

Texas Risk Reduction Program (TRRP) Checklist

Laboratory Name:	Microbac OVD	**Laboratory Log Number:**	L14010285
Project Name:		**Method:**	8260
Prep Batch Number(s):	459903	**Reviewer Name:**	Michael Albertson
LRC Date:	2014-01-20 00:00:00		

below, I affirm to the best of my knowledge all problems/anomalies observed by the laboratory have been identified in the Laboratory Review Checklist, and no information affecting the quality of the data has been knowingly withheld.

Check, if applicable: [ ] This laboratory meets an exception under 30 TAC §25.6 and was last inspection by [ ] TCEQ or [ ] ___________ on **(enter date of last inspection)**. Any findings affecting the data in this laboratory data package are noted in the Exception Reports herein. The official signing the cover page of the report in which these data are used is responsible for releasing this data package and is by signature affirming the above release statement is true.

Exceptions Report

1) Acetone, 1,2-dibromomethane and 2-hexanone were outside the control limits in the LCS analyzed 01-19-2014 on HPMS11.

2) Dichlorodifluoromethane was outside the control limits in the Alternate Source analyzed 11-05-2013 on HPMS11.

3) Bromomethane was outside the control limits in the CCV analyzed 01-19-2014 on HPMS11.

1.2 Certificate of Analysis

Microbac

Lab Report #: L14010285
Lab Project #: 2551.096
Project Name: Longhorn Army Ammunition
Lab Contact: Kathy Albertson

Certificate of Analysis

Sample #:	L14010285-01	**PrePrep Method:**	N/A	**Instrument:**	HPMS11
Client ID:	12WW23-010814	**Prep Method:**	5030B/5030C/5035A	**Prep Date:**	N/A
Matrix:	Water	**Analytical Method:**	8260B	**Cal Date:**	11/05/2013 21:39
Workgroup #:	WG459903	**Analyst:**	ADC	**Run Date:**	01/19/2014 21:25
Collect Date:	01/08/2014 09:25	**Dilution:**	1	**File ID:**	11M98476
Sample Tag:	01	**Units:**	ug/L		

Analyte	CAS #	Result	Qual	LOQ	LOD	DL
Acetone	67-64-1	8.76	J	10.0	5.00	2.50
Benzene	71-43-2	0.250	U	1.00	0.250	0.125
Bromobenzene	108-86-1	0.250	U	1.00	0.250	0.125
Bromochloromethane	74-97-5	0.400	U	1.00	0.400	0.200
Bromodichloromethane	75-27-4	0.500	U	1.00	0.500	0.250
Bromoform	75-25-2	1.00	U	2.00	1.00	0.500
Bromomethane	74-83-9	1.00	Q	2.00	1.00	0.500
2-Butanone	78-93-3	5.00	U	10.0	5.00	2.50
n-Butylbenzene	104-51-8	0.500	U	1.00	0.500	0.250
sec-Butylbenzene	135-98-8	0.500	U	1.00	0.500	0.250
tert-Butylbenzene	98-06-6	0.500	U	1.00	0.500	0.250
Carbon disulfide	75-15-0	1.00	U	2.00	1.00	0.500
Carbon tetrachloride	56-23-5	0.500	U	1.00	0.500	0.250
Chlorobenzene	108-90-7	0.250	U	1.00	0.250	0.125
Chlorodibromomethane	124-48-1	0.500	U	1.00	0.500	0.250
Chloroethane	75-00-3	1.00	U	2.00	1.00	0.500
Chloroform	67-66-3	0.250	U	1.00	0.250	0.125
Chloromethane	74-87-3	1.00	U	2.00	1.00	0.500
2-Chlorotoluene	95-49-8	0.250	U	1.00	0.250	0.125
4-Chlorotoluene	106-43-4	0.500	U	1.00	0.500	0.250
1,2-Dibromo-3-chloropropane	96-12-8	2.00	U	5.00	2.00	1.00
1,2-Dibromoethane	106-93-4	0.500	U	1.00	0.500	0.250
Dibromomethane	74-95-3	0.500	U	1.00	0.500	0.250
1,2-Dichlorobenzene	95-50-1	0.250	U	1.00	0.250	0.125
1,3-Dichlorobenzene	541-73-1	0.500	U	1.00	0.500	0.250
1,4-Dichlorobenzene	106-46-7	0.250	U	1.00	0.250	0.125
Dichlorodifluoromethane	75-71-8	0.500	U	1.00	0.500	0.250
1,1-Dichloroethane	75-34-3	0.250	U	1.00	0.250	0.125
1,2-Dichloroethane	107-06-2	0.500	U	1.00	0.500	0.250
1,1-Dichloroethene	75-35-4	1.00	U	2.00	1.00	0.500
cis-1,2-Dichloroethene	156-59-2	0.500	U	1.00	0.500	0.250
trans-1,2-Dichloroethene	156-60-5	0.500	U	1.00	0.500	0.250

Analyte	CAS #	Result	Qual	LOQ	LOD	DL
1,2-Dichloropropane	78-87-5	0.400	U	1.00	0.400	0.200
1,3-Dichloropropane	142-28-9	0.400	U	1.00	0.400	0.200
2,2-Dichloropropane	594-20-7	0.500	U	1.00	0.500	0.250
cis-1,3-Dichloropropene	10061-01-5	0.500	U	1.00	0.500	0.250
trans-1,3-Dichloropropene	10061-02-6	1.00	U	2.00	1.00	0.500
1,1-Dichloropropene	563-58-6	0.500	U	1.00	0.500	0.250
Ethylbenzene	100-41-4	0.500	U	1.00	0.500	0.250
2-Hexanone	591-78-6	5.00	U	10.0	5.00	2.50
Hexachlorobutadiene	87-68-3	0.500	U	1.00	0.500	0.250
Isopropylbenzene	98-82-8	0.500	U	1.00	0.500	0.250
p-Isopropyltoluene	99-87-6	0.500	U	1.00	0.500	0.250
4-Methyl-2-pentanone	108-10-1	5.00	U	10.0	5.00	2.50
Methylene chloride	75-09-2	0.500	U	1.00	0.500	0.250
Naphthalene	91-20-3	0.400	U	1.00	0.400	0.200
n-Propylbenzene	103-65-1	0.250	U	1.00	0.250	0.125
Styrene	100-42-5	0.250	U	1.00	0.250	0.125
1,1,1,2-Tetrachloroethane	630-20-6	0.500	U	1.00	0.500	0.250
1,1,2,2-Tetrachloroethane	79-34-5	0.400	U	1.00	0.400	0.200
Tetrachloroethene	127-18-4	0.500	U	1.00	0.500	0.250
Toluene	108-88-3	0.500	U	1.00	0.500	0.250
1,2,3-Trichlorobenzene	87-61-6	0.300	U	1.00	0.300	0.150
1,2,4-Trichlorobenzene	120-82-1	0.400	U	1.00	0.400	0.200
1,1,1-Trichloroethane	71-55-6	0.500	U	1.00	0.500	0.250
1,1,2-Trichloroethane	79-00-5	0.500	U	1.00	0.500	0.250
Trichloroethene	79-01-6	0.500	U	1.00	0.500	0.250
Trichlorofluoromethane	75-69-4	0.500	U	1.00	0.500	0.250
1,2,3-Trichloropropane	96-18-4	1.00	U	2.00	1.00	0.500
1,2,4-Trimethylbenzene	95-63-6	0.500	U	1.00	0.500	0.250
1,3,5-Trimethylbenzene	108-67-8	0.500	U	1.00	0.500	0.250
Vinyl chloride	75-01-4	0.500	U	1.00	0.500	0.250
o-Xylene	95-47-6	0.500	U	1.00	0.500	0.250
m-,p-Xylene	179601-23-1	1.00	U	2.00	1.00	0.500

Surrogate	Recovery	Lower Limit	Upper Limit	Q
Dibromofluoromethane	100	85	115	
1,2-Dichloroethane-d4	97.4	70	120	
Toluene-d8	109	85	120	
4-Bromofluorobenzene	101	75	120	

J	Estimated value ; the analyte concentration was less than the LOQ.
Q	One or more quality control criteria failed. See narrative.

U	Analyte was not detected. The concentration is below the reported LOD.

Certificate of Analysis

Sample #:	L14010285-02	**PrePrep Method:**	N/A	**Instrument:**	HPMS11
Client ID:	12WW22-010814	**Prep Method:**	5030B/5030C/5035A	**Prep Date:**	N/A
Matrix:	Water	**Analytical Method:**	8260B	**Cal Date:**	11/05/2013 21:39
Workgroup #:	WG459903	**Analyst:**	ADC	**Run Date:**	01/19/2014 21:57
Collect Date:	01/08/2014 10:45	**Dilution:**	1	**File ID:**	11M98477
Sample Tag:	01	**Units:**	ug/L		

Analyte	CAS #	Result	Qual	LOQ	LOD	DL
Acetone	67-64-1	5.00	U	10.0	5.00	2.50
Benzene	71-43-2	0.250	U	1.00	0.250	0.125
Bromobenzene	108-86-1	0.250	U	1.00	0.250	0.125
Bromochloromethane	74-97-5	0.400	U	1.00	0.400	0.200
Bromodichloromethane	75-27-4	0.500	U	1.00	0.500	0.250
Bromoform	75-25-2	1.00	U	2.00	1.00	0.500
Bromomethane	74-83-9	1.00	Q	2.00	1.00	0.500
2-Butanone	78-93-3	5.00	U	10.0	5.00	2.50
n-Butylbenzene	104-51-8	0.500	U	1.00	0.500	0.250
sec-Butylbenzene	135-98-8	0.500	U	1.00	0.500	0.250
tert-Butylbenzene	98-06-6	0.500	U	1.00	0.500	0.250
Carbon disulfide	75-15-0	1.00	U	2.00	1.00	0.500
Carbon tetrachloride	56-23-5	0.500	U	1.00	0.500	0.250
Chlorobenzene	108-90-7	0.250	U	1.00	0.250	0.125
Chlorodibromomethane	124-48-1	0.500	U	1.00	0.500	0.250
Chloroethane	75-00-3	1.00	U	2.00	1.00	0.500
Chloroform	67-66-3	0.250	U	1.00	0.250	0.125
Chloromethane	74-87-3	1.00	U	2.00	1.00	0.500
2-Chlorotoluene	95-49-8	0.250	U	1.00	0.250	0.125
4-Chlorotoluene	106-43-4	0.500	U	1.00	0.500	0.250
1,2-Dibromo-3-chloropropane	96-12-8	2.00	U	5.00	2.00	1.00
1,2-Dibromoethane	106-93-4	0.500	U	1.00	0.500	0.250
Dibromomethane	74-95-3	0.500	U	1.00	0.500	0.250
1,2-Dichlorobenzene	95-50-1	0.250	U	1.00	0.250	0.125
1,3-Dichlorobenzene	541-73-1	0.500	U	1.00	0.500	0.250
1,4-Dichlorobenzene	106-46-7	0.250	U	1.00	0.250	0.125
Dichlorodifluoromethane	75-71-8	0.500	U	1.00	0.500	0.250
1,1-Dichloroethane	75-34-3	0.250	U	1.00	0.250	0.125
1,2-Dichloroethane	107-06-2	0.500	U	1.00	0.500	0.250
1,1-Dichloroethene	75-35-4	1.00	U	2.00	1.00	0.500
cis-1,2-Dichloroethene	156-59-2	0.500	U	1.00	0.500	0.250

Analyte	CAS #	Result	Qual	LOQ	LOD	DL
trans-1,2-Dichloroethene	156-60-5	0.500	U	1.00	0.500	0.250
1,2-Dichloropropane	78-87-5	0.400	U	1.00	0.400	0.200
1,3-Dichloropropane	142-28-9	0.400	U	1.00	0.400	0.200
2,2-Dichloropropane	594-20-7	0.500	U	1.00	0.500	0.250
cis-1,3-Dichloropropene	10061-01-5	0.500	U	1.00	0.500	0.250
trans-1,3-Dichloropropene	10061-02-6	1.00	U	2.00	1.00	0.500
1,1-Dichloropropene	563-58-6	0.500	U	1.00	0.500	0.250
Ethylbenzene	100-41-4	0.500	U	1.00	0.500	0.250
2-Hexanone	591-78-6	5.00	U	10.0	5.00	2.50
Hexachlorobutadiene	87-68-3	0.500	U	1.00	0.500	0.250
Isopropylbenzene	98-82-8	0.500	U	1.00	0.500	0.250
p-Isopropyltoluene	99-87-6	0.500	U	1.00	0.500	0.250
4-Methyl-2-pentanone	108-10-1	5.00	U	10.0	5.00	2.50
Methylene chloride	75-09-2	0.500	U	1.00	0.500	0.250
Naphthalene	91-20-3	0.400	U	1.00	0.400	0.200
n-Propylbenzene	103-65-1	0.250	U	1.00	0.250	0.125
Styrene	100-42-5	0.250	U	1.00	0.250	0.125
1,1,1,2-Tetrachloroethane	630-20-6	0.500	U	1.00	0.500	0.250
1,1,2,2-Tetrachloroethane	79-34-5	0.400	U	1.00	0.400	0.200
Tetrachloroethene	127-18-4	0.500	U	1.00	0.500	0.250
Toluene	108-88-3	0.500	U	1.00	0.500	0.250
1,2,3-Trichlorobenzene	87-61-6	0.300	U	1.00	0.300	0.150
1,2,4-Trichlorobenzene	120-82-1	0.400	U	1.00	0.400	0.200
1,1,1-Trichloroethane	71-55-6	0.500	U	1.00	0.500	0.250
1,1,2-Trichloroethane	79-00-5	0.500	U	1.00	0.500	0.250
Trichloroethene	79-01-6	0.500	U	1.00	0.500	0.250
Trichlorofluoromethane	75-69-4	0.500	U	1.00	0.500	0.250
1,2,3-Trichloropropane	96-18-4	1.00	U	2.00	1.00	0.500
1,2,4-Trimethylbenzene	95-63-6	0.500	U	1.00	0.500	0.250
1,3,5-Trimethylbenzene	108-67-8	0.500	U	1.00	0.500	0.250
Vinyl chloride	75-01-4	0.500	U	1.00	0.500	0.250
o-Xylene	95-47-6	0.500	U	1.00	0.500	0.250
m-,p-Xylene	179601-23-1	1.00	U	2.00	1.00	0.500

Surrogate	Recovery	Lower Limit	Upper Limit	Q
Dibromofluoromethane	102	85	115	
1,2-Dichloroethane-d4	100	70	120	
Toluene-d8	108	85	120	
4-Bromofluorobenzene	104	75	120	

Q	One or more quality control criteria failed. See narrative.

U	Analyte was not detected. The concentration is below the reported LOD.

Certificate of Analysis

Sample #:	L14010285-03	**PrePrep Method:**	N/A	**Instrument:**	HPMS11
Client ID:	12WW21-010814	**Prep Method:**	5030B/5030C/5035A	**Prep Date:**	N/A
Matrix:	Water	**Analytical Method:**	8260B	**Cal Date:**	11/05/2013 21:39
Workgroup #:	WG459903	**Analyst:**	ADC	**Run Date:**	01/19/2014 22:28
Collect Date:	01/08/2014 13:15	**Dilution:**	1	**File ID:**	11M98478
Sample Tag:	01	**Units:**	ug/L		

Analyte	CAS #	Result	Qual	LOQ	LOD	DL
Acetone	67-64-1	5.00	U	10.0	5.00	2.50
Benzene	71-43-2	0.250	U	1.00	0.250	0.125
Bromobenzene	108-86-1	0.250	U	1.00	0.250	0.125
Bromochloromethane	74-97-5	0.400	U	1.00	0.400	0.200
Bromodichloromethane	75-27-4	0.500	U	1.00	0.500	0.250
Bromoform	75-25-2	1.00	U	2.00	1.00	0.500
Bromomethane	74-83-9	1.00	Q	2.00	1.00	0.500
2-Butanone	78-93-3	5.00	U	10.0	5.00	2.50
n-Butylbenzene	104-51-8	0.500	U	1.00	0.500	0.250
sec-Butylbenzene	135-98-8	0.500	U	1.00	0.500	0.250
tert-Butylbenzene	98-06-6	0.500	U	1.00	0.500	0.250
Carbon disulfide	75-15-0	1.00	U	2.00	1.00	0.500
Carbon tetrachloride	56-23-5	0.500	U	1.00	0.500	0.250
Chlorobenzene	108-90-7	0.250	U	1.00	0.250	0.125
Chlorodibromomethane	124-48-1	0.500	U	1.00	0.500	0.250
Chloroethane	75-00-3	1.00	U	2.00	1.00	0.500
Chloroform	67-66-3	0.250	U	1.00	0.250	0.125
Chloromethane	74-87-3	1.00	U	2.00	1.00	0.500
2-Chlorotoluene	95-49-8	0.250	U	1.00	0.250	0.125
4-Chlorotoluene	106-43-4	0.500	U	1.00	0.500	0.250
1,2-Dibromo-3-chloropropane	96-12-8	2.00	U	5.00	2.00	1.00
1,2-Dibromoethane	106-93-4	0.500	U	1.00	0.500	0.250
Dibromomethane	74-95-3	0.500	U	1.00	0.500	0.250
1,2-Dichlorobenzene	95-50-1	0.250	U	1.00	0.250	0.125
1,3-Dichlorobenzene	541-73-1	0.500	U	1.00	0.500	0.250
1,4-Dichlorobenzene	106-46-7	0.250	U	1.00	0.250	0.125
Dichlorodifluoromethane	75-71-8	0.500	U	1.00	0.500	0.250
1,1-Dichloroethane	75-34-3	0.250	U	1.00	0.250	0.125
1,2-Dichloroethane	107-06-2	0.500	U	1.00	0.500	0.250
1,1-Dichloroethene	75-35-4	1.00	U	2.00	1.00	0.500
cis-1,2-Dichloroethene	156-59-2	0.500	U	1.00	0.500	0.250

Analyte	CAS #	Result	Qual	LOQ	LOD	DL
trans-1,2-Dichloroethene	156-60-5	0.500	U	1.00	0.500	0.250
1,2-Dichloropropane	78-87-5	0.400	U	1.00	0.400	0.200
1,3-Dichloropropane	142-28-9	0.400	U	1.00	0.400	0.200
2,2-Dichloropropane	594-20-7	0.500	U	1.00	0.500	0.250
cis-1,3-Dichloropropene	10061-01-5	0.500	U	1.00	0.500	0.250
trans-1,3-Dichloropropene	10061-02-6	1.00	U	2.00	1.00	0.500
1,1-Dichloropropene	563-58-6	0.500	U	1.00	0.500	0.250
Ethylbenzene	100-41-4	0.500	U	1.00	0.500	0.250
2-Hexanone	591-78-6	5.00	U	10.0	5.00	2.50
Hexachlorobutadiene	87-68-3	0.500	U	1.00	0.500	0.250
Isopropylbenzene	98-82-8	0.500	U	1.00	0.500	0.250
p-Isopropyltoluene	99-87-6	0.500	U	1.00	0.500	0.250
4-Methyl-2-pentanone	108-10-1	5.00	U	10.0	5.00	2.50
Methylene chloride	75-09-2	0.500	U	1.00	0.500	0.250
Naphthalene	91-20-3	0.400	U	1.00	0.400	0.200
n-Propylbenzene	103-65-1	0.250	U	1.00	0.250	0.125
Styrene	100-42-5	0.250	U	1.00	0.250	0.125
1,1,1,2-Tetrachloroethane	630-20-6	0.500	U	1.00	0.500	0.250
1,1,2,2-Tetrachloroethane	79-34-5	0.400	U	1.00	0.400	0.200
Tetrachloroethene	127-18-4	0.500	U	1.00	0.500	0.250
Toluene	108-88-3	0.500	U	1.00	0.500	0.250
1,2,3-Trichlorobenzene	87-61-6	0.300	U	1.00	0.300	0.150
1,2,4-Trichlorobenzene	120-82-1	0.400	U	1.00	0.400	0.200
1,1,1-Trichloroethane	71-55-6	0.500	U	1.00	0.500	0.250
1,1,2-Trichloroethane	79-00-5	0.500	U	1.00	0.500	0.250
Trichloroethene	79-01-6	0.500	U	1.00	0.500	0.250
Trichlorofluoromethane	75-69-4	0.500	U	1.00	0.500	0.250
1,2,3-Trichloropropane	96-18-4	1.00	U	2.00	1.00	0.500
1,2,4-Trimethylbenzene	95-63-6	0.500	U	1.00	0.500	0.250
1,3,5-Trimethylbenzene	108-67-8	0.500	U	1.00	0.500	0.250
Vinyl chloride	75-01-4	0.500	U	1.00	0.500	0.250
o-Xylene	95-47-6	0.500	U	1.00	0.500	0.250
m-,p-Xylene	179601-23-1	1.00	U	2.00	1.00	0.500

Surrogate	Recovery	Lower Limit	Upper Limit	Q
Dibromofluoromethane	100	85	115	
1,2-Dichloroethane-d4	100	70	120	
Toluene-d8	107	85	120	
4-Bromofluorobenzene	102	75	120	

Q	One or more quality control criteria failed. See narrative.

U	Analyte was not detected. The concentration is below the reported LOD.

Certificate of Analysis

Sample #:	L14010285-04	**PrePrep Method:**	N/A	**Instrument:**	HPMS11
Client ID:	12WW20-010814	**Prep Method:**	5030B/5030C/5035A	**Prep Date:**	N/A
Matrix:	Water	**Analytical Method:**	8260B	**Cal Date:**	11/05/2013 21:39
Workgroup #:	WG459903	**Analyst:**	ADC	**Run Date:**	01/19/2014 23:00
Collect Date:	01/08/2014 14:30	**Dilution:**	1	**File ID:**	11M98479
Sample Tag:	01	**Units:**	ug/L		

Analyte	CAS #	Result	Qual	LOQ	LOD	DL
Acetone	67-64-1	5.00	U	10.0	5.00	2.50
Benzene	71-43-2	0.250	U	1.00	0.250	0.125
Bromobenzene	108-86-1	0.250	U	1.00	0.250	0.125
Bromochloromethane	74-97-5	0.400	U	1.00	0.400	0.200
Bromodichloromethane	75-27-4	0.500	U	1.00	0.500	0.250
Bromoform	75-25-2	1.00	U	2.00	1.00	0.500
Bromomethane	74-83-9	1.00	Q	2.00	1.00	0.500
2-Butanone	78-93-3	5.00	U	10.0	5.00	2.50
n-Butylbenzene	104-51-8	0.500	U	1.00	0.500	0.250
sec-Butylbenzene	135-98-8	0.500	U	1.00	0.500	0.250
tert-Butylbenzene	98-06-6	0.500	U	1.00	0.500	0.250
Carbon disulfide	75-15-0	1.00	U	2.00	1.00	0.500
Carbon tetrachloride	56-23-5	0.500	U	1.00	0.500	0.250
Chlorobenzene	108-90-7	0.250	U	1.00	0.250	0.125
Chlorodibromomethane	124-48-1	0.500	U	1.00	0.500	0.250
Chloroethane	75-00-3	1.00	U	2.00	1.00	0.500
Chloroform	67-66-3	0.250	U	1.00	0.250	0.125
Chloromethane	74-87-3	1.00	U	2.00	1.00	0.500
2-Chlorotoluene	95-49-8	0.250	U	1.00	0.250	0.125
4-Chlorotoluene	106-43-4	0.500	U	1.00	0.500	0.250
1,2-Dibromo-3-chloropropane	96-12-8	2.00	U	5.00	2.00	1.00
1,2-Dibromoethane	106-93-4	0.500	U	1.00	0.500	0.250
Dibromomethane	74-95-3	0.500	U	1.00	0.500	0.250
1,2-Dichlorobenzene	95-50-1	0.250	U	1.00	0.250	0.125
1,3-Dichlorobenzene	541-73-1	0.500	U	1.00	0.500	0.250
1,4-Dichlorobenzene	106-46-7	0.250	U	1.00	0.250	0.125
Dichlorodifluoromethane	75-71-8	0.500	U	1.00	0.500	0.250
1,1-Dichloroethane	75-34-3	0.250	U	1.00	0.250	0.125
1,2-Dichloroethane	107-06-2	0.500	U	1.00	0.500	0.250
1,1-Dichloroethene	75-35-4	1.00	U	2.00	1.00	0.500
cis-1,2-Dichloroethene	156-59-2	0.552	J	1.00	0.500	0.250

Analyte	CAS #	Result	Qual	LOQ	LOD	DL
trans-1,2-Dichloroethene	156-60-5	0.500	U	1.00	0.500	0.250
1,2-Dichloropropane	78-87-5	0.400	U	1.00	0.400	0.200
1,3-Dichloropropane	142-28-9	0.400	U	1.00	0.400	0.200
2,2-Dichloropropane	594-20-7	0.500	U	1.00	0.500	0.250
cis-1,3-Dichloropropene	10061-01-5	0.500	U	1.00	0.500	0.250
trans-1,3-Dichloropropene	10061-02-6	1.00	U	2.00	1.00	0.500
1,1-Dichloropropene	563-58-6	0.500	U	1.00	0.500	0.250
Ethylbenzene	100-41-4	0.500	U	1.00	0.500	0.250
2-Hexanone	591-78-6	5.00	U	10.0	5.00	2.50
Hexachlorobutadiene	87-68-3	0.500	U	1.00	0.500	0.250
Isopropylbenzene	98-82-8	0.500	U	1.00	0.500	0.250
p-Isopropyltoluene	99-87-6	0.500	U	1.00	0.500	0.250
4-Methyl-2-pentanone	108-10-1	5.00	U	10.0	5.00	2.50
Methylene chloride	75-09-2	0.500	U	1.00	0.500	0.250
Naphthalene	91-20-3	0.400	U	1.00	0.400	0.200
n-Propylbenzene	103-65-1	0.250	U	1.00	0.250	0.125
Styrene	100-42-5	0.250	U	1.00	0.250	0.125
1,1,1,2-Tetrachloroethane	630-20-6	0.500	U	1.00	0.500	0.250
1,1,2,2-Tetrachloroethane	79-34-5	0.400	U	1.00	0.400	0.200
Tetrachloroethene	127-18-4	0.500	U	1.00	0.500	0.250
Toluene	108-88-3	0.500	U	1.00	0.500	0.250
1,2,3-Trichlorobenzene	87-61-6	0.300	U	1.00	0.300	0.150
1,2,4-Trichlorobenzene	120-82-1	0.400	U	1.00	0.400	0.200
1,1,1-Trichloroethane	71-55-6	0.500	U	1.00	0.500	0.250
1,1,2-Trichloroethane	79-00-5	0.500	U	1.00	0.500	0.250
Trichloroethene	79-01-6	0.721	J	1.00	0.500	0.250
Trichlorofluoromethane	75-69-4	0.500	U	1.00	0.500	0.250
1,2,3-Trichloropropane	96-18-4	1.00	U	2.00	1.00	0.500
1,2,4-Trimethylbenzene	95-63-6	0.500	U	1.00	0.500	0.250
1,3,5-Trimethylbenzene	108-67-8	0.500	U	1.00	0.500	0.250
Vinyl chloride	75-01-4	0.500	U	1.00	0.500	0.250
o-Xylene	95-47-6	0.500	U	1.00	0.500	0.250
m-,p-Xylene	179601-23-1	1.00	U	2.00	1.00	0.500

Surrogate	Recovery	Lower Limit	Upper Limit	Q
Dibromofluoromethane	100	85	115	
1,2-Dichloroethane-d4	100	70	120	
Toluene-d8	107	85	120	
4-Bromofluorobenzene	102	75	120	

J	Estimated value ; the analyte concentration was less than the LOQ.

Q	One or more quality control criteria failed. See narrative.
U	Analyte was not detected. The concentration is below the reported LOD.

Certificate of Analysis

Sample #:	L14010285-05	**PrePrep Method:**	N/A	**Instrument:**	HPMS11
Client ID:	TRIP BLANK	**Prep Method:**	5030B/5030C/5035A	**Prep Date:**	N/A
Matrix:	Water	**Analytical Method:**	8260B	**Cal Date:**	11/05/2013 21:39
Workgroup #:	WG459903	**Analyst:**	ADC	**Run Date:**	01/19/2014 18:47
Collect Date:	01/08/2014 00:01	**Dilution:**	1	**File ID:**	11M98471
Sample Tag:	01	**Units:**	ug/L		

Analyte	CAS #	Result	Qual	LOQ	LOD	DL
Acetone	67-64-1	5.00	U	10.0	5.00	2.50
Benzene	71-43-2	0.250	U	1.00	0.250	0.125
Bromobenzene	108-86-1	0.250	U	1.00	0.250	0.125
Bromochloromethane	74-97-5	0.400	U	1.00	0.400	0.200
Bromodichloromethane	75-27-4	0.500	U	1.00	0.500	0.250
Bromoform	75-25-2	1.00	U	2.00	1.00	0.500
Bromomethane	74-83-9	1.00	Q	2.00	1.00	0.500
2-Butanone	78-93-3	5.00	U	10.0	5.00	2.50
n-Butylbenzene	104-51-8	0.500	U	1.00	0.500	0.250
sec-Butylbenzene	135-98-8	0.500	U	1.00	0.500	0.250
tert-Butylbenzene	98-06-6	0.500	U	1.00	0.500	0.250
Carbon disulfide	75-15-0	1.00	U	2.00	1.00	0.500
Carbon tetrachloride	56-23-5	0.500	U	1.00	0.500	0.250
Chlorobenzene	108-90-7	0.250	U	1.00	0.250	0.125
Chlorodibromomethane	124-48-1	0.500	U	1.00	0.500	0.250
Chloroethane	75-00-3	1.00	U	2.00	1.00	0.500
Chloroform	67-66-3	0.250	U	1.00	0.250	0.125
Chloromethane	74-87-3	1.00	U	2.00	1.00	0.500
2-Chlorotoluene	95-49-8	0.250	U	1.00	0.250	0.125
4-Chlorotoluene	106-43-4	0.500	U	1.00	0.500	0.250
1,2-Dibromo-3-chloropropane	96-12-8	2.00	U	5.00	2.00	1.00
1,2-Dibromoethane	106-93-4	0.500	U	1.00	0.500	0.250
Dibromomethane	74-95-3	0.500	U	1.00	0.500	0.250
1,2-Dichlorobenzene	95-50-1	0.250	U	1.00	0.250	0.125
1,3-Dichlorobenzene	541-73-1	0.500	U	1.00	0.500	0.250
1,4-Dichlorobenzene	106-46-7	0.250	U	1.00	0.250	0.125
Dichlorodifluoromethane	75-71-8	0.500	U	1.00	0.500	0.250
1,1-Dichloroethane	75-34-3	0.250	U	1.00	0.250	0.125
1,2-Dichloroethane	107-06-2	0.500	U	1.00	0.500	0.250
1,1-Dichloroethene	75-35-4	1.00	U	2.00	1.00	0.500
cis-1,2-Dichloroethene	156-59-2	0.500	U	1.00	0.500	0.250

Analyte	CAS #	Result	Qual	LOQ	LOD	DL
trans-1,2-Dichloroethene	156-60-5	0.500	U	1.00	0.500	0.250
1,2-Dichloropropane	78-87-5	0.400	U	1.00	0.400	0.200
1,3-Dichloropropane	142-28-9	0.400	U	1.00	0.400	0.200
2,2-Dichloropropane	594-20-7	0.500	U	1.00	0.500	0.250
cis-1,3-Dichloropropene	10061-01-5	0.500	U	1.00	0.500	0.250
trans-1,3-Dichloropropene	10061-02-6	1.00	U	2.00	1.00	0.500
1,1-Dichloropropene	563-58-6	0.500	U	1.00	0.500	0.250
Ethylbenzene	100-41-4	0.500	U	1.00	0.500	0.250
2-Hexanone	591-78-6	5.00	U	10.0	5.00	2.50
Hexachlorobutadiene	87-68-3	0.500	U	1.00	0.500	0.250
Isopropylbenzene	98-82-8	0.500	U	1.00	0.500	0.250
p-Isopropyltoluene	99-87-6	0.500	U	1.00	0.500	0.250
4-Methyl-2-pentanone	108-10-1	5.00	U	10.0	5.00	2.50
Methylene chloride	75-09-2	0.500	U	1.00	0.500	0.250
Naphthalene	91-20-3	0.400	U	1.00	0.400	0.200
n-Propylbenzene	103-65-1	0.250	U	1.00	0.250	0.125
Styrene	100-42-5	0.250	U	1.00	0.250	0.125
1,1,1,2-Tetrachloroethane	630-20-6	0.500	U	1.00	0.500	0.250
1,1,2,2-Tetrachloroethane	79-34-5	0.400	U	1.00	0.400	0.200
Tetrachloroethene	127-18-4	0.500	U	1.00	0.500	0.250
Toluene	108-88-3	0.500	U	1.00	0.500	0.250
1,2,3-Trichlorobenzene	87-61-6	0.300	U	1.00	0.300	0.150
1,2,4-Trichlorobenzene	120-82-1	0.400	U	1.00	0.400	0.200
1,1,1-Trichloroethane	71-55-6	0.500	U	1.00	0.500	0.250
1,1,2-Trichloroethane	79-00-5	0.500	U	1.00	0.500	0.250
Trichloroethene	79-01-6	0.500	U	1.00	0.500	0.250
Trichlorofluoromethane	75-69-4	0.500	U	1.00	0.500	0.250
1,2,3-Trichloropropane	96-18-4	1.00	U	2.00	1.00	0.500
1,2,4-Trimethylbenzene	95-63-6	0.500	U	1.00	0.500	0.250
1,3,5-Trimethylbenzene	108-67-8	0.500	U	1.00	0.500	0.250
Vinyl chloride	75-01-4	0.500	U	1.00	0.500	0.250
o-Xylene	95-47-6	0.500	U	1.00	0.500	0.250
m-,p-Xylene	179601-23-1	1.00	U	2.00	1.00	0.500

Surrogate	Recovery	Lower Limit	Upper Limit	Q
Dibromofluoromethane	99.3	85	115	
1,2-Dichloroethane-d4	97.8	70	120	
Toluene-d8	107	85	120	
4-Bromofluorobenzene	99.2	75	120	

Q	One or more quality control criteria failed. See narrative.

U	Analyte was not detected. The concentration is below the reported LOD.

2.0 Full Sample Data Package

2.1 Volatiles Data

2.1.1 Volatiles GCMS Data (8260)

2.1.1.1 Summary Data

Microbac

Lab Report #: L14010285
Lab Project #: 2551.096
Project Name: Longhorn Army Ammunition
Lab Contact: Kathy Albertson

Certificate of Analysis

Sample #:	L14010285-01	**PrePrep Method:**	N/A	**Instrument:**	HPMS11
Client ID:	12WW23-010814	**Prep Method:**	5030B/5030C/5035A	**Prep Date:**	N/A
Matrix:	Water	**Analytical Method:**	8260B	**Cal Date:**	11/05/2013 21:39
Workgroup #:	WG459903	**Analyst:**	ADC	**Run Date:**	01/19/2014 21:25
Collect Date:	01/08/2014 09:25	**Dilution:**	1	**File ID:**	11M98476
Sample Tag:	01	**Units:**	ug/L		

Analyte	CAS #	Result	Qual	LOQ	LOD	DL
Acetone	67-64-1	8.76	J	10.0	5.00	2.50
Benzene	71-43-2	0.250	U	1.00	0.250	0.125
Bromobenzene	108-86-1	0.250	U	1.00	0.250	0.125
Bromochloromethane	74-97-5	0.400	U	1.00	0.400	0.200
Bromodichloromethane	75-27-4	0.500	U	1.00	0.500	0.250
Bromoform	75-25-2	1.00	U	2.00	1.00	0.500
Bromomethane	74-83-9	1.00	Q	2.00	1.00	0.500
2-Butanone	78-93-3	5.00	U	10.0	5.00	2.50
n-Butylbenzene	104-51-8	0.500	U	1.00	0.500	0.250
sec-Butylbenzene	135-98-8	0.500	U	1.00	0.500	0.250
tert-Butylbenzene	98-06-6	0.500	U	1.00	0.500	0.250
Carbon disulfide	75-15-0	1.00	U	2.00	1.00	0.500
Carbon tetrachloride	56-23-5	0.500	U	1.00	0.500	0.250
Chlorobenzene	108-90-7	0.250	U	1.00	0.250	0.125
Chlorodibromomethane	124-48-1	0.500	U	1.00	0.500	0.250
Chloroethane	75-00-3	1.00	U	2.00	1.00	0.500
Chloroform	67-66-3	0.250	U	1.00	0.250	0.125
Chloromethane	74-87-3	1.00	U	2.00	1.00	0.500
2-Chlorotoluene	95-49-8	0.250	U	1.00	0.250	0.125
4-Chlorotoluene	106-43-4	0.500	U	1.00	0.500	0.250
1,2-Dibromo-3-chloropropane	96-12-8	2.00	U	5.00	2.00	1.00
1,2-Dibromoethane	106-93-4	0.500	U	1.00	0.500	0.250
Dibromomethane	74-95-3	0.500	U	1.00	0.500	0.250
1,2-Dichlorobenzene	95-50-1	0.250	U	1.00	0.250	0.125
1,3-Dichlorobenzene	541-73-1	0.500	U	1.00	0.500	0.250
1,4-Dichlorobenzene	106-46-7	0.250	U	1.00	0.250	0.125
Dichlorodifluoromethane	75-71-8	0.500	U	1.00	0.500	0.250
1,1-Dichloroethane	75-34-3	0.250	U	1.00	0.250	0.125
1,2-Dichloroethane	107-06-2	0.500	U	1.00	0.500	0.250
1,1-Dichloroethene	75-35-4	1.00	U	2.00	1.00	0.500
cis-1,2-Dichloroethene	156-59-2	0.500	U	1.00	0.500	0.250
trans-1,2-Dichloroethene	156-60-5	0.500	U	1.00	0.500	0.250

Analyte	CAS #	Result	Qual	LOQ	LOD	DL
1,2-Dichloropropane	78-87-5	0.400	U	1.00	0.400	0.200
1,3-Dichloropropane	142-28-9	0.400	U	1.00	0.400	0.200
2,2-Dichloropropane	594-20-7	0.500	U	1.00	0.500	0.250
cis-1,3-Dichloropropene	10061-01-5	0.500	U	1.00	0.500	0.250
trans-1,3-Dichloropropene	10061-02-6	1.00	U	2.00	1.00	0.500
1,1-Dichloropropene	563-58-6	0.500	U	1.00	0.500	0.250
Ethylbenzene	100-41-4	0.500	U	1.00	0.500	0.250
2-Hexanone	591-78-6	5.00	U	10.0	5.00	2.50
Hexachlorobutadiene	87-68-3	0.500	U	1.00	0.500	0.250
Isopropylbenzene	98-82-8	0.500	U	1.00	0.500	0.250
p-Isopropyltoluene	99-87-6	0.500	U	1.00	0.500	0.250
4-Methyl-2-pentanone	108-10-1	5.00	U	10.0	5.00	2.50
Methylene chloride	75-09-2	0.500	U	1.00	0.500	0.250
Naphthalene	91-20-3	0.400	U	1.00	0.400	0.200
n-Propylbenzene	103-65-1	0.250	U	1.00	0.250	0.125
Styrene	100-42-5	0.250	U	1.00	0.250	0.125
1,1,1,2-Tetrachloroethane	630-20-6	0.500	U	1.00	0.500	0.250
1,1,2,2-Tetrachloroethane	79-34-5	0.400	U	1.00	0.400	0.200
Tetrachloroethene	127-18-4	0.500	U	1.00	0.500	0.250
Toluene	108-88-3	0.500	U	1.00	0.500	0.250
1,2,3-Trichlorobenzene	87-61-6	0.300	U	1.00	0.300	0.150
1,2,4-Trichlorobenzene	120-82-1	0.400	U	1.00	0.400	0.200
1,1,1-Trichloroethane	71-55-6	0.500	U	1.00	0.500	0.250
1,1,2-Trichloroethane	79-00-5	0.500	U	1.00	0.500	0.250
Trichloroethene	79-01-6	0.500	U	1.00	0.500	0.250
Trichlorofluoromethane	75-69-4	0.500	U	1.00	0.500	0.250
1,2,3-Trichloropropane	96-18-4	1.00	U	2.00	1.00	0.500
1,2,4-Trimethylbenzene	95-63-6	0.500	U	1.00	0.500	0.250
1,3,5-Trimethylbenzene	108-67-8	0.500	U	1.00	0.500	0.250
Vinyl chloride	75-01-4	0.500	U	1.00	0.500	0.250
o-Xylene	95-47-6	0.500	U	1.00	0.500	0.250
m-,p-Xylene	179601-23-1	1.00	U	2.00	1.00	0.500

Surrogate	Recovery	Lower Limit	Upper Limit	Q
Dibromofluoromethane	100	85	115	
1,2-Dichloroethane-d4	97.4	70	120	
Toluene-d8	109	85	120	
4-Bromofluorobenzene	101	75	120	

J	Estimated value ; the analyte concentration was less than the LOQ.
Q	One or more quality control criteria failed. See narrative.

U	Analyte was not detected. The concentration is below the reported LOD.

Certificate of Analysis

Sample #:	L14010285-02	**PrePrep Method:**	N/A	**Instrument:**	HPMS11
Client ID:	12WW22-010814	**Prep Method:**	5030B/5030C/5035A	**Prep Date:**	N/A
Matrix:	Water	**Analytical Method:**	8260B	**Cal Date:**	11/05/2013 21:39
Workgroup #:	WG459903	**Analyst:**	ADC	**Run Date:**	01/19/2014 21:57
Collect Date:	01/08/2014 10:45	**Dilution:**	1	**File ID:**	11M98477
Sample Tag:	01	**Units:**	ug/L		

Analyte	CAS #	Result	Qual	LOQ	LOD	DL
Acetone	67-64-1	5.00	U	10.0	5.00	2.50
Benzene	71-43-2	0.250	U	1.00	0.250	0.125
Bromobenzene	108-86-1	0.250	U	1.00	0.250	0.125
Bromochloromethane	74-97-5	0.400	U	1.00	0.400	0.200
Bromodichloromethane	75-27-4	0.500	U	1.00	0.500	0.250
Bromoform	75-25-2	1.00	U	2.00	1.00	0.500
Bromomethane	74-83-9	1.00	Q	2.00	1.00	0.500
2-Butanone	78-93-3	5.00	U	10.0	5.00	2.50
n-Butylbenzene	104-51-8	0.500	U	1.00	0.500	0.250
sec-Butylbenzene	135-98-8	0.500	U	1.00	0.500	0.250
tert-Butylbenzene	98-06-6	0.500	U	1.00	0.500	0.250
Carbon disulfide	75-15-0	1.00	U	2.00	1.00	0.500
Carbon tetrachloride	56-23-5	0.500	U	1.00	0.500	0.250
Chlorobenzene	108-90-7	0.250	U	1.00	0.250	0.125
Chlorodibromomethane	124-48-1	0.500	U	1.00	0.500	0.250
Chloroethane	75-00-3	1.00	U	2.00	1.00	0.500
Chloroform	67-66-3	0.250	U	1.00	0.250	0.125
Chloromethane	74-87-3	1.00	U	2.00	1.00	0.500
2-Chlorotoluene	95-49-8	0.250	U	1.00	0.250	0.125
4-Chlorotoluene	106-43-4	0.500	U	1.00	0.500	0.250
1,2-Dibromo-3-chloropropane	96-12-8	2.00	U	5.00	2.00	1.00
1,2-Dibromoethane	106-93-4	0.500	U	1.00	0.500	0.250
Dibromomethane	74-95-3	0.500	U	1.00	0.500	0.250
1,2-Dichlorobenzene	95-50-1	0.250	U	1.00	0.250	0.125
1,3-Dichlorobenzene	541-73-1	0.500	U	1.00	0.500	0.250
1,4-Dichlorobenzene	106-46-7	0.250	U	1.00	0.250	0.125
Dichlorodifluoromethane	75-71-8	0.500	U	1.00	0.500	0.250
1,1-Dichloroethane	75-34-3	0.250	U	1.00	0.250	0.125
1,2-Dichloroethane	107-06-2	0.500	U	1.00	0.500	0.250
1,1-Dichloroethene	75-35-4	1.00	U	2.00	1.00	0.500
cis-1,2-Dichloroethene	156-59-2	0.500	U	1.00	0.500	0.250

Analyte	CAS #	Result	Qual	LOQ	LOD	DL
trans-1,2-Dichloroethene	156-60-5	0.500	U	1.00	0.500	0.250
1,2-Dichloropropane	78-87-5	0.400	U	1.00	0.400	0.200
1,3-Dichloropropane	142-28-9	0.400	U	1.00	0.400	0.200
2,2-Dichloropropane	594-20-7	0.500	U	1.00	0.500	0.250
cis-1,3-Dichloropropene	10061-01-5	0.500	U	1.00	0.500	0.250
trans-1,3-Dichloropropene	10061-02-6	1.00	U	2.00	1.00	0.500
1,1-Dichloropropene	563-58-6	0.500	U	1.00	0.500	0.250
Ethylbenzene	100-41-4	0.500	U	1.00	0.500	0.250
2-Hexanone	591-78-6	5.00	U	10.0	5.00	2.50
Hexachlorobutadiene	87-68-3	0.500	U	1.00	0.500	0.250
Isopropylbenzene	98-82-8	0.500	U	1.00	0.500	0.250
p-Isopropyltoluene	99-87-6	0.500	U	1.00	0.500	0.250
4-Methyl-2-pentanone	108-10-1	5.00	U	10.0	5.00	2.50
Methylene chloride	75-09-2	0.500	U	1.00	0.500	0.250
Naphthalene	91-20-3	0.400	U	1.00	0.400	0.200
n-Propylbenzene	103-65-1	0.250	U	1.00	0.250	0.125
Styrene	100-42-5	0.250	U	1.00	0.250	0.125
1,1,1,2-Tetrachloroethane	630-20-6	0.500	U	1.00	0.500	0.250
1,1,2,2-Tetrachloroethane	79-34-5	0.400	U	1.00	0.400	0.200
Tetrachloroethene	127-18-4	0.500	U	1.00	0.500	0.250
Toluene	108-88-3	0.500	U	1.00	0.500	0.250
1,2,3-Trichlorobenzene	87-61-6	0.300	U	1.00	0.300	0.150
1,2,4-Trichlorobenzene	120-82-1	0.400	U	1.00	0.400	0.200
1,1,1-Trichloroethane	71-55-6	0.500	U	1.00	0.500	0.250
1,1,2-Trichloroethane	79-00-5	0.500	U	1.00	0.500	0.250
Trichloroethene	79-01-6	0.500	U	1.00	0.500	0.250
Trichlorofluoromethane	75-69-4	0.500	U	1.00	0.500	0.250
1,2,3-Trichloropropane	96-18-4	1.00	U	2.00	1.00	0.500
1,2,4-Trimethylbenzene	95-63-6	0.500	U	1.00	0.500	0.250
1,3,5-Trimethylbenzene	108-67-8	0.500	U	1.00	0.500	0.250
Vinyl chloride	75-01-4	0.500	U	1.00	0.500	0.250
o-Xylene	95-47-6	0.500	U	1.00	0.500	0.250
m-,p-Xylene	179601-23-1	1.00	U	2.00	1.00	0.500

Surrogate	Recovery	Lower Limit	Upper Limit	Q
Dibromofluoromethane	102	85	115	
1,2-Dichloroethane-d4	100	70	120	
Toluene-d8	108	85	120	
4-Bromofluorobenzene	104	75	120	

Q	One or more quality control criteria failed. See narrative.

U	Analyte was not detected. The concentration is below the reported LOD.

Certificate of Analysis

Sample #:	L14010285-03	**PrePrep Method:**	N/A	**Instrument:**	HPMS11
Client ID:	12WW21-010814	**Prep Method:**	5030B/5030C/5035A	**Prep Date:**	N/A
Matrix:	Water	**Analytical Method:**	8260B	**Cal Date:**	11/05/2013 21:39
Workgroup #:	WG459903	**Analyst:**	ADC	**Run Date:**	01/19/2014 22:28
Collect Date:	01/08/2014 13:15	**Dilution:**	1	**File ID:**	11M98478
Sample Tag:	01	**Units:**	ug/L		

Analyte	CAS #	Result	Qual	LOQ	LOD	DL
Acetone	67-64-1	5.00	U	10.0	5.00	2.50
Benzene	71-43-2	0.250	U	1.00	0.250	0.125
Bromobenzene	108-86-1	0.250	U	1.00	0.250	0.125
Bromochloromethane	74-97-5	0.400	U	1.00	0.400	0.200
Bromodichloromethane	75-27-4	0.500	U	1.00	0.500	0.250
Bromoform	75-25-2	1.00	U	2.00	1.00	0.500
Bromomethane	74-83-9	1.00	Q	2.00	1.00	0.500
2-Butanone	78-93-3	5.00	U	10.0	5.00	2.50
n-Butylbenzene	104-51-8	0.500	U	1.00	0.500	0.250
sec-Butylbenzene	135-98-8	0.500	U	1.00	0.500	0.250
tert-Butylbenzene	98-06-6	0.500	U	1.00	0.500	0.250
Carbon disulfide	75-15-0	1.00	U	2.00	1.00	0.500
Carbon tetrachloride	56-23-5	0.500	U	1.00	0.500	0.250
Chlorobenzene	108-90-7	0.250	U	1.00	0.250	0.125
Chlorodibromomethane	124-48-1	0.500	U	1.00	0.500	0.250
Chloroethane	75-00-3	1.00	U	2.00	1.00	0.500
Chloroform	67-66-3	0.250	U	1.00	0.250	0.125
Chloromethane	74-87-3	1.00	U	2.00	1.00	0.500
2-Chlorotoluene	95-49-8	0.250	U	1.00	0.250	0.125
4-Chlorotoluene	106-43-4	0.500	U	1.00	0.500	0.250
1,2-Dibromo-3-chloropropane	96-12-8	2.00	U	5.00	2.00	1.00
1,2-Dibromoethane	106-93-4	0.500	U	1.00	0.500	0.250
Dibromomethane	74-95-3	0.500	U	1.00	0.500	0.250
1,2-Dichlorobenzene	95-50-1	0.250	U	1.00	0.250	0.125
1,3-Dichlorobenzene	541-73-1	0.500	U	1.00	0.500	0.250
1,4-Dichlorobenzene	106-46-7	0.250	U	1.00	0.250	0.125
Dichlorodifluoromethane	75-71-8	0.500	U	1.00	0.500	0.250
1,1-Dichloroethane	75-34-3	0.250	U	1.00	0.250	0.125
1,2-Dichloroethane	107-06-2	0.500	U	1.00	0.500	0.250
1,1-Dichloroethene	75-35-4	1.00	U	2.00	1.00	0.500
cis-1,2-Dichloroethene	156-59-2	0.500	U	1.00	0.500	0.250

Analyte	CAS #	Result	Qual	LOQ	LOD	DL
trans-1,2-Dichloroethene	156-60-5	0.500	U	1.00	0.500	0.250
1,2-Dichloropropane	78-87-5	0.400	U	1.00	0.400	0.200
1,3-Dichloropropane	142-28-9	0.400	U	1.00	0.400	0.200
2,2-Dichloropropane	594-20-7	0.500	U	1.00	0.500	0.250
cis-1,3-Dichloropropene	10061-01-5	0.500	U	1.00	0.500	0.250
trans-1,3-Dichloropropene	10061-02-6	1.00	U	2.00	1.00	0.500
1,1-Dichloropropene	563-58-6	0.500	U	1.00	0.500	0.250
Ethylbenzene	100-41-4	0.500	U	1.00	0.500	0.250
2-Hexanone	591-78-6	5.00	U	10.0	5.00	2.50
Hexachlorobutadiene	87-68-3	0.500	U	1.00	0.500	0.250
Isopropylbenzene	98-82-8	0.500	U	1.00	0.500	0.250
p-Isopropyltoluene	99-87-6	0.500	U	1.00	0.500	0.250
4-Methyl-2-pentanone	108-10-1	5.00	U	10.0	5.00	2.50
Methylene chloride	75-09-2	0.500	U	1.00	0.500	0.250
Naphthalene	91-20-3	0.400	U	1.00	0.400	0.200
n-Propylbenzene	103-65-1	0.250	U	1.00	0.250	0.125
Styrene	100-42-5	0.250	U	1.00	0.250	0.125
1,1,1,2-Tetrachloroethane	630-20-6	0.500	U	1.00	0.500	0.250
1,1,2,2-Tetrachloroethane	79-34-5	0.400	U	1.00	0.400	0.200
Tetrachloroethene	127-18-4	0.500	U	1.00	0.500	0.250
Toluene	108-88-3	0.500	U	1.00	0.500	0.250
1,2,3-Trichlorobenzene	87-61-6	0.300	U	1.00	0.300	0.150
1,2,4-Trichlorobenzene	120-82-1	0.400	U	1.00	0.400	0.200
1,1,1-Trichloroethane	71-55-6	0.500	U	1.00	0.500	0.250
1,1,2-Trichloroethane	79-00-5	0.500	U	1.00	0.500	0.250
Trichloroethene	79-01-6	0.500	U	1.00	0.500	0.250
Trichlorofluoromethane	75-69-4	0.500	U	1.00	0.500	0.250
1,2,3-Trichloropropane	96-18-4	1.00	U	2.00	1.00	0.500
1,2,4-Trimethylbenzene	95-63-6	0.500	U	1.00	0.500	0.250
1,3,5-Trimethylbenzene	108-67-8	0.500	U	1.00	0.500	0.250
Vinyl chloride	75-01-4	0.500	U	1.00	0.500	0.250
o-Xylene	95-47-6	0.500	U	1.00	0.500	0.250
m-,p-Xylene	179601-23-1	1.00	U	2.00	1.00	0.500

Surrogate	Recovery	Lower Limit	Upper Limit	Q
Dibromofluoromethane	100	85	115	
1,2-Dichloroethane-d4	100	70	120	
Toluene-d8	107	85	120	
4-Bromofluorobenzene	102	75	120	

Q	One or more quality control criteria failed. See narrative.

U	Analyte was not detected. The concentration is below the reported LOD.

Certificate of Analysis

Sample #:	L14010285-04	**PrePrep Method:**	N/A	**Instrument:**	HPMS11
Client ID:	12WW20-010814	**Prep Method:**	5030B/5030C/5035A	**Prep Date:**	N/A
Matrix:	Water	**Analytical Method:**	8260B	**Cal Date:**	11/05/2013 21:39
Workgroup #:	WG459903	**Analyst:**	ADC	**Run Date:**	01/19/2014 23:00
Collect Date:	01/08/2014 14:30	**Dilution:**	1	**File ID:**	11M98479
Sample Tag:	01	**Units:**	ug/L		

Analyte	CAS #	Result	Qual	LOQ	LOD	DL
Acetone	67-64-1	5.00	U	10.0	5.00	2.50
Benzene	71-43-2	0.250	U	1.00	0.250	0.125
Bromobenzene	108-86-1	0.250	U	1.00	0.250	0.125
Bromochloromethane	74-97-5	0.400	U	1.00	0.400	0.200
Bromodichloromethane	75-27-4	0.500	U	1.00	0.500	0.250
Bromoform	75-25-2	1.00	U	2.00	1.00	0.500
Bromomethane	74-83-9	1.00	Q	2.00	1.00	0.500
2-Butanone	78-93-3	5.00	U	10.0	5.00	2.50
n-Butylbenzene	104-51-8	0.500	U	1.00	0.500	0.250
sec-Butylbenzene	135-98-8	0.500	U	1.00	0.500	0.250
tert-Butylbenzene	98-06-6	0.500	U	1.00	0.500	0.250
Carbon disulfide	75-15-0	1.00	U	2.00	1.00	0.500
Carbon tetrachloride	56-23-5	0.500	U	1.00	0.500	0.250
Chlorobenzene	108-90-7	0.250	U	1.00	0.250	0.125
Chlorodibromomethane	124-48-1	0.500	U	1.00	0.500	0.250
Chloroethane	75-00-3	1.00	U	2.00	1.00	0.500
Chloroform	67-66-3	0.250	U	1.00	0.250	0.125
Chloromethane	74-87-3	1.00	U	2.00	1.00	0.500
2-Chlorotoluene	95-49-8	0.250	U	1.00	0.250	0.125
4-Chlorotoluene	106-43-4	0.500	U	1.00	0.500	0.250
1,2-Dibromo-3-chloropropane	96-12-8	2.00	U	5.00	2.00	1.00
1,2-Dibromoethane	106-93-4	0.500	U	1.00	0.500	0.250
Dibromomethane	74-95-3	0.500	U	1.00	0.500	0.250
1,2-Dichlorobenzene	95-50-1	0.250	U	1.00	0.250	0.125
1,3-Dichlorobenzene	541-73-1	0.500	U	1.00	0.500	0.250
1,4-Dichlorobenzene	106-46-7	0.250	U	1.00	0.250	0.125
Dichlorodifluoromethane	75-71-8	0.500	U	1.00	0.500	0.250
1,1-Dichloroethane	75-34-3	0.250	U	1.00	0.250	0.125
1,2-Dichloroethane	107-06-2	0.500	U	1.00	0.500	0.250
1,1-Dichloroethene	75-35-4	1.00	U	2.00	1.00	0.500
cis-1,2-Dichloroethene	156-59-2	0.552	J	1.00	0.500	0.250

Analyte	CAS #	Result	Qual	LOQ	LOD	DL
trans-1,2-Dichloroethene	156-60-5	0.500	U	1.00	0.500	0.250
1,2-Dichloropropane	78-87-5	0.400	U	1.00	0.400	0.200
1,3-Dichloropropane	142-28-9	0.400	U	1.00	0.400	0.200
2,2-Dichloropropane	594-20-7	0.500	U	1.00	0.500	0.250
cis-1,3-Dichloropropene	10061-01-5	0.500	U	1.00	0.500	0.250
trans-1,3-Dichloropropene	10061-02-6	1.00	U	2.00	1.00	0.500
1,1-Dichloropropene	563-58-6	0.500	U	1.00	0.500	0.250
Ethylbenzene	100-41-4	0.500	U	1.00	0.500	0.250
2-Hexanone	591-78-6	5.00	U	10.0	5.00	2.50
Hexachlorobutadiene	87-68-3	0.500	U	1.00	0.500	0.250
Isopropylbenzene	98-82-8	0.500	U	1.00	0.500	0.250
p-Isopropyltoluene	99-87-6	0.500	U	1.00	0.500	0.250
4-Methyl-2-pentanone	108-10-1	5.00	U	10.0	5.00	2.50
Methylene chloride	75-09-2	0.500	U	1.00	0.500	0.250
Naphthalene	91-20-3	0.400	U	1.00	0.400	0.200
n-Propylbenzene	103-65-1	0.250	U	1.00	0.250	0.125
Styrene	100-42-5	0.250	U	1.00	0.250	0.125
1,1,1,2-Tetrachloroethane	630-20-6	0.500	U	1.00	0.500	0.250
1,1,2,2-Tetrachloroethane	79-34-5	0.400	U	1.00	0.400	0.200
Tetrachloroethene	127-18-4	0.500	U	1.00	0.500	0.250
Toluene	108-88-3	0.500	U	1.00	0.500	0.250
1,2,3-Trichlorobenzene	87-61-6	0.300	U	1.00	0.300	0.150
1,2,4-Trichlorobenzene	120-82-1	0.400	U	1.00	0.400	0.200
1,1,1-Trichloroethane	71-55-6	0.500	U	1.00	0.500	0.250
1,1,2-Trichloroethane	79-00-5	0.500	U	1.00	0.500	0.250
Trichloroethene	79-01-6	0.721	J	1.00	0.500	0.250
Trichlorofluoromethane	75-69-4	0.500	U	1.00	0.500	0.250
1,2,3-Trichloropropane	96-18-4	1.00	U	2.00	1.00	0.500
1,2,4-Trimethylbenzene	95-63-6	0.500	U	1.00	0.500	0.250
1,3,5-Trimethylbenzene	108-67-8	0.500	U	1.00	0.500	0.250
Vinyl chloride	75-01-4	0.500	U	1.00	0.500	0.250
o-Xylene	95-47-6	0.500	U	1.00	0.500	0.250
m-,p-Xylene	179601-23-1	1.00	U	2.00	1.00	0.500

Surrogate	Recovery	Lower Limit	Upper Limit	Q
Dibromofluoromethane	100	85	115	
1,2-Dichloroethane-d4	100	70	120	
Toluene-d8	107	85	120	
4-Bromofluorobenzene	102	75	120	

J	Estimated value ; the analyte concentration was less than the LOQ.

Q	One or more quality control criteria failed. See narrative.
U	Analyte was not detected. The concentration is below the reported LOD.

Lab Report #: L14010285
Lab Project #: 2551.096
Project Name: Longhorn Army Ammunition
Lab Contact: Kathy Albertson

Certificate of Analysis

Sample #:	L14010285-05	**PrePrep Method:**	N/A	**Instrument:**	HPMS11
Client ID:	TRIP BLANK	**Prep Method:**	5030B/5030C/5035A	**Prep Date:**	N/A
Matrix:	Water	**Analytical Method:**	8260B	**Cal Date:**	11/05/2013 21:39
Workgroup #:	WG459903	**Analyst:**	ADC	**Run Date:**	01/19/2014 18:47
Collect Date:	01/08/2014 00:01	**Dilution:**	1	**File ID:**	11M98471
Sample Tag:	01	**Units:**	ug/L		

Analyte	CAS #	Result	Qual	LOQ	LOD	DL
Acetone	67-64-1	5.00	U	10.0	5.00	2.50
Benzene	71-43-2	0.250	U	1.00	0.250	0.125
Bromobenzene	108-86-1	0.250	U	1.00	0.250	0.125
Bromochloromethane	74-97-5	0.400	U	1.00	0.400	0.200
Bromodichloromethane	75-27-4	0.500	U	1.00	0.500	0.250
Bromoform	75-25-2	1.00	U	2.00	1.00	0.500
Bromomethane	74-83-9	1.00	Q	2.00	1.00	0.500
2-Butanone	78-93-3	5.00	U	10.0	5.00	2.50
n-Butylbenzene	104-51-8	0.500	U	1.00	0.500	0.250
sec-Butylbenzene	135-98-8	0.500	U	1.00	0.500	0.250
tert-Butylbenzene	98-06-6	0.500	U	1.00	0.500	0.250
Carbon disulfide	75-15-0	1.00	U	2.00	1.00	0.500
Carbon tetrachloride	56-23-5	0.500	U	1.00	0.500	0.250
Chlorobenzene	108-90-7	0.250	U	1.00	0.250	0.125
Chlorodibromomethane	124-48-1	0.500	U	1.00	0.500	0.250
Chloroethane	75-00-3	1.00	U	2.00	1.00	0.500
Chloroform	67-66-3	0.250	U	1.00	0.250	0.125
Chloromethane	74-87-3	1.00	U	2.00	1.00	0.500
2-Chlorotoluene	95-49-8	0.250	U	1.00	0.250	0.125
4-Chlorotoluene	106-43-4	0.500	U	1.00	0.500	0.250
1,2-Dibromo-3-chloropropane	96-12-8	2.00	U	5.00	2.00	1.00
1,2-Dibromoethane	106-93-4	0.500	U	1.00	0.500	0.250
Dibromomethane	74-95-3	0.500	U	1.00	0.500	0.250
1,2-Dichlorobenzene	95-50-1	0.250	U	1.00	0.250	0.125
1,3-Dichlorobenzene	541-73-1	0.500	U	1.00	0.500	0.250
1,4-Dichlorobenzene	106-46-7	0.250	U	1.00	0.250	0.125
Dichlorodifluoromethane	75-71-8	0.500	U	1.00	0.500	0.250
1,1-Dichloroethane	75-34-3	0.250	U	1.00	0.250	0.125
1,2-Dichloroethane	107-06-2	0.500	U	1.00	0.500	0.250
1,1-Dichloroethene	75-35-4	1.00	U	2.00	1.00	0.500
cis-1,2-Dichloroethene	156-59-2	0.500	U	1.00	0.500	0.250

Analyte	CAS #	Result	Qual	LOQ	LOD	DL
trans-1,2-Dichloroethene	156-60-5	0.500	U	1.00	0.500	0.250
1,2-Dichloropropane	78-87-5	0.400	U	1.00	0.400	0.200
1,3-Dichloropropane	142-28-9	0.400	U	1.00	0.400	0.200
2,2-Dichloropropane	594-20-7	0.500	U	1.00	0.500	0.250
cis-1,3-Dichloropropene	10061-01-5	0.500	U	1.00	0.500	0.250
trans-1,3-Dichloropropene	10061-02-6	1.00	U	2.00	1.00	0.500
1,1-Dichloropropene	563-58-6	0.500	U	1.00	0.500	0.250
Ethylbenzene	100-41-4	0.500	U	1.00	0.500	0.250
2-Hexanone	591-78-6	5.00	U	10.0	5.00	2.50
Hexachlorobutadiene	87-68-3	0.500	U	1.00	0.500	0.250
Isopropylbenzene	98-82-8	0.500	U	1.00	0.500	0.250
p-Isopropyltoluene	99-87-6	0.500	U	1.00	0.500	0.250
4-Methyl-2-pentanone	108-10-1	5.00	U	10.0	5.00	2.50
Methylene chloride	75-09-2	0.500	U	1.00	0.500	0.250
Naphthalene	91-20-3	0.400	U	1.00	0.400	0.200
n-Propylbenzene	103-65-1	0.250	U	1.00	0.250	0.125
Styrene	100-42-5	0.250	U	1.00	0.250	0.125
1,1,1,2-Tetrachloroethane	630-20-6	0.500	U	1.00	0.500	0.250
1,1,2,2-Tetrachloroethane	79-34-5	0.400	U	1.00	0.400	0.200
Tetrachloroethene	127-18-4	0.500	U	1.00	0.500	0.250
Toluene	108-88-3	0.500	U	1.00	0.500	0.250
1,2,3-Trichlorobenzene	87-61-6	0.300	U	1.00	0.300	0.150
1,2,4-Trichlorobenzene	120-82-1	0.400	U	1.00	0.400	0.200
1,1,1-Trichloroethane	71-55-6	0.500	U	1.00	0.500	0.250
1,1,2-Trichloroethane	79-00-5	0.500	U	1.00	0.500	0.250
Trichloroethene	79-01-6	0.500	U	1.00	0.500	0.250
Trichlorofluoromethane	75-69-4	0.500	U	1.00	0.500	0.250
1,2,3-Trichloropropane	96-18-4	1.00	U	2.00	1.00	0.500
1,2,4-Trimethylbenzene	95-63-6	0.500	U	1.00	0.500	0.250
1,3,5-Trimethylbenzene	108-67-8	0.500	U	1.00	0.500	0.250
Vinyl chloride	75-01-4	0.500	U	1.00	0.500	0.250
o-Xylene	95-47-6	0.500	U	1.00	0.500	0.250
m-,p-Xylene	179601-23-1	1.00	U	2.00	1.00	0.500

Surrogate	Recovery	Lower Limit	Upper Limit	Q
Dibromofluoromethane	99.3	85	115	
1,2-Dichloroethane-d4	97.8	70	120	
Toluene-d8	107	85	120	
4-Bromofluorobenzene	99.2	75	120	

Q	One or more quality control criteria failed. See narrative.

U	Analyte was not detected. The concentration is below the reported LOD.

2.1.1.2 QC Summary Data

Example 8260 Calculations

1.0 Calculating the Response Factor (RF) from the initial calibration (ICAL) data:

$$RF = [\ (Ax)\ (Cis)\ ]\ /\ [\ (Ais)\ (Cx)\ ]$$

where:

	Example
Ax = Area of the characteristic ion for the compound being measured:	3399156
Cis = Concentration of the specific internal standard (ug/mL)	25
Ais = Area of the characteristic ion of the specific internal standard	846471
Cx = Concentration of the compound in the standard being measured (ug/mL)	100
RF = Calculated Response Factor	**1.0039**

2.0 Calculating the concentration (C) of a compound in water using the average RF: *

$$Cx = [\ (Ax)\ (Cis)\ (Vn)(D)]\ /\ [\ (Ais)\ (RF)\ (Vs)\ ]$$

where:

	Example
Ax = Area of the characteristic ion for the compound being measured	**3122498**
Cis = Concentration of the specific internal standard (ug/L)	**25**
D = Dilution factor for sample as a multiplier (10x = 10)	**1**
Ais = Area of the characteristic ion of the specific internal standard	**611048**
RF = Average RF from the ICAL	**1.004**
Vs = Purge volume of sample (mL)	**10**
Vn = Nominal purge volume of sample (mL) (10.0 mL)	**10**
Cx = Concentration of the compound in the sample being measured (ug/L)	**127.2428**

3.0 Calculating the concentration (C) of a compound in soil using the average RF: *

$$Cx = [\ (Ax)\ (Cis)\ (Wn)(D)]\ /\ [\ (Ais)\ (RF)\ (Ws)\ ]$$

where:

	Example
Ax = Area of the characteristic ion for the compound being measured	**3122498**
Cis = Concentration of the specific internal standard (ug/L)	**25**
D = Dilution factor for sample as a multiplier (10x = 10)	**1**
Ais = Area of the characteristic ion of the specific internal standard	**611048**
RF = Average RF from the ICAL	**1.004**
Ws = Weight of sample purged (g)	**5**
Wn = Nominal purge weight (g) (5.0 g)	**5**
Cx = Concentration of the compound in the sample being measured (ug/L)	**127.2428**

Dry weight correction:

Percent solids (PCT_S)	**50**
Cd = (Cx) (100)/PCT_S	**254.4856**

* Concentrations appearing on the instrument quantitation reports are on-column results and do not take into account initial volume, final volume, and the dilution factor.

4.0 Concentration from Linear Regression

Step 1: Retrieve Curve Data From Plot, y = mx + b

y = response ratio = response of analyte / response of IS = Ax/Ais

x = amount ratio = concentration analyte/concentration internal standard = Cx / Cis

m = slope from curve = 0.213

b = intercept from curve = - 0.00642

Step 2: Calculate y from Quantitation Report

y = 86550/593147 = 0.1459

Step 3: Solve for x

x = (y - b)/m = [(0.1459 -(- 0.00642)]/ 0.213 = 0.7152

Step 4: Solve for analyte concentration Cx

Cx = Cis (x) = (25.0)(0.7152) = 17.88

Example Spreadsheet Calculation:

Slope from curve, m:	**0.213**
Intercept from curve, b:	**-0.00642**
Area of analyte, Ax:	**86550**
Area of Internal Standard , Ais:	**593147**
Concentration of IS, Cis	**25.00**
Response Ratio:	**0.145917**
Amount Ratio:	**0.715195**
Concentration:	**17.87988**
Units of Internal Standard:	**ug/L**

5.0 Concentration from Quadratic Regression

Step 1 - Retrieve Curve Data from Plot, y = Ax^2 + Bx + C
Where:
Ax^2 + Bx + (C - y) = 0
A, B, C = constants from the ICAL quadratic regression
y = Response ratio = Area of analyte/Area of internal standard (IS)
x = Amount ratio = Concentration of analyte/concentration of IS

Step 2: Calculate y from Quantitation Report

y = Ax/Ais

Step 3: Solve for x using the quadratic formula
Ax^2 + Bx + C - y = 0

$$x = \frac{b \pm \sqrt{\left(b^2 - 4a\left(c - y\right)\right)}}{2a}$$ (Two possible solutions)

Step 4: Solve for analyte concentration Cx

Cx = (Cis)(Amount ratio)

Example Spreadsheet Calculation:

Value of A from plot:	**-0.00629**	
Value of B from plot:	**0.511**	
Value of C from plot:	**-0.0276**	
Area of unknown from quantitation report:	**293821**	
Area of IS from quantiation report:	**784848**	
Response ratio, y:	**0.374367**	
C - y:	**-0.40197**	
Root 1 - Computed amount ratio , X1:	**80.44567**	
Root 2 - Computed amount ratio , X2:	**0.794396**	use this solution
Concentration of IS, Cis:	**25.00**	
Concentration of analyte, Cx:	**19.86**	ug/L

Microbac Laboratories Inc.

Instrument Run Log

Instrument: HPMS11
Dataset: 110513
Analyst1: FJB
Analyst2: TMB
Method: 8260B
SOP: MSV01 / OVAP MSV01
Rev: 18 / 0
Method: 5030B/5030C/5035A
SOP: PAT01 / OVAP PAT01
Rev: 15 / 0
Method: 624
SOP: MSV10
Rev: 11
Maintenance Log ID: 48078

Internal Standard: STD60878
Surrogate Standard: STD60879
CCV: NA
LCS: STD61121
MS/MSD: NA

Column 1 ID: RTX502.2
Column 2 ID: NA
Workgroups: WG451178

Comments: Retuned on a clean source with new filaments. Had to adjust the tune targets. Passed 3 BFBs in a row.

File ID	Sample Information	pH	Mat	Dil	Reference	Date/Time
11M96653	BFB CHECK	NA	1	1		11/05/13 07:13
11M96654	BFB CHECK	NA	1	1		11/05/13 07:29
11M96655	BFB CHECK	NA	1	1		11/05/13 08:01
11M96656	BFB CHECK	NA	1	1		11/05/13 08:42
11M96657	BFB CHECK	NA	1	1		11/05/13 08:54
11M96658	BFB CHECK	NA	1	1		11/05/13 09:07
11M96659	RINSE	NA	1	1		11/05/13 09:32
11M96660	WG451178-01 BFB 50ng 8260	NA	1	1	STD61161	11/05/13 15:39
11M96661	WG451178-01 BFB 50ng 8260	NA	1	1	STD61161	11/05/13 15:54
11M96662	WG451178-02 0.3ug/L STD 8260	NA	1	1	STD61183	11/05/13 16:30
11M96663	WG451178-03 0.4ug/L STD 8260	NA	1	1	STD61183	11/05/13 17:02
11M96664	WG451178-04 1ug/L STD 8260	NA	1	1	STD61183	11/05/13 17:37
11M96665	WG451178-05 2ug/L STD 8260	NA	1	1	STD61183	11/05/13 18:22
11M96666	WG451178-06 5ug/L STD 8260	NA	1	1	STD61183	11/05/13 18:54
11M96667	WG451178-07 20ug/L STD 8260	NA	1	1	STD61183	11/05/13 19:34
11M96668	WG451178-08 50ug/L STD 8260	NA	1	1	STD61183	11/05/13 20:05
11M96669	WG451178-09 100ug/L STD 8260	NA	1	1	STD61183	11/05/13 20:36
11M96670	WG451178-10 200ug/L STD 8260	NA	1	1	STD61183	11/05/13 21:08
11M96671	WG451178-11 300ug/L STD 8260	NA	1	1	STD61183	11/05/13 21:39
11M96672	RINSE	NA	1	1		11/05/13 22:10
11M96673	WG451178-12 20ug/L ALT SRC 8260	NA	1	1	STD61121	11/05/13 22:42
11M96674	RINSE	NA	1	1		11/05/13 23:13

Comments

Seq.	Rerun	Dil.	Reason	Analytes
21				

File ID: 11M96673

Surrogates spiked at 10ppb instead of 25ppb.

Approved: November 07, 2013

Page: 1

Microbac Laboratories Inc.

Instrument Run Log

Instrument: HPMS11
Dataset: 120413
Analyst1: FJB
Analyst2: NA
Method: 8260B
SOP: MSV1
Rev: 19
Method: 5030B/5030C/5035A
SOP: PAT01
Rev: 16

Maintenance Log ID: 48563

Internal Standard: STD61448
Surrogate Standard: STD61328
CCV: NA
LCS: STD61663
MS/MSD: NA

Column 1 ID: RTX502.2
Column 2 ID: NA
Workgroups: WG455130

Comments:

File ID	Sample Information	pH	Mat	Dil	Reference	Date/Time
11M97408	WG455130-01 BFB 50ng A9FOO	NA	1	1	STD61161	12/04/13 15:09
11M97409	RINSE	NA	1	1		12/04/13 15:34
11M97410	WG455130-02 5ug/L STD A9FOO	NA	1	1	STD61356	12/04/13 16:06
11M97411	WG455130-03 20ug/L STD A9FOO	NA	1	1	STD61356	12/04/13 16:38
11M97412	WG455130-04 50ug/L STD A9FOO	NA	1	1	STD61356	12/04/13 17:10
11M97413	WG455130-05 100ug/L STD A9FOO	NA	1	1	STD61356	12/04/13 17:41
11M97414	WG455130-06 200ug/L STD A9FOO	NA	1	1	STD61356	12/04/13 18:13
11M97415	WG455130-07 300ug/L STD A9FOO	NA	1	1	STD61356	12/04/13 18:44
11M97416	WG455130-08 400ug/L STD A9FOO	NA	1	1	STD61356	12/04/13 19:15
11M97417	WG455130-09 500ug/L STD A9FOO	NA	1	1	STD61356	12/04/13 19:47
11M97418	RINSE	NA	1	1		12/04/13 20:18
11M97419	WG455130-10 100ug/L ALT SRC A9FOO	NA	1	1	STD61663	12/04/13 20:50

Approved: December 19, 2013

Microbac Laboratories Inc.

Instrument Run Log

Instrument:	HPMS11	Dataset:	011914		
Analyst1:	ADC	Analyst2:	NA		
Method:	8260B	SOP:	MSV01	Rev:	19
Method:	5030B/5030C/5035A	SOP:	PAT01	Rev:	16

Maintenance Log ID: 48878

Internal Standard: STD62025
Surrogate Standard: STD62083
CCV: STD62280
LCS: STD62287
MS/MSD: NA

Column 1 ID: RTX502.2
Column 2 ID: NA
Workgroups: WG459903

Comments:

File ID	Sample Information	pH	Mat	Dil	Reference	Date/Time
11M98460	WG459902-01 BFB 50ng 8260	NA	1	1	STD62146	01/19/14 13:14
11M98461	WG459902-01 BFB 50ng 8260	NA	1	1	STD62146	01/19/14 13:33
11M98462	WG459902-01 BFB 50ng 8260	NA	1	1	STD62146	01/19/14 14:06
11M98463	WG459902-02 50ug/L CCV 8260	NA	1	1	STD62280	01/19/14 14:35
11M98464	RINSE	NA	1	1		01/19/14 15:07
11M98465	WG459903-01 VBLK0119 BLANK 8260	NA	1	1		01/19/14 15:38
11M98466	WG459903-02 20ug/L LCS 8260	NA	1	1	STD62287	01/19/14 16:10
11M98467	WG459903-03 20ug/L LCSDUP 8260	NA	1	1	STD62287	01/19/14 16:42
11M98468	RINSE	NA	1	1		01/19/14 17:13
11M98469	L14010264-03 A 826-LOW	<2	1	1		01/19/14 17:44
11M98470	L14010263-01 A 826-LOW	<2	1	1		01/19/14 18:16
11M98471	L14010285-05 A 826-LOW	<2	1	1		01/19/14 18:47
11M98472	L14010351-01 A 826-LOW	<2	1	1		01/19/14 19:19
11M98473	L14010363-02 A 826-A9	<2	1	1		01/19/14 19:51
11M98474	L14010263-02 A 826-LOW	<2	1	1		01/19/14 20:22
11M98475	L14010264-01 A 826-LOW	<2	1	1		01/19/14 20:54
11M98476	L14010285-01 A 826-LOW	<2	1	1		01/19/14 21:25
11M98477	L14010285-02 A 826-LOW	<2	1	1		01/19/14 21:57
11M98478	L14010285-03 A 826-LOW	<2	1	1		01/19/14 22:28
11M98479	L14010285-04 A 826-LOW	<2	1	1		01/19/14 23:00
11M98480	L14010351-02 A 826-LOW	<2	1	1		01/19/14 23:31
11M98481	L14010351-03 A 826-LOW	<2	1	1		01/20/14 00:03
11M98482	L14010351-04 A 826-LOW	<2	1	1		01/20/14 00:34
11M98483	L14010351-05 A 826-LOW	<2	1	1		01/20/14 01:06
11M98484	L14010419-01 A 826-SPE	<2	1	1		01/20/14 01:37
11M98485	L14010286-04 A 826-SPE	<2	1	1		01/20/14 02:09
11M98486	RINSE	NA	1	1		01/20/14 02:40
11M98487	RINSE	NA	1	1		01/20/14 03:12
11M98488	RINSE	NA	1	1		01/20/14 03:43

Comments

Seq.	Rerun	Dil.	Reason	Analytes
1				

Approved: January 20, 2014

Microbac Laboratories Inc.

Instrument Run Log

Instrument: HPMS11
Dataset: 011914
Analyst1: ADC
Analyst2: NA
Method: 8260B
SOP: MSV01
Rev: 19
Method: 5030B/5030C/5035A
SOP: PAT01
Rev: 16

Maintenance Log ID: 48878

Internal Standard: STD62025
Surrogate Standard: STD62083
CCV: STD62280
LCS: STD62287
MS/MSD: NA

Column 1 ID: RTX502.2
Column 2 ID: NA
Workgroups: WG459903

Comments:

Comments

Seq.	Rerun	Dil.	Reason	Analytes
File ID: 11M98460				
	RR, BFB failed.			
2				
File ID: 11M98461				
	RR, BFB failed. Purging next BFB.			
26	X		Missed Tune	
File ID: 11M98485				
	L14010286-04			

Approved: January 20, 2014

Microbac Laboratories Inc.

Data Checklist

Date: 05-NOV-2013
Analyst: FJB
Analyst: TMB
Method: 8260B / 624
Instrument: HPMS11
Curve Workgroup: NA
Runlog ID: 56925
Analytical Workgroups: WG451178

System Performance Check	X
BFB	X
Initial Calibration	X
Average RF	X
Linear Reg or Higher Order Curve	X
Second Source standard % Difference	X
Continuing Calibration /Check Standards	X
Project/Client Specific Requirements	X
Special Standards	NA
Blanks	X
TCL's	X
Surrogates	X
LCS (Laboratory Control Sample)	X
Recoveries	X
Surrogates	X
MS/MSD/Duplicates	NA
Samples	NA
TCL Hits	NA
Spectra of TCL Hits	NA
Surrogates	NA
Internal Standards Criteria	NA
Library Searches	NA
Calculations & Correct Factors	NA
Dilutions Run	NA
Reruns	NA
Manual Integrations	NA
Case Narrative	X
Results Reporting/Data Qualifiers	X
KOBRA Workgroup Data	X
Check for Completeness	X
Primary Reviewer	FJB
Secondary Reviewer	MDA
Check for compliance with method and project specific requirements	X
Check the completeness of reported information	X
Check the information for the report narrative	X
Check the reasonableness of the results	X

Primary Reviewer:
06-NOV-2013

Secondary Reviewer:
07-NOV-2013

CHECKLIST1 - Modified 03/05/2008
Generated: NOV-07-2013 12:42:59

Microbac®

Microbac Laboratories Inc.

Data Checklist

Date: 04-DEC-2013
Analyst: FJB
Analyst: NA
Method: 8260B
Instrument: HPMS11
Curve Workgroup: NA
Runlog ID: 57820
Analytical Workgroups: WG455130

System Performance Check	X
BFB	X
Initial Calibration	X
Average RF	X
Linear Reg or Higher Order Curve	X
Second Source standard % Difference	X
Continuing Calibration /Check Standards	X
Project/Client Specific Requirements	X
Special Standards	X
Blanks	X
TCL's	X
Surrogates	X
LCS (Laboratory Control Sample)	X
Recoveries	X
Surrogates	X
MS/MSD/Duplicates	NA
Samples	NA
TCL Hits	NA
Spectra of TCL Hits	NA
Surrogates	NA
Internal Standards Criteria	NA
Library Searches	NA
Calculations & Correct Factors	NA
Dilutions Run	NA
Reruns	NA
Manual Integrations	NA
Case Narrative	X
Results Reporting/Data Qualifiers	X
KOBRA Workgroup Data	X
Check for Completeness	X
Primary Reviewer	FJB
Secondary Reviewer	MDA
Check for compliance with method and project specific requirements	X
Check the completeness of reported information	X
Check the information for the report narrative	X
Check the reasonableness of the results	X

Primary Reviewer:
18-DEC-2013

Secondary Reviewer:
19-DEC-2013

CHECKLIST1 - Modified 03/05/2008
Generated: DEC-19-2013 08:33:22

Checklist ID: 84407

Microbac Laboratories Inc.

Data Checklist

Date: 19-JAN-2014

Analyst: ADC

Analyst: NA

Method: 8260

Instrument: HPMS11

Curve Workgroup: NA

Runlog ID: 58380

Analytical Workgroups: WG459903

System Performance Check	NA
BFB	X
Initial Calibration	X
Average RF	X
Linear Reg or Higher Order Curve	X
Second Source standard % Difference	X
Continuing Calibration /Check Standards	X
Project/Client Specific Requirements	X
Special Standards	NA
Blanks	X
TCL's	X
Surrogates	X
LCS (Laboratory Control Sample)	X
Recoveries	X
Surrogates	X
MS/MSD/Duplicates	NA
Samples	X
TCL Hits	X
Spectra of TCL Hits	X
Surrogates	X
Internal Standards Criteria	X
Library Searches	NA
Calculations & Correct Factors	X
Dilutions Run	NA
Reruns	NA
Manual Integrations	NA
Case Narrative	X
Results Reporting/Data Qualifiers	X
KOBRA Workgroup Data	X
Check for Completeness	X
Primary Reviewer	MES
Secondary Reviewer	MDA
Check for compliance with method and project specific requirements	X
Check the completeness of reported information	X
Check the information for the report narrative	X
Check the reasonableness of the results	X

Primary Reviewer:
20-JAN-2014
Mary Schilling

Secondary Reviewer:
20-JAN-2014

CHECKLIST1 - Modified 03/05/2008
Generated: JAN-20-2014 14:23:27

Microbac Laboratories Inc.

HOLDING TIMES
EQUIVALENT TO AFCEE FORM 9

Analytical Method: 8260B

AAB#: WG459903

Login Number: L14010285

Client ID	ID	Date Collected	TCLP Date	Time Held	Max Hold	Q	Extract Date	Time Held	Max Hold	Q	Run Date	Time Held	Max Hold	Q
12WW23-010814	01	01/08/14					01/19/2014	11.5	14		01/19/14	11.5	14	
12WW22-010814	02	01/08/14					01/19/2014	11.5	14		01/19/14	11.5	14	
12WW21-010814	03	01/08/14					01/19/2014	11.4	14		01/19/14	11.4	14	
12WW20-010814	04	01/08/14					01/19/2014	11.4	14		01/19/14	11.4	14	
TRIP BLANK	05	01/08/14					01/19/2014	11.8	14		01/19/14	11.8	14	

* = SEE PROJECT QAPP REQUIREMENTS

HOLD_TIMES - Modified 03/06/2008
PDF File ID: 3319095
Report generated 01/20/2014 15:16

Microbac Laboratories Inc.
SURROGATE STANDARDS

Login Number: L14010285
Instrument Id: HPMS11
Workgroup (AAB#): WG459903
Method: 8260
CAL ID: HPMS11 - 05-NOV-13
Matrix: Water

Sample Number	Dilution	Tag	1	2	3	4
L14010285-01	1.00	01	97.4	100	101	109
L14010285-02	1.00	01	100	102	104	108
L14010285-03	1.00	01	100	100	102	107
L14010285-04	1.00	01	100	100	102	107
L14010285-05	1.00	01	97.8	99.3	99.2	107
WG459903-01	1.00	01	98.7	99.1	102	109
WG459903-02	1.00	01	98.0	99.2	102	108
WG459903-03	1.00	01	97.6	101	104	109

Surrogates	Surrogate Limits
1 - 1,2-Dichloroethane-d4	70 - 120
2 - Dibromofluoromethane	85 - 115
3 - 4-Bromofluorobenzene	75 - 120
4 - Toluene-d8	85 - 120

Underline = Result out of surrogate limits

DL = surrogate diluted out
ND = surrogate not detected

SURROGATES - Modified 03/06/2008
PDF File ID: 3318500
Report generated: 01/20/2014 15:16

METHOD BLANK SUMMARY

Login Number:	L14010285	Work Group:	WG459903
Blank File ID:	11M98465	Blank Sample ID:	WG459903-01
Prep Date:	01/19/14 15:38	Instrument ID:	HPMS11
Analyzed Date:	01/19/14 15:38	Method:	8260B
Analyst:	ADC		

This Method Blank Applies To The Following Samples:

Client ID	Lab Sample ID	Lab File ID	Time Analyzed	TAG
LCS	WG459903-02	11M98466	01/19/14 16:10	01
LCS2	WG459903-03	11M98467	01/19/14 16:42	01
TRIP BLANK	L14010285-05	11M98471	01/19/14 18:47	01
12WW23-010814	L14010285-01	11M98476	01/19/14 21:25	01
12WW22-010814	L14010285-02	11M98477	01/19/14 21:57	01
12WW21-010814	L14010285-03	11M98478	01/19/14 22:28	01
12WW20-010814	L14010285-04	11M98479	01/19/14 23:00	01

Report Name: BLANK_SUMMARY
PDF File ID: 3319096
Report generated 01/20/2014 15:16

Microbac Laboratories Inc.
METHOD BLANK REPORT

Login Number: L14010285
Prep Date: 01/19/14 15:38
Sample ID: WG459903-01
Instrument ID: HPMS11
Run Date: 01/19/14 15:38
Prep Method: 5030B/5030C/503
File ID: 11M98465
Analyst: ADC
Method: 8260B
Workgroup (AAB#): WG459903
Matrix: Water
Units: ug/L
Contract #:
Cal ID: HPMS11 - 05-NOV-13

Analytes	DL	LOQ	Concentration	Dilution	Qualifier
Acetone	2.50	10.0	2.50	1	U
Benzene	0.125	1.00	0.125	1	U
Bromobenzene	0.125	1.00	0.125	1	U
Bromochloromethane	0.200	1.00	0.200	1	U
Bromodichloromethane	0.250	1.00	0.250	1	U
Bromoform	0.500	2.00	0.500	1	U
Bromomethane	0.500	2.00	0.500	1	U
2-Butanone	2.50	10.0	2.50	1	U
n-Butylbenzene	0.250	1.00	0.250	1	U
sec-Butylbenzene	0.250	1.00	0.250	1	U
tert-Butylbenzene	0.250	1.00	0.250	1	U
Carbon disulfide	0.500	2.00	0.500	1	U
Carbon tetrachloride	0.250	1.00	0.250	1	U
Chlorobenzene	0.125	1.00	0.125	1	U
Chlorodibromomethane	0.250	1.00	0.250	1	U
Chloroethane	0.500	2.00	0.500	1	U
Chloroform	0.125	1.00	0.125	1	U
Chloromethane	0.500	2.00	0.500	1	U
2-Chlorotoluene	0.125	1.00	0.125	1	U
4-Chlorotoluene	0.250	1.00	0.250	1	U
1,2-Dibromo-3-chloropropane	1.00	5.00	1.00	1	U
1,2-Dibromoethane	0.250	1.00	0.250	1	U
Dibromomethane	0.250	1.00	0.250	1	U
1,2-Dichlorobenzene	0.125	1.00	0.125	1	U
1,3-Dichlorobenzene	0.250	1.00	0.250	1	U
1,4-Dichlorobenzene	0.125	1.00	0.125	1	U
Dichlorodifluoromethane	0.250	1.00	0.250	1	U
1,1-Dichloroethane	0.125	1.00	0.125	1	U
1,2-Dichloroethane	0.250	1.00	0.250	1	U
1,1-Dichloroethene	0.500	2.00	0.500	1	U
cis-1,2-Dichloroethene	0.250	1.00	0.250	1	U
trans-1,2-Dichloroethene	0.250	1.00	0.250	1	U
1,2-Dichloropropane	0.200	1.00	0.200	1	U
1,3-Dichloropropane	0.200	1.00	0.200	1	U
2,2-Dichloropropane	0.250	1.00	0.250	1	U
cis-1,3-Dichloropropene	0.250	1.00	0.250	1	U
trans-1,3-Dichloropropene	0.500	2.00	0.500	1	U
1,1-Dichloropropene	0.250	1.00	0.250	1	U
Ethylbenzene	0.250	1.00	0.250	1	U
2-Hexanone	2.50	10.0	2.50	1	U
Hexachlorobutadiene	0.250	1.00	0.258	1	J
Isopropylbenzene	0.250	1.00	0.250	1	U

Report Name: BLANK
PDF ID: 3319097
20-JAN-2014 15:16

Microbac Laboratories Inc.
METHOD BLANK REPORT

Login Number:	L14010285	Prep Date:	01/19/14 15:38	Sample ID:	WG459903-01
Instrument ID:	HPMS11	Run Date:	01/19/14 15:38	Prep Method:	5030B/5030C/503
File ID:	11M98465	Analyst:	ADC	Method:	8260B
Workgroup (AAB#):	WG459903	Matrix:	Water	Units:	ug/L
Contract #:		Cal ID:	HPMS11 - 05-NOV-13		

Analytes	DL	LOQ	Concentration	Dilution	Qualifier
p-Isopropyltoluene	0.250	1.00	0.250	1	U
4-Methyl-2-pentanone	2.50	10.0	2.50	1	U
Methylene chloride	0.250	1.00	0.250	1	U
Naphthalene	0.200	1.00	0.200	1	U
n-Propylbenzene	0.125	1.00	0.125	1	U
Styrene	0.125	1.00	0.125	1	U
1,1,1,2-Tetrachloroethane	0.250	1.00	0.250	1	U
1,1,2,2-Tetrachloroethane	0.200	1.00	0.200	1	U
Tetrachloroethene	0.250	1.00	0.250	1	U
Toluene	0.250	1.00	0.250	1	U
1,2,3-Trichlorobenzene	0.150	1.00	0.150	1	U
1,2,4-Trichlorobenzene	0.200	1.00	0.200	1	U
1,1,1-Trichloroethane	0.250	1.00	0.250	1	U
1,1,2-Trichloroethane	0.250	1.00	0.250	1	U
Trichloroethene	0.250	1.00	0.250	1	U
Trichlorofluoromethane	0.250	1.00	0.250	1	U
1,2,3-Trichloropropane	0.500	2.00	0.500	1	U
1,2,4-Trimethylbenzene	0.250	1.00	0.250	1	U
1,3,5-Trimethylbenzene	0.250	1.00	0.250	1	U
Vinyl chloride	0.250	1.00	0.250	1	U
o-Xylene	0.250	1.00	0.250	1	U
m-,p-Xylene	0.500	2.00	0.500	1	U

Surrogates	% Recovery	Surrogate Limits	Qualifier
Dibromofluoromethane	99.1	85 - 115	PASS
1,2-Dichloroethane-d4	98.7	70 - 120	PASS
Toluene-d8	109	85 - 120	PASS
4-Bromofluorobenzene	102	75 - 120	PASS

DL	Method Detection Limit
LOQ	Reporting/Practical Quantitation Limit
ND	Analyte Not detected at or above reporting limit
*	|Analyte concentration| > 1/2 RL

Report Name:BLANK
PDF ID: 3319097
20-JAN-2014 15:16

Microbac Laboratories Inc.
LABORATORY CONTROL SAMPLE (LCS)

Login Number: L14010285
Analyst: ADC
Prep Method: 5030B/5030C/503
Instrument ID: HPMS11
Matrix: Water
Method: 8260B
Workgroup (AAB#): WG459903
Units: ug/L
QC Key: DOD4
Lot #: STD62287

Sample ID: WG459903-02 LCS File ID: 11M98466 Run Date: 01/19/2014 16:10
Sample ID: WG459903-03 LCS2 File ID: 11M98467 Run Date: 01/19/2014 16:42

Analytes	LCS			LCS2			%RPD	%Rec Limits	RPD Lmt	Q
	Known	Found	% REC	Known	Found	% REC				
1,1,1,2-Tetrachloroethane	20.0	22.3	112	20.0	21.3	106	4.80	80 - 130	30	
1,1,1-Trichloroethane	20.0	21.3	106	20.0	21.4	107	0.540	65 - 130	30	
1,1,2,2-Tetrachloroethane	20.0	24.7	123	20.0	25.5	128	3.49	65 - 130	30	
1,1,2-Trichloroethane	20.0	24.9	125	20.0	24.5	122	1.83	75 - 125	30	
1,1-Dichloroethane	20.0	22.2	111	20.0	22.0	110	0.562	70 - 135	30	
1,1-Dichloroethene	20.0	21.1	105	20.0	20.8	104	1.43	70 - 130	30	
1,1-Dichloropropene	20.0	23.0	115	20.0	22.3	112	2.83	75 - 130	30	
1,2,3-Trichlorobenzene	20.0	22.4	112	20.0	22.6	113	0.861	55 - 140	30	
1,2,3-Trichloropropane	20.0	24.5	123	20.0	24.7	123	0.539	75 - 125	30	
1,2,4-Trichlorobenzene	20.0	22.2	111	20.0	22.4	112	0.954	65 - 135	30	
1,2,4-Trimethylbenzene	20.0	22.0	110	20.0	22.1	111	0.505	75 - 130	30	
1,2-Dibromo-3-chloropropane	20.0	22.8	114	20.0	25.4	127	11.0	50 - 130	30	
1,2-Dibromoethane	20.0	24.5	123	20.0	24.4	122	0.658	80 - 120	30	*
1,2-Dichlorobenzene	20.0	20.4	102	20.0	20.2	101	0.666	70 - 120	30	
1,2-Dichloroethane	20.0	23.3	117	20.0	23.6	118	1.11	70 - 130	30	
1,2-Dichloropropane	20.0	23.7	118	20.0	23.6	118	0.455	75 - 125	30	
1,3,5-Trimethylbenzene	20.0	22.3	111	20.0	22.4	112	0.750	75 - 130	30	
1,3-Dichlorobenzene	20.0	19.9	99.6	20.0	20.1	101	1.03	75 - 125	30	
1,3-Dichloropropane	20.0	24.6	123	20.0	24.3	121	1.17	75 - 125	30	
1,4-Dichlorobenzene	20.0	20.5	102	20.0	20.8	104	1.86	75 - 125	30	
2,2-Dichloropropane	20.0	20.1	100	20.0	19.8	98.8	1.44	70 - 135	30	
2-Butanone	20.0	28.0	140	20.0	28.5	142	1.65	30 - 150	30	
2-Chlorotoluene	20.0	19.5	97.4	20.0	19.5	97.5	0.118	75 - 125	30	
2-Hexanone	20.0	26.2	131	20.0	26.3	132	0.398	55 - 130	30	*
4-Chlorotoluene	20.0	18.0	90.0	20.0	18.1	90.6	0.679	75 - 130	30	
4-Methyl-2-pentanone	20.0	25.9	130	20.0	27.0	135	4.11	60 - 135	30	
Acetone	20.0	31.3	156	20.0	32.8	164	4.80	40 - 140	30	*
Benzene	20.0	22.3	111	20.0	22.2	111	0.641	80 - 120	30	
Bromobenzene	20.0	21.2	106	20.0	21.0	105	0.807	75 - 125	30	
Bromochloromethane	20.0	23.9	120	20.0	23.9	119	0.190	65 - 130	30	
Bromodichloromethane	20.0	21.0	105	20.0	20.9	105	0.497	75 - 120	30	
Bromoform	20.0	24.3	122	20.0	23.7	119	2.65	70 - 130	30	
Bromomethane	20.0	26.8	134	20.0	26.6	133	0.685	30 - 145	30	
Carbon disulfide	20.0	20.9	105	20.0	20.8	104	0.363	35 - 160	30	
Carbon tetrachloride	20.0	21.3	106	20.0	21.3	107	0.244	65 - 140	30	
Chlorobenzene	20.0	20.2	101	20.0	19.8	98.8	2.39	80 - 120	30	
Chloroethane	20.0	23.7	118	20.0	23.9	119	0.769	60 - 135	30	
Chloroform	20.0	21.1	106	20.0	21.1	105	0.289	65 - 135	30	
Chloromethane	20.0	22.6	113	20.0	22.4	112	1.03	40 - 125	30	
cis-1,2-Dichloroethene	20.0	22.3	112	20.0	21.7	108	2.84	70 - 125	30	

LCS_LCS2 - Modified 03/06/2008
PDF File ID: 3318496
Report generated: 01/20/2014 15:16

Microbac Laboratories Inc.
LABORATORY CONTROL SAMPLE (LCS)

Login Number: L14010285
Analyst: ADC
Prep Method: 5030B/5030C/503
Instrument ID: HPMS11
Matrix: Water
Method: 8260B
Workgroup (AAB#): WG459903
Units: ug/L
QC Key: DOD4
Lot #: STD62287

Sample ID: WG459903-02 LCS File ID: 11M98466 Run Date: 01/19/2014 16:10
Sample ID: WG459903-03 LCS2 File ID: 11M98467 Run Date: 01/19/2014 16:42

Analytes	LCS			LCS2			%RPD	%Rec Limits	RPD Lmt	Q
	Known	Found	% REC	Known	Found	% REC				
cis-1,3-Dichloropropene	20.0	24.2	121	20.0	24.5	123	1.17	70 - 130	30	
Chlorodibromomethane	20.0	22.7	114	20.0	22.9	114	0.647	60 - 135	30	
Dibromomethane	20.0	23.3	116	20.0	23.9	120	2.55	75 - 125	30	
Dichlorodifluoromethane	20.0	27.7	139	20.0	26.9	135	3.00	30 - 155	30	
Ethylbenzene	20.0	21.3	107	20.0	20.8	104	2.64	75 - 125	30	
Hexachlorobutadiene	20.0	21.5	108	20.0	22.3	111	3.34	50 - 140	30	
Isopropylbenzene	20.0	21.5	107	20.0	21.1	106	1.62	75 - 125	30	
m-,p-Xylene	40.0	42.9	107	40.0	41.5	104	3.23	75 - 130	30	
Methylene chloride	20.0	21.4	107	20.0	21.6	108	1.09	55 - 140	30	
n-Butylbenzene	20.0	22.5	113	20.0	22.4	112	0.425	70 - 135	30	
n-Propylbenzene	20.0	19.8	98.8	20.0	19.5	97.7	1.08	70 - 130	30	
Naphthalene	20.0	24.8	124	20.0	25.5	128	3.01	55 - 140	30	
o-Xylene	20.0	19.8	99.1	20.0	19.0	95.1	4.08	80 - 120	30	
p-Isopropyltoluene	20.0	21.4	107	20.0	21.6	108	0.961	75 - 130	30	
sec-Butylbenzene	20.0	21.1	106	20.0	21.1	105	0.175	70 - 125	30	
Styrene	20.0	21.8	109	20.0	21.2	106	3.16	65 - 135	30	
tert-Butylbenzene	20.0	19.4	97.1	20.0	19.3	96.5	0.660	70 - 130	30	
Tetrachloroethene	20.0	21.6	108	20.0	20.8	104	3.71	45 - 150	30	
Toluene	20.0	22.6	113	20.0	21.7	109	4.03	75 - 120	30	
trans-1,2-Dichloroethene	20.0	22.0	110	20.0	21.9	110	0.446	60 - 140	30	
trans-1,3-Dichloropropene	20.0	22.9	114	20.0	22.5	112	1.59	55 - 140	30	
Trichloroethene	20.0	22.5	113	20.0	22.6	113	0.610	70 - 125	30	
Trichlorofluoromethane	20.0	23.1	116	20.0	22.3	112	3.51	60 - 145	30	
Vinyl chloride	20.0	23.3	117	20.0	23.0	115	1.35	50 - 145	30	

Surogates	LCS	LCS2	Surrogate Limits	Qualifier
	% Recovery	% Recovery		
1,2-Dichloroethane-d4	98.0	97.6	70 - 120	PASS
Dibromofluoromethane	99.2	101	85 - 115	PASS
4-Bromofluorobenzene	102	104	75 - 120	PASS
Toluene-d8	108	109	85 - 120	PASS

* EXCEEDS %REC LIMIT

EXCEEDS RPD LIMIT

LCS_LCS2 - Modified 03/06/2008
PDF File ID: 3318496
Report generated: 01/20/2014 15:16

Microbac Laboratories Inc.
ORGANIC INSTRUMENT CHECK

BFB

Login Number:	L14010285	Tune ID:	WG451178-01
Instrument:	HPMS11	Run Date:	11/05/2013
Analyst:	FJB	Run Time:	15:54
Workgroup:	WG451178	File ID:	11M96661
		Cal ID:	HPMS11 -

Target Mass	Rel. to Mass	Lower Limit%	Upper Limit%	Rel. Abn%	Raw Abn	Result Pass/Fail
50.0	95.0	15.0	40.0	20.8	2847	PASS
75.0	95.0	30.0	60.0	51.7	7067	PASS
95.0	95.0	100	100	100	13657	PASS
96.0	95.0	5.00	9.00	7.89	1078	PASS
173	174	0	2.00	0	0	PASS
174	95.0	50.0	100	70.9	9677	PASS
175	174	5.00	9.00	6.61	640	PASS
176	174	95.0	101	95.5	9240	PASS
177	176	5.00	9.00	5.78	534	PASS

This check relates to the following samples:

Lab ID	Client ID	Tag	Date Analyzed	Q
WG451178-02	STD	01	11/05/2013 16:30	
WG451178-03	STD	01	11/05/2013 17:02	
WG451178-04	STD	01	11/05/2013 17:37	
WG451178-05	STD	01	11/05/2013 18:22	
WG451178-06	STD	01	11/05/2013 18:54	
WG451178-07	STD	01	11/05/2013 19:34	
WG451178-08	STD-CCV	01	11/05/2013 20:05	
WG451178-09	STD	01	11/05/2013 20:36	
WG451178-10	STD	01	11/05/2013 21:08	
WG451178-11	STD	01	11/05/2013 21:39	
WG451178-12	SSCV	01	11/05/2013 22:42	

* Sample past 12 hour tune limit

TUNE - Modified 03/06/2008
PDF File ID: 3319099
Report generated 01/20/2014 15:16

Microbac Laboratories Inc.
ORGANIC INSTRUMENT CHECK

BFB

Login Number:	L14010285	Tune ID:	WG455130-01
Instrument:	HPMS11	Run Date:	12/04/2013
Analyst:	FJB	Run Time:	15:09
Workgroup:	WG455130	File ID:	11M97408
		Cal ID:	HPMS11 - 04-DEC-13

Target Mass	Rel. to Mass	Lower Limit%	Upper Limit%	Rel. Abn%	Raw Abn	Result Pass/Fail
50.0	95.0	15.0	40.0	26.3	2601	PASS
75.0	95.0	30.0	60.0	52.3	5177	PASS
95.0	95.0	100	100	100	9902	PASS
96.0	95.0	5.00	9.00	6.82	675	PASS
173	174	0	2.00	0	0	PASS
174	95.0	50.0	100	65.0	6441	PASS
175	174	5.00	9.00	5.96	384	PASS
176	174	95.0	101	98.2	6328	PASS
177	176	5.00	9.00	8.12	514	PASS

This check relates to the following samples:

Lab ID	Client ID	Tag	Date Analyzed	Q
WG455130-02	STD	01	12/04/2013 16:06	
WG455130-03	STD	01	12/04/2013 16:38	
WG455130-04	STD	01	12/04/2013 17:10	
WG455130-05	STD	01	12/04/2013 17:41	
WG455130-06	STD-CCV	01	12/04/2013 18:13	
WG455130-07	STD	01	12/04/2013 18:44	
WG455130-08	STD	01	12/04/2013 19:15	
WG455130-09	STD	01	12/04/2013 19:47	
WG455130-10	SSCV	01	12/04/2013 20:50	

* Sample past 12 hour tune limit

TUNE - Modified 03/06/2008
PDF File ID: 3319099
Report generated 01/20/2014 15:16

Microbac Laboratories Inc.
ORGANIC INSTRUMENT CHECK

BFB

Login Number: L14010285
Instrument: HPMS11
Analyst: ADC
Workgroup: WG459902

Tune ID: WG459902-01
Run Date: 01/19/2014
Run Time: 14:06
File ID: 11M98462
Cal ID: HPMS11 - 05-NOV-13

Target Mass	Rel. to Mass	Lower Limit%	Upper Limit%	Rel. Abn%	Raw Abn	Result Pass/Fail
50.0	95.0	15.0	40.0	21.0	6775	PASS
75.0	95.0	30.0	60.0	49.7	16066	PASS
95.0	95.0	100	100	100	32333	PASS
96.0	95.0	5.00	9.00	6.91	2235	PASS
173	174	0	2.00	0.527	127	PASS
174	95.0	50.0	100	74.5	24080	PASS
175	174	5.00	9.00	7.56	1820	PASS
176	174	95.0	101	97.7	23520	PASS
177	176	5.00	9.00	7.02	1651	PASS

This check relates to the following samples:

Lab ID	Client ID	Tag	Date Analyzed	Q
WG459902-02	CCV	01	01/19/2014 14:35	
WG459903-01	BLANK	01	01/19/2014 15:38	
WG459903-02	LCS	01	01/19/2014 16:10	
WG459903-03	LCS2	01	01/19/2014 16:42	
L14010285-05	TRIP BLANK	01	01/19/2014 18:47	
L14010285-01	12WW23-010814	01	01/19/2014 21:25	
L14010285-02	12WW22-010814	01	01/19/2014 21:57	
L14010285-03	12WW21-010814	01	01/19/2014 22:28	
L14010285-04	12WW20-010814	01	01/19/2014 23:00	

* Sample past 12 hour tune limit

TUNE - Modified 03/06/2008
PDF File ID: 3319099
Report generated 01/20/2014 15:16

Calibration Table Report
Method: 8260_WT.M
Title: 8260B/624 (SOP: OVL MSV01) Water 11/05/13 HPMS11
Last Calibration: Wed Nov 06 14:52:21 2013
Curve: WG451178
Calibration Files

	Compound	0.3 11M96662.D	0.4 11M96663.D	1 11M96664.D	2 11M96665.D	5 11M96666.D	20 11M96667.D	50 11M96668.D	100 11M96669.D	200 11M96670.D	300 11M96671.D	Avg	%RSD	Linear	Quadratic
I	Fluorobenzene	ISTD													
T	Dichlorodifluoromethane		0.233	0.206	0.240	0.213	0.270	0.266	0.269	0.254	0.269	0.247	10.096		
P	Chloromethane		0.392	0.328	0.384	0.305	0.357	0.330	0.340	0.330	0.367	0.348	8.297		
C	Vinyl Chloride		0.343	0.305	0.364	0.305	0.353	0.350	0.351	0.326	0.272	0.330	9.201		
T	1,3-Butadiene					0.288	0.268	0.209	0.166	0.155	0.150	0.206	29.033		0.999
T	Bromomethane		0.132	0.117	0.157	0.130	0.131	0.124	0.144	0.160	0.179	0.142	14.333		
T	Chloroethane		0.176	0.176	0.209	0.185	0.195	0.196	0.199	0.190	0.201	0.192	5.802		
T	Trichlorofluoromethane		0.476	0.408	0.477	0.428	0.469	0.472	0.478	0.451	0.473	0.459	5.516		
T	Diethyl ether			0.188	0.191	0.182	0.186	0.196	0.198		0.207	0.193	4.300		
T	Isoprene		0.408	0.346	0.398	0.346	0.383	0.370	0.390	0.368	0.392	0.378	5.831		
T	Acrolein			0.002	0.003	0.004	0.003	0.004	0.004		0.005	0.004	20.594		0.998
T	1,1,2-Trichloro-1,2,2-Trifluoroet		0.280	0.228	0.293	0.251	0.271	0.271	0.276	0.263	0.279	0.268	7.172		
T	Acetone					0.071	0.049	0.053	0.057	0.059	0.059	0.058	12.753		
C	1,1-Dichloroethene		0.447	0.408	0.495	0.430	0.463	0.465	0.467	0.442	0.465	0.454	5.514		
T	Tert-Butyl Alcohol			0.017	0.018	0.017	0.017	0.019	0.020		0.020	0.018	8.086		
T	Dimethyl Sulfide		0.243	0.227	0.268	0.251	0.266	0.256	0.271	0.262	0.272	0.257	5.778		
T	Iodomethane					0.020	0.126	0.196	0.230	0.225	0.229	0.171	49.117	0.999	
T	Methyl acetate			0.173	0.183	0.174	0.156	0.158	0.166	0.165	0.171	0.168	5.325		
T	Methylene Chloride		0.389	0.276	0.308	0.263	0.276	0.271	0.278	0.269	0.280	0.290	13.529		
T	Carbon Disulfide		0.890	0.755	0.911	0.786	0.873	0.821	0.857	0.776	0.765	0.826	7.075		
T	Acrylonitrile			0.063	0.065	0.062	0.067	0.074	0.076		0.088	0.071	13.084		
T	Methyl Tert Butyl Ether		0.640	0.666	0.697	0.663	0.663	0.696	0.704	0.678	0.685	0.677	3.058		
T	trans-1,2-Dichloroethene		0.293	0.285	0.302	0.272	0.288	0.285	0.289	0.275	0.289	0.287	3.133		
T	n-Hexane			0.353	0.391	0.330	0.364	0.349	0.363	0.335	0.350	0.354	5.304		
T	Diisopropyl ether			0.937	0.957	0.868	0.902	0.919	0.887		0.876	0.907	3.607		
T	Vinyl Acetate		0.296	0.303	0.325	0.314	0.359	0.370	0.385	0.362	0.350	0.340	9.320		
P	1,1-Dichloroethane		0.527	0.501	0.561	0.495	0.526	0.526	0.531	0.501	0.515	0.520	3.875		
T	Ethyl-Tert-Butyl ether			0.858	0.851	0.807	0.818	0.852	0.826		0.821	0.834	2.393		
T	2-Butanone				0.097	0.081	0.073	0.082	0.086	0.085	0.087	0.084	8.801		
T	Propionitrile			0.022	0.021	0.021	0.022	0.025	0.026		0.027	0.024	9.507		
T	2,2-Dichloropropane		0.587	0.452	0.531	0.468	0.495	0.493	0.500	0.466	0.482	0.497	8.207		
T	cis-1,2-Dichloroethene		0.293	0.289	0.322	0.302	0.310	0.307	0.315	0.300	0.313	0.306	3.541		
C	Chloroform	0.592	0.554	0.497	0.567	0.485	0.517	0.516	0.518	0.486	0.496	0.523	6.974		
T	1-Bromopropane			0.044	0.061	0.048	0.057	0.054	0.058	0.056	0.058	0.055	10.469		
T	Bromochloromethane		0.132	0.159	0.187	0.166	0.178	0.177	0.182	0.175	0.178	0.170	9.785		
T	Tetrahydrofuran			0.052	0.045	0.047	0.046	0.053	0.053		0.055	0.050	8.288		
S	Dibromofluoromethane			0.350	0.371	0.278	0.290	0.280	0.288	0.279	0.284	0.302	12.055		
T	1,1,1-Trichloroethane		0.484	0.430	0.507	0.442	0.476	0.481	0.487	0.455	0.474	0.471	5.089		
T	Cyclohexane		0.565	0.486	0.529	0.458	0.486	0.467	0.492	0.464	0.485	0.493	6.969		
T	1,1-Dichloropropene		0.390	0.361	0.421	0.386	0.406	0.405	0.410	0.384	0.398	0.396	4.470		
T	Carbon Tetrachloride		0.433	0.398	0.451	0.410	0.437	0.449	0.453	0.424	0.440	0.433	4.398		
T	Tert-Amyl-Methyl ether			0.71	0.688	0.665	0.673	0.702	0.684		0.685	0.687	2.279		
S	1,2-Dichloroethane-d4			0.42	0.403	0.316	0.327	0.315	0.324	0.313	0.315	0.342	12.765		
T	1,2-Dichloroethane		0.356	0.356	0.401	0.368	0.383	0.389	0.394	0.376	0.378	0.378	4.173		
T	Benzene		1.303	1.163	1.206	1.046	1.106	1.078	1.069	0.945	0.901	1.091	11.397		
T	Trichloroethene		0.325	0.274	0.316	0.281	0.3	0.299	0.304	0.29	0.305	0.299	5.389		
T	Methylcyclohexane		0.439	0.383	0.448	0.383	0.433	0.407	0.426	0.398	0.414	0.414	5.759		
C	1,2-Dichloropropane		0.293	0.262	0.292	0.267	0.285	0.288	0.29	0.283	0.294	0.284	4.098		
T	1,4-Dioxane					0.001	0.002	0.002	0.002		0.002	0.002	14.514		
T	Bromodichloromethane		0.391	0.382	0.407	0.375	0.395	0.402	0.408	0.39	0.4	0.394	2.842		
T	Dibromomethane		0.152	0.135	0.159	0.152	0.154	0.16	0.162	0.159	0.163	0.155	5.504		
T	2-Chloroethyl Vinyl Ether			0.109	0.13	0.126	0.133	0.138	0.141	0.138	0.14	0.132	7.987		
T	4-Methyl-2-Pentanone			0.054	0.069	0.063	0.064	0.073	0.075	0.075	0.077	0.069	11.615		
T	cis-1,3-Dichloropropene		0.434	0.402	0.488	0.44	0.465	0.466	0.473	0.45	0.456	0.453	5.589		
T	Dimethyl Disulfide		0.248	0.209	0.249	0.228	0.253	0.25	0.267	0.264	0.272	0.249	7.959		

I	Chlorobenzene-d5	ISTD												
S	Toluene-d8				1.591	1.207	1.268	1.224	1.207	1.164	1.128	1.256	12.298	
C	Toluene		1.586	1.409	1.575	1.407	1.467	1.431	1.351	1.203	1.088	1.391	11.614	
T	Ethyl Methacrylate			0.309	0.316	0.336	0.336	0.354	0.364	0.368	0.358	0.343	6.450	
T	trans-1,3-Dichloropropene		0.469	0.488	0.499	0.479	0.513	0.529	0.519	0.511	0.5	0.501	3.911	
T	1,1,2-Trichloroethane		0.232	0.23	0.263	0.249	0.255	0.264	0.258	0.258	0.261	0.252	5.057	
T	2-Hexanone			0.143	0.155	0.153	0.143	0.169	0.167	0.171	0.165	0.158	7.140	
T	1,3-Dichloropropane		0.475	0.438	0.475	0.451	0.461	0.472	0.464	0.459	0.453	0.461	2.687	
T	Tetrachloroethene		0.322	0.269	0.328	0.279	0.298	0.291	0.285	0.281	0.291	0.294	6.617	
T	Dibromochloromethane		0.351	0.309	0.33	0.309	0.337	0.353	0.348	0.352	0.353	0.338	5.424	
T	1,2-Dibromoethane		0.237	0.241	0.259	0.246	0.26	0.27	0.268	0.27	0.27	0.258	5.133	
T	1-Chlorohexane		0.473	0.448	0.498	0.452	0.494	0.469	0.472	0.46	0.459	0.469	3.702	
P	Chlorobenzene		1.106	0.962	1.09	0.962	0.997	0.985	0.956	0.909	0.859	0.981	7.982	
T	1,1,1,2-Tetrachloroethane		0.349	0.363	0.388	0.342	0.362	0.369	0.37	0.373	0.374	0.366	3.731	
C	Ethylbenzene		0.552	0.491	0.592	0.513	0.544	0.546	0.545	0.549	0.554	0.543	5.148	
T	m-,p-Xylene		0.697	0.619	0.697	0.624	0.654	0.652	0.626	0.576	0.521	0.630	8.881	
T	o-Xylene		0.668	0.618	0.681	0.624	0.653	0.645	0.642	0.632	0.628	0.643	3.214	
T	Styrene		1.024	0.988	1.074	1.008	1.072	1.072	1.054	1	0.928	1.024	4.795	
P	Bromoform		0.175	0.175	0.184	0.185	0.194	0.211	0.213	0.22	0.217	0.197	9.306	
T	Isopropylbenzene		1.629	1.459	1.666	1.509	1.58	1.551	1.476	1.314	1.175	1.484	10.490	
I	1,4-Dichlorobenzene-d4	ISTD												
P	1,1,2,2-Tetrachloroethane		0.55	0.472	0.548	0.562	0.566	0.588	0.589	0.585	0.577	0.560	6.465	
S	p-Bromofluorobenzene				1.305	0.986	1	0.933	0.948	0.932	0.925	1.004	13.502	
T	1,2,3-Trichloropropane			0.143	0.182	0.158	0.162	0.17	0.172	0.173	0.173	0.167	7.322	
T	trans-1,4-Dichloro-2-Butene			0.129	0.144	0.155	0.185	0.195	0.21	0.212	0.212	0.180	18.350	0.999
T	n-Propylbenzene		3.798	3.341	3.838	3.337	3.626	3.414	3.237	2.68		3.409	10.827	
T	Bromobenzene	0.861	0.679	0.753	0.783	0.724	0.759	0.734	0.748	0.734	0.743	0.752	6.228	
T	1,3,5-Trimethylbenzene		2.67	2.465	2.666	2.417	2.557	2.429	2.406	2.131	1.963	2.411	9.681	
T	2-Chlorotoluene		2.909	2.11	2.406	2.141	2.225	2.139	2.061	1.818		2.226	14.414	
T	4-Chlorotoluene		2.909	2.212	2.457	2.145	2.345	2.185	2.143	1.818		2.277	13.838	
T	a-Methylstyrene		1.275	1.11	1.308	1.252	1.39	1.326	1.381	1.302	1.267	1.290	6.401	
T	tert-Butylbenzene		0.476	0.464	0.572	0.503	0.522	0.508	0.52	0.507	0.528	0.511	6.092	
T	1,2,4-Trimethylbenzene		2.719	2.528	2.725	2.4	2.609	2.489	2.452	2.147	1.963	2.448	10.337	
T	sec-Butylbenzene		3.081	2.696	3.207	2.776	2.974	2.85	2.755	2.378	2.162	2.764	11.895	
T	p-Isopropyltoluene		2.536	2.364	2.568	2.364	2.556	2.444	2.403	2.094	1.929	2.362	9.203	
T	1,3-Dichlorobenzene		1.604	1.281	1.548	1.376	1.453	1.399	1.407	1.304	1.277	1.406	8.162	
T	1,4-Dichlorobenzene	2.026	1.449	1.467	1.552	1.387	1.472	1.415	1.413	1.312	1.273	1.477	14.142	
T	n-Butylbenzene		2.479	1.983	2.327	2.057	2.269	2.171	2.097	1.832	1.722	2.104	11.377	
T	1,2-Dichlorobenzene	1.499	1.314	1.326	1.394	1.292	1.346	1.311	1.315	1.223	1.205	1.322	6.276	
T	1,2-Dibromo-3-Chloropropane		0.074	0.095	0.096	0.097	0.1	0.115	0.117	0.114	0.123	0.103	14.646	
T	1,2,4-Trichlorobenzene		0.887	0.922	0.967	0.867	0.922	0.898	0.88	0.821	0.882	0.894	4.568	
T	Hexachlorobutadiene		0.444	0.299	0.401	0.307	0.356	0.335	0.325	0.304	0.337	0.345	13.991	
T	Naphthalene		1.787	1.663	1.755	1.752	1.783	1.851	1.777	1.609	1.58	1.729	5.239	
T	1,2,3-Trichlorobenzene	1.019	0.92	0.754	0.809	0.78	0.813	0.807	0.791	0.746	0.793	0.823	10.146	

Wed Nov 06 14:59:19 2013

Thu Sep 19 10:28:54 2013

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Calibration Table Report
Method: A9WTR.M
Title: Appendix IX (SOP:OVL MSV01) Water 12/04/13 HPMS11
Last Calibration: Wed Dec 18 14:24:41 2013
Curve: WG455130
Calibration Files
                                      5      20      50     100     200     300     400     500                  Linear  Quadratic
                                11M97410.D 11M97411.D 11M97412.D 11M97413.D 11M97414.D 11M97415.D 11M97416.D 11M97417.D
Compound                                                                                             Avg    %RSD

Fluorobenzene                    ISTD
Acetonitrile                       0.036   0.028   0.027   0.029   0.029   0.030   0.029   0.029   0.030   9.836
3-Chloro-1-propene                 0.478   0.497   0.515   0.502   0.505   0.493   0.454   0.439   0.485   5.450
2-Chloro-1,3-butadiene             0.458   0.502   0.525   0.523   0.533   0.520   0.480   0.464   0.501   5.923
Methacrylonitrile                  0.196   0.178   0.168   0.176   0.183   0.184   0.174   0.174   0.179   4.838
Isobutyl Alcohol                           0.010   0.008   0.009   0.009   0.010   0.009   0.010   0.009   7.458
1-Butanol                                  0.003   0.003   0.004   0.004   0.005   0.005   0.004   0.004  19.985   0.995
Cyclohexanone                              0.028   0.021   0.021   0.018   0.036   0.036   0.042   0.029  31.895           0.991
2-Nitropropane                     0.073   0.071   0.074   0.082   0.087   0.091   0.088   0.088   0.082   9.852
Ethyl Acetate                      0.246   0.236   0.224   0.236   0.242   0.241   0.225   0.223   0.234   3.836
Methyl methacrylate                0.235   0.219   0.223   0.243   0.251   0.251   0.237   0.236   0.237   4.857
Chlorobenzene-d5                 ISTD
1,4-Dichlorobenzene-d4           ISTD

Wed Dec 18 14:50:12 2013
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Microbac Laboratories Inc.
ALTERNATE SOURCE CALIBRATION REPORT

Login Number: L14010285
Run Date: 11/05/2013
Sample ID: WG451178-12
Instrument ID: HPMS11
Run Time: 22:42
Method: 8260B
File ID: 11M96673
Analyst: FJB
QC Key: DOD4
ICal Workgroup: WG451178
Cal ID: HPMS11 - 05-NOV-13

Analyte		Expected	Found	Units	RF	%D	UCL	Q
Chloroform	CCC	20.0	20.8	ug/L	0.543	3.90	20	
1,1-Dichloroethene	CCC	20.0	19.6	ug/L	0.446	1.80	20	
1,2-Dichloropropane	CCC	20.0	20.5	ug/L	0.290	2.30	20	
Ethylbenzene	CCC	20.0	20.2	ug/L	0.548	0.900	20	
Toluene	CCC	20.0	21.4	ug/L	1.49	7.20	20	
Vinyl Chloride	CCC	20.0	23.8	ug/L	0.392	18.8	20	
Bromoform	SPCC	20.0	21.7	ug/L	0.214	8.50	20	
Chlorobenzene	SPCC	20.0	21.3	ug/L	1.05	6.60	20	
Chloromethane	SPCC	20.0	23.2	ug/L	0.404	15.9	20	
1,1-Dichloroethane	SPCC	20.0	20.8	ug/L	0.540	3.80	20	
1,1,2,2-Tetrachloroethane	SPCC	20.0	20.6	ug/L	0.577	3.10	20	
Acetone		20.0	23.8	ug/L	0.0690	18.9	20	
Benzene		20.0	20.6	ug/L	1.12	3.00	20	
Bromobenzene		20.0	20.6	ug/L	0.776	3.20	20	
Bromochloromethane		20.0	21.7	ug/L	0.185	8.40	20	
Bromodichloromethane		20.0	20.2	ug/L	0.398	1.00	20	
Bromomethane		20.0	20.5	ug/L	0.145	2.60	20	
2-Butanone		20.0	21.1	ug/L	0.0892	5.70	20	
n-Butylbenzene		20.0	21.5	ug/L	2.26	7.50	20	
sec-Butylbenzene		20.0	22.2	ug/L	3.06	10.8	20	
tert-Butylbenzene		20.0	21.4	ug/L	0.548	7.20	20	
Carbon Disulfide		20.0	21.5	ug/L	0.889	7.70	20	
Carbon Tetrachloride		20.0	21.1	ug/L	0.457	5.70	20	
Dibromochloromethane		20.0	21.0	ug/L	0.355	4.90	20	
Chloroethane		20.0	21.0	ug/L	0.202	5.10	20	
2-Chlorotoluene		20.0	21.3	ug/L	2.37	6.30	20	
4-Chlorotoluene		20.0	20.8	ug/L	2.37	4.20	20	
1,2-Dibromo-3-Chloropropane		20.0	22.1	ug/L	0.114	10.5	20	
1,2-Dibromoethane		20.0	21.1	ug/L	0.272	5.60	20	
Dibromomethane		20.0	21.4	ug/L	0.166	6.90	20	
1,2-Dichlorobenzene		20.0	21.8	ug/L	1.44	8.80	20	
1,3-Dichlorobenzene		20.0	21.4	ug/L	1.50	6.90	20	
1,4-Dichlorobenzene		20.0	20.1	ug/L	1.48	0.300	20	
Dichlorodifluoromethane		20.0	30.9	ug/L	0.381	54.5	20	*
1,2-Dichloroethane		20.0	20.7	ug/L	0.391	3.30	20	
cis-1,2-Dichloroethene		20.0	20.5	ug/L	0.314	2.70	20	
trans-1,2-Dichloroethene		20.0	20.0	ug/L	0.287	0.100	20	
1,3-Dichloropropane		20.0	20.7	ug/L	0.478	3.60	20	
2,2-Dichloropropane		20.0	18.9	ug/L	0.470	5.40	20	
cis-1,3-Dichloropropene		20.0	21.3	ug/L	0.482	6.50	20	
trans-1,3-Dichloropropene		20.0	20.2	ug/L	0.505	0.800	20	
1,1-Dichloropropene		20.0	20.5	ug/L	0.406	2.50	20	

ALT - Modified 09/06/2007
Version 1.5 PDF File ID: 3318497
Report generated 01/20/2014 15:16

Microbac Laboratories Inc.
ALTERNATE SOURCE CALIBRATION REPORT

Login Number: L14010285
Run Date: 11/05/2013
Sample ID: WG451178-12
Instrument ID: HPMS11
Run Time: 22:42
Method: 8260B
File ID: 11M96673
Analyst: FJB
QC Key: DOD4
ICal Workgroup: WG451178
Cal ID: HPMS11 - 05-NOV-13

Analyte		Expected	Found	Units	RF	%D	UCL	Q
2-Hexanone		20.0	22.6	ug/L	0.179	12.8	20	
Hexachlorobutadiene		20.0	20.3	ug/L	0.351	1.60	20	
Isopropylbenzene		20.0	22.5	ug/L	1.67	12.7	20	
p-Isopropyltoluene		20.0	21.6	ug/L	2.55	7.80	20	
4-Methyl-2-Pentanone		20.0	22.4	ug/L	0.0769	11.8	20	
Methylene Chloride		20.0	19.5	ug/L	0.284	2.30	20	
Naphthalene		20.0	22.4	ug/L	1.94	12.2	20	
n-Propylbenzene		20.0	21.3	ug/L	3.64	6.70	20	
Styrene		20.0	21.6	ug/L	1.11	8.10	20	
1,1,1,2-Tetrachloroethane		20.0	20.3	ug/L	0.372	1.70	20	
Tetrachloroethene		20.0	20.4	ug/L	0.299	1.80	20	
1,2,3-Trichlorobenzene		20.0	20.9	ug/L	0.859	4.40	20	
1,2,4-Trichlorobenzene		20.0	21.0	ug/L	0.940	5.20	20	
1,1,1-Trichloroethane		20.0	21.2	ug/L	0.498	5.80	20	
1,1,2-Trichloroethane		20.0	21.0	ug/L	0.265	5.00	20	
Trichloroethene		20.0	20.5	ug/L	0.307	2.50	20	
Trichlorofluoromethane		20.0	23.2	ug/L	0.532	15.8	20	
1,2,3-Trichloropropane		20.0	20.5	ug/L	0.171	2.50	20	
1,2,4-Trimethylbenzene		20.0	21.2	ug/L	2.59	6.00	20	
1,3,5-Trimethylbenzene		20.0	21.4	ug/L	2.58	7.00	20	
o-Xylene		20.0	21.3	ug/L	0.684	6.30	20	
m-,p-Xylene		40.0	43.4	ug/L	0.682	8.40	20	

* Exceeds %D Limit

CCC Calibration Check Compounds
SPCC System Performance Check Compounds

ALT - Modified 09/06/2007
Version 1.5 PDF File ID: 3318497
Report generated 01/20/2014 15:16

Microbac Laboratories Inc.
CONTINUING CALIBRATION VERIFICATION (CCV)

Login Number: L14010285
Run Date: 01/19/2014
Sample ID: WG459902-02
Instrument ID: HPMS11
Run Time: 14:35
Method: 8260B
File ID: 11M98463
Analyst: ADC
QC Key: DOD4
Workgroup (AAB#): WG459903
Cal ID: HPMS11 - 05-NOV-13
Matrix: WATER

Analyte		Expected	Found	UNITS	RF	%D	UCL	Q
Chloroform	CCC	50.0	50.9	ug/L	0.532	1.85	20	
1,1-Dichloroethene	CCC	50.0	54.1	ug/L	0.491	8.14	20	
1,2-Dichloropropane	CCC	50.0	55.8	ug/L	0.317	11.7	20	
Ethylbenzene	CCC	50.0	49.6	ug/L	0.539	0.755	20	
Toluene	CCC	50.0	51.6	ug/L	1.44	3.23	20	
Vinyl Chloride	CCC	50.0	56.1	ug/L	0.370	12.3	20	
Bromoform	SPCC	50.0	51.4	ug/L	0.203	2.88	20	
Chlorobenzene	SPCC	50.0	50.5	ug/L	0.991	1.08	20	
Chloromethane	SPCC	50.0	51.1	ug/L	0.356	2.24	20	
1,1-Dichloroethane	SPCC	50.0	54.1	ug/L	0.563	8.22	20	
1,1,2,2-Tetrachloroethane	SPCC	50.0	48.0	ug/L	0.538	3.96	20	
Xylenes		150	153	ug/L	0.648	2.18	20	
Acetone		50.0	49.7	ug/L	0.0578	0.552	20	
Benzene		50.0	52.6	ug/L	1.15	5.22	20	
Bromobenzene		50.0	48.0	ug/L	0.722	3.97	20	
Bromochloromethane		50.0	56.6	ug/L	0.193	13.3	20	
Bromodichloromethane		50.0	51.2	ug/L	0.404	2.35	20	
Bromomethane		50.0	67.9	ug/L	0.192	35.8	20	*
2-Butanone		50.0	52.5	ug/L	0.0885	4.91	20	
n-Butylbenzene		50.0	53.4	ug/L	2.25	6.87	20	
sec-Butylbenzene		50.0	54.5	ug/L	3.01	8.92	20	
tert-Butylbenzene		50.0	48.2	ug/L	0.492	3.68	20	
Carbon Disulfide		50.0	55.2	ug/L	0.913	10.5	20	
Carbon Tetrachloride		50.0	52.1	ug/L	0.451	4.12	20	
Dibromochloromethane		50.0	52.4	ug/L	0.354	4.73	20	
Chloroethane		50.0	57.6	ug/L	0.221	15.3	20	
2-Chlorotoluene		50.0	46.9	ug/L	2.09	6.18	20	
4-Chlorotoluene		50.0	44.7	ug/L	2.04	10.5	20	
1,2-Dibromo-3-Chloropropane		50.0	47.6	ug/L	0.0985	4.81	20	
1,2-Dibromoethane		50.0	52.5	ug/L	0.270	4.93	20	
Dibromomethane		50.0	52.9	ug/L	0.164	5.77	20	
1,2-Dichlorobenzene		50.0	50.4	ug/L	1.33	0.810	20	
1,3-Dichlorobenzene		50.0	51.2	ug/L	1.44	2.47	20	
1,4-Dichlorobenzene		50.0	49.0	ug/L	1.45	1.93	20	
Dichlorodifluoromethane		50.0	53.1	ug/L	0.262	6.22	20	
1,2-Dichloroethane		50.0	51.7	ug/L	0.391	3.37	20	
cis-1,2-Dichloroethene		50.0	53.8	ug/L	0.329	7.67	20	
trans-1,2-Dichloroethene		50.0	51.8	ug/L	0.297	3.56	20	
1,3-Dichloropropane		50.0	51.9	ug/L	0.479	3.82	20	
2,2-Dichloropropane		50.0	50.1	ug/L	0.499	0.283	20	
cis-1,3-Dichloropropene		50.0	54.7	ug/L	0.495	9.36	20	
trans-1,3-Dichloropropene		50.0	52.0	ug/L	0.521	3.97	20	

CCV - Modified 03/05/2008
PDF File ID: 3318498
Report generated 01/20/2014 15:16

Microbac Laboratories Inc.
CONTINUING CALIBRATION VERIFICATION (CCV)

Login Number: L14010285
Run Date: 01/19/2014
Sample ID: WG459902-02
Instrument ID: HPMS11
Run Time: 14:35
Method: 8260B
File ID: 11M98463
Analyst: ADC
QC Key: DOD4
Workgroup (AAB#): WG459903
Cal ID: HPMS11 - 05-NOV-13
Matrix: WATER

Analyte		Expected	Found	UNITS	RF	%D	UCL	Q
1,1-Dichloropropene		50.0	53.4	ug/L	0.422	6.70	20	
2-Hexanone		50.0	50.6	ug/L	0.160	1.14	20	
Hexachlorobutadiene		50.0	47.1	ug/L	0.325	5.89	20	
Isopropylbenzene		50.0	53.4	ug/L	1.58	6.74	20	
p-Isopropyltoluene		50.0	54.4	ug/L	2.57	8.70	20	
4-Methyl-2-Pentanone		50.0	55.4	ug/L	0.0762	10.9	20	
Methylene Chloride		50.0	50.9	ug/L	0.295	1.73	20	
Naphthalene		50.0	49.7	ug/L	1.72	0.632	20	
n-Propylbenzene		50.0	48.7	ug/L	3.32	2.63	20	
Styrene		50.0	50.9	ug/L	1.04	1.71	20	
1,1,1,2-Tetrachloroethane		50.0	49.8	ug/L	0.364	0.474	20	
Tetrachloroethene		50.0	50.8	ug/L	0.299	1.62	20	
1,2,3-Trichlorobenzene		50.0	47.2	ug/L	0.778	5.55	20	
1,2,4-Trichlorobenzene		50.0	49.4	ug/L	0.884	1.17	20	
1,1,1-Trichloroethane		50.0	51.6	ug/L	0.486	3.24	20	
1,1,2-Trichloroethane		50.0	52.7	ug/L	0.266	5.32	20	
Trichloroethene		50.0	53.1	ug/L	0.318	6.13	20	
Trichlorofluoromethane		50.0	51.7	ug/L	0.475	3.44	20	
1,2,3-Trichloropropane		50.0	47.4	ug/L	0.158	5.22	20	
1,2,4-Trimethylbenzene		50.0	49.2	ug/L	2.41	1.55	20	
1,3,5-Trimethylbenzene		50.0	49.8	ug/L	2.40	0.361	20	
o-Xylene		50.0	50.4	ug/L	0.649	0.873	20	
m-,p-Xylene		100	103	ug/L	0.648	2.83	20	

* Exceeds %D Criteria

CCC Calibration Check Compounds
SPCC System Performance Check Compounds

CCV - Modified 03/05/2008
PDF File ID: 3318498
Report generated 01/20/2014 15:16

INTERNAL STANDARD AREA SUMMARY
(COMPARED TO MIDPOINT OF ICAL)

Login Number: L14010285
Instrument ID: HPMS11
Workgroup (AAB#): WG459903

ICAL CCV Number: WG451178-08
CAL ID: HPMS11 - 05-NOV-13
Matrix: WATER

Sample Number	Dilution	Tag	IS-1	IS-2	IS-3
WG451178-08	NA	NA	381974	702242	886698
Upper Limit	NA	NA	763948	1404484	1773396
Lower Limit	NA	NA	190987	351121	443349
L14010285-01	1.00	01	335196	611931	752625
L14010285-02	1.00	01	328493	615108	751088
L14010285-03	1.00	01	332116	618653	754871
L14010285-04	1.00	01	329278	614712	744936
L14010285-05	1.00	01	349221	639042	780944
WG459903-01	1.00	01	359174	655317	807878
WG459903-02	1.00	01	370395	662255	808926
WG459903-03	1.00	01	364208	667768	802390

IS-1 - 1,4-Dichlorobenzene-d4
IS-2 - Chlorobenzene-d5
IS-3 - Fluorobenzene

Underline = Response outside limits

INTERNAL_STD_ICAL - Modified 03/06/2008
PDF File ID: 3318499
Report generated 01/20/2014 15:16

Microbac Laboratories Inc.

INTERNAL STANDARD RETENTION TIME SUMMARY
(COMPARED TO MIDPOINT OF ICAL)

Login Number: L14010285
Instrument ID: HPMS11
Workgroup (AAB#): WG459903

ICAL CCV Number: WG451178-08
CAL ID: HPMS11 - 05-NOV-13
Matrix: WATER

Sample Number	Dilution	Tag	IS-1	IS-2	IS-3
WG451178-08	NA	NA	17.07	14.26	10.63
Upper Limit	NA	NA	17.57	14.76	11.13
Lower Limit	NA	NA	16.57	13.76	10.13
L14010285-01	1.00	01	17.05	14.24	10.61
L14010285-02	1.00	01	17.05	14.24	10.61
L14010285-03	1.00	01	17.05	14.24	10.61
L14010285-04	1.00	01	17.05	14.24	10.61
L14010285-05	1.00	01	17.05	14.24	10.61
WG459903-01	1.00	01	17.05	14.24	10.61
WG459903-02	1.00	01	17.05	14.24	10.61
WG459903-03	1.00	01	17.05	14.24	10.61

IS-1 - 1,4-Dichlorobenzene-d4
IS-2 - Chlorobenzene-d5
IS-3 - Fluorobenzene

Underline = Response outside limits

INTERNAL_STD_RT_ICAL - Modified 03/06/2008
PDF File ID: 3319100
Report generated: 01/20/2014 15:16

2.1.1.3 Sample Data

```
                         Quantitation Report    (Not Reviewed)
Data File : C:\MSDCHEM\1\DATA\011914\11M98476.D          Vial: 15
Acq On    : 19 Jan 2014  21:25                       Operator: adc
Sample    : L14010285-01 A 826-LOW                   Inst    : hpms11
Misc      : 1,1                                      Multiplr: 1.00
MS Integration Params: rteint.p
Quant Time: Jan 20 13:43:32 2014          Quant Results File: 8260_WT.RES

Quant Method : C:\MSDCHEM\1\METHODS\8260_WT.M (RTE Integrator)
Title        : 8260B/624 (SOP: OVL MSV01) Water 11/05/13 HPMS11
Last Update  : Mon Dec 16 17:06:06 2013
Response via : Initial Calibration
DataAcq Meth : 8260_WT

 Internal Standards                R.T. QIon  Response  Conc Units Dev(Min)
-----------------------------------------------------------------------------
  1) Fluorobenzene                10.61   96   752625    25.00 ug/L   -0.02
 56) Chlorobenzene-d5             14.24  117   611931    25.00 ug/L   -0.02
 76) 1,4-Dichlorobenzene-d4       17.05  152   335196    25.00 ug/L   -0.02

 System Monitoring Compounds
 37) Dibromofluoromethane          9.62  111   227749    25.0151 ug/L -0.02
  Spiked Amount     25.000   Range  86 - 118    Recovery   =  100.08%
 43) 1,2-Dichloroethane-d4        10.23   65   250322    24.3452 ug/L -0.02
  Spiked Amount     25.000   Range  80 - 120    Recovery   =   97.40%
 57) Toluene-d8                   12.47   98   837995    27.2674 ug/L -0.02
  Spiked Amount     25.000   Range  88 - 110    Recovery   =  109.08%
 78) p-Bromofluorobenzene         15.63   95   340680    25.3073 ug/L -0.02
  Spiked Amount     25.000   Range  86 - 115    Recovery   =  101.24%

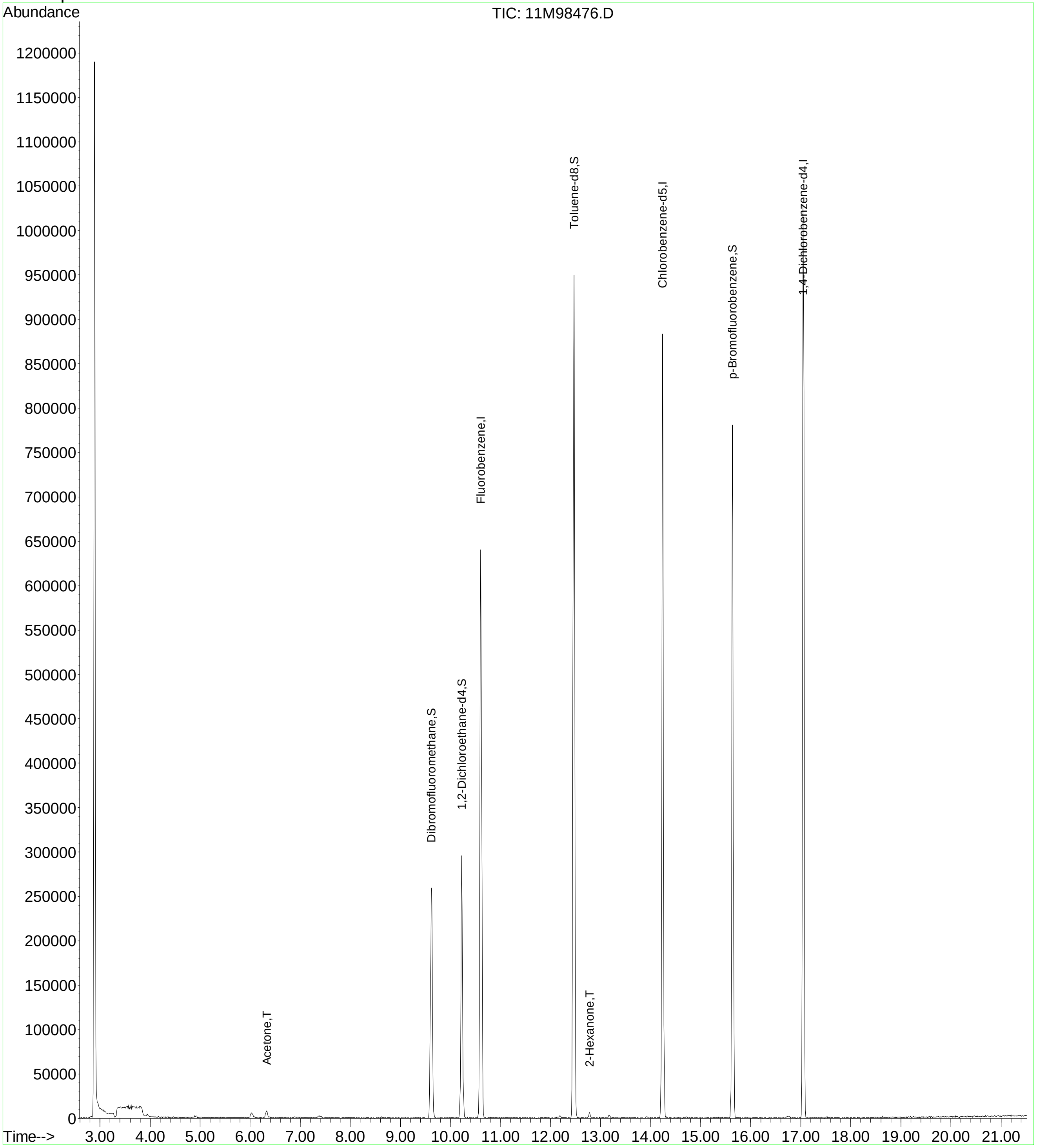
 Target Compounds                                                 Qvalue
 13) Acetone                       6.33   43    15320     8.7625 ug/L #  80
 62) 2-Hexanone                   12.78   43     7533     1.9420 ug/L #  26

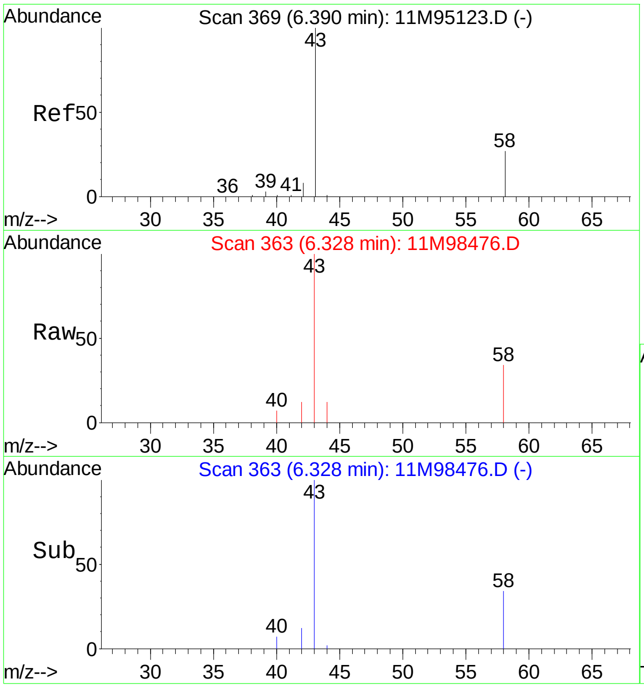
-----------------------------------------------------------------------------
(#) = qualifier out of range (m) = manual integration
11M98476.D  8260_WT.M      Mon Jan 20 13:43:33 2014                        Page 1
```

```
                         Quantitation Report    (Not Reviewed)

  Data File : C:\MSDCHEM\1\DATA\011914\11M98476.D         Vial: 15
  Acq On    : 19 Jan 2014  21:25                      Operator: adc
  Sample    : L14010285-01 A 826-LOW                  Inst    : hpms11
  Misc      : 1,1                                     Multiplr: 1.00
  MS Integration Params: rteint.p
  Quant Time: Jan 20 13:43 2014            Quant Results File: 8260_WT.RES

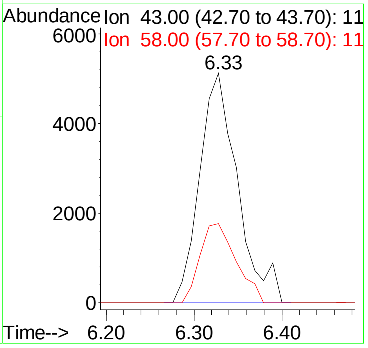
  Method       : C:\MSDCHEM\1\METHODS\8260_WT.M (RTE Integrator)
  Title        : 8260B/624 (SOP: OVL MSV01) Water 11/05/13 HPMS11
  Last Update  : Mon Dec 16 17:06:06 2013
  Response via : Initial Calibration
```

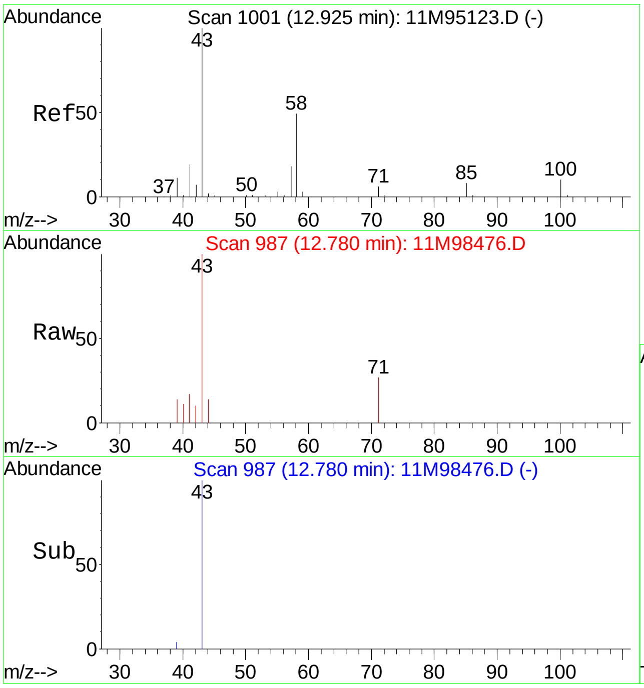




```
#13
Acetone
Concen:    8.76 ug/L
RT: 6.33 min  Scan# 363
Delta R.T.   -0.02 min
Lab File:   11M98476.D
Acq: 19 Jan 2014  21:25

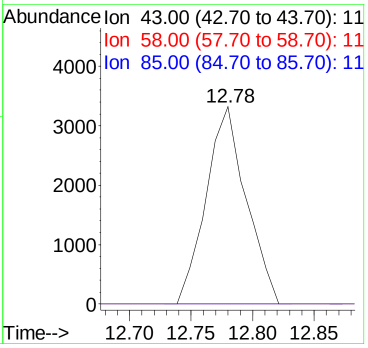
Tgt Ion: 43 Resp:   15320
Ion  Ratio  Lower  Upper
 43  100
 58   32.9   13.9   32.3#
```





```
#62
2-Hexanone
Concen:    1.94 ug/L
RT: 12.78 min  Scan# 987
Delta R.T.   -0.09 min
Lab File:   11M98476.D
Acq: 19 Jan 2014  21:25

Tgt Ion: 43 Resp:    7533
Ion  Ratio  Lower  Upper
 43  100
 58    0.0   39.0   91.0#
 85    0.0    7.8   18.2#
```



```
                         Quantitation Report    (Not Reviewed)

Data File : C:\MSDCHEM\1\DATA\011914\11M98477.D          Vial: 16
Acq On    : 19 Jan 2014  21:57                       Operator: adc
Sample    : L14010285-02 A 826-LOW                   Inst    : hpms11
Misc      : 1,1                                      Multiplr: 1.00
MS Integration Params: rteint.p
Quant Time: Jan 20 13:43:34 2014          Quant Results File: 8260_WT.RES

Quant Method : C:\MSDCHEM\1\METHODS\8260_WT.M (RTE Integrator)
Title        : 8260B/624 (SOP: OVL MSV01) Water 11/05/13 HPMS11
Last Update  : Mon Dec 16 17:06:06 2013
Response via : Initial Calibration
DataAcq Meth : 8260_WT

 Internal Standards                 R.T. QIon  Response  Conc Units Dev(Min)
 -------------------------------------------------------------------------
   1) Fluorobenzene                10.61   96   751088    25.00 ug/L   -0.02
  56) Chlorobenzene-d5             14.24  117   615108    25.00 ug/L   -0.02
  76) 1,4-Dichlorobenzene-d4       17.05  152   328493    25.00 ug/L   -0.02

 System Monitoring Compounds
  37) Dibromofluoromethane          9.62  111   231236    25.4501 ug/L -0.02
   Spiked Amount     25.000   Range  86 - 118    Recovery   =  101.80%
  43) 1,2-Dichloroethane-d4        10.23   65   256917    25.0377 ug/L -0.02
   Spiked Amount     25.000   Range  80 - 120    Recovery   =  100.16%
  57) Toluene-d8                   12.47   98   835616    27.0496 ug/L -0.02
   Spiked Amount     25.000   Range  88 - 110    Recovery   =  108.20%
  78) p-Bromofluorobenzene         15.63   95   342225    25.9408 ug/L -0.02
   Spiked Amount     25.000   Range  86 - 115    Recovery   =  103.76%

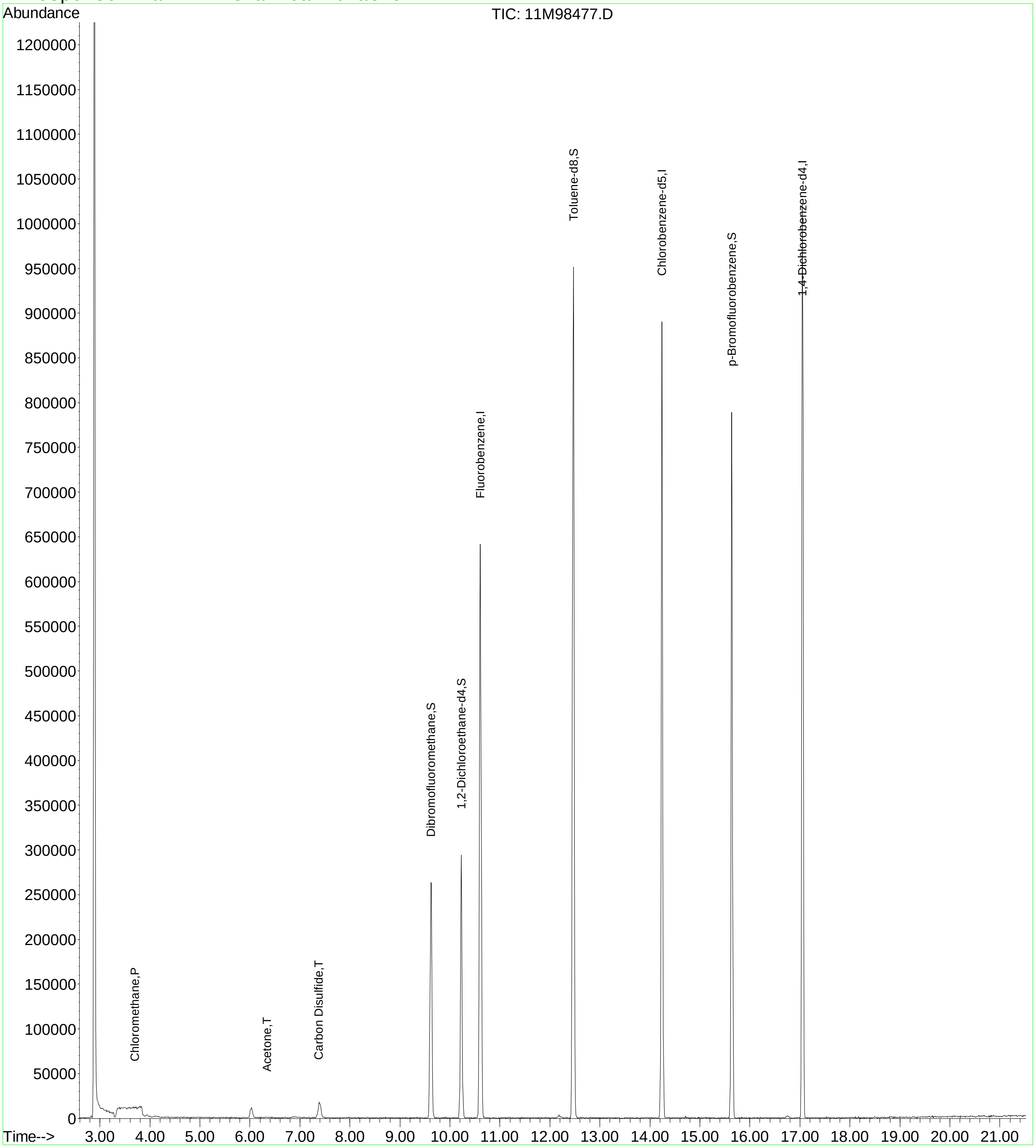
 Target Compounds                                                 Qvalue
   3) Chloromethane                 3.69   50     2813     0.2690 ug/L    88
  13) Acetone                       6.34   43     1115     0.6390 ug/L #  52
  20) Carbon Disulfide              7.37   76     3410     0.1374 ug/L #  90

 -------------------------------------------------------------------------
 (#) = qualifier out of range (m) = manual integration
 11M98477.D  8260_WT.M      Mon Jan 20 13:43:35 2014                         Page 1
```

```
Quantitation Report    (Not Reviewed)

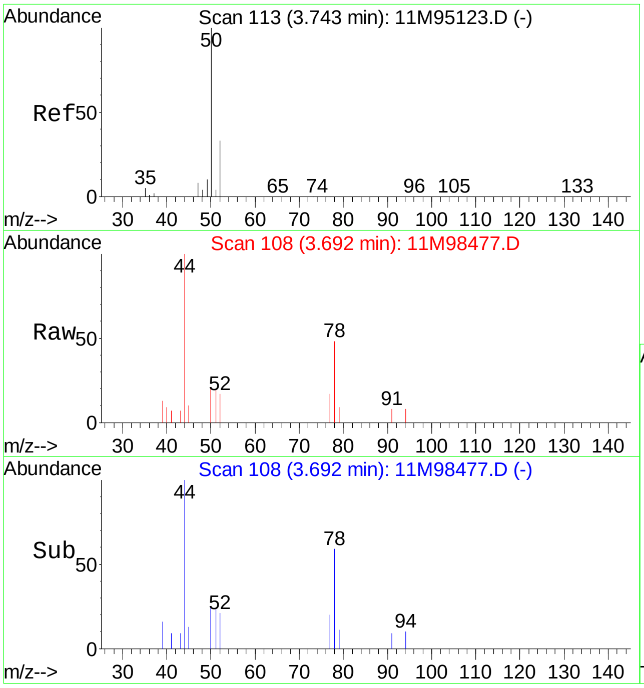
Data File : C:\MSDCHEM\1\DATA\011914\11M98477.D          Vial: 16
Acq On    : 19 Jan 2014  21:57                       Operator: adc
Sample    : L14010285-02 A 826-LOW                   Inst    : hpms11
Misc      : 1,1                                      Multiplr: 1.00
MS Integration Params: rteint.p
Quant Time: Jan 20 13:43 2014           Quant Results File: 8260_WT.RES

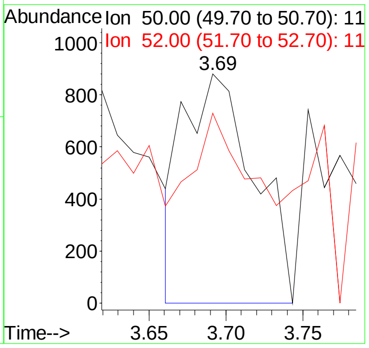
Method       : C:\MSDCHEM\1\METHODS\8260_WT.M (RTE Integrator)
Title        : 8260B/624 (SOP: OVL MSV01) Water 11/05/13 HPMS11
Last Update  : Mon Dec 16 17:06:06 2013
Response via : Initial Calibration
```



```
#3
Chloromethane
Concen:     0.27 ug/L
RT: 3.69 min   Scan# 108
Delta R.T.    -0.01 min
Lab File:   11M98477.D
Acq: 19 Jan 2014   21:57

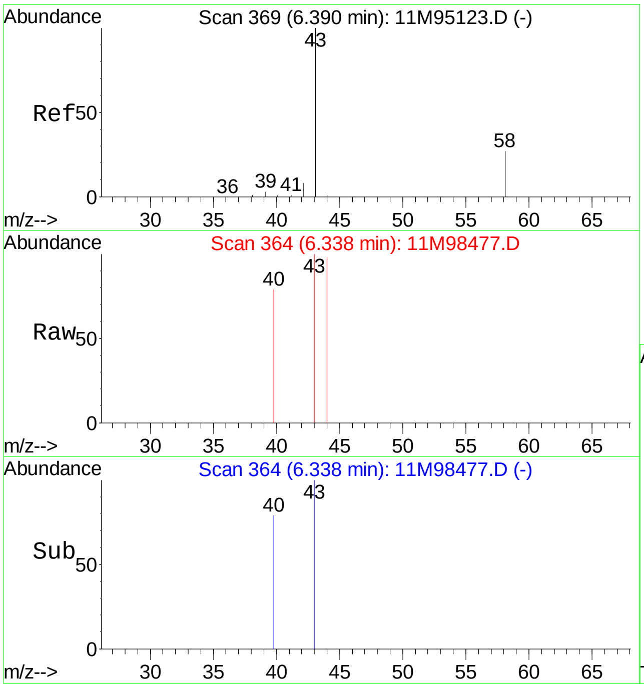
Tgt Ion: 50 Resp:     2813
Ion   Ratio  Lower   Upper
 50   100
 52    40.7   20.3    47.3
```

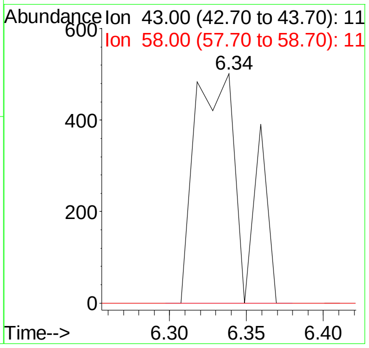




```
#13
Acetone
Concen:     0.64 ug/L
RT: 6.34 min   Scan# 364
Delta R.T.    -0.01 min
Lab File:   11M98477.D
Acq: 19 Jan 2014   21:57

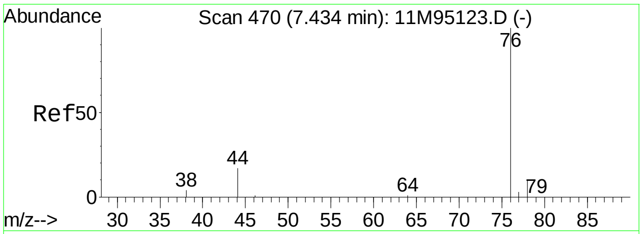
Tgt Ion: 43 Resp:     1115
Ion   Ratio  Lower   Upper
 43   100
 58     0.0   13.9    32.3#
```

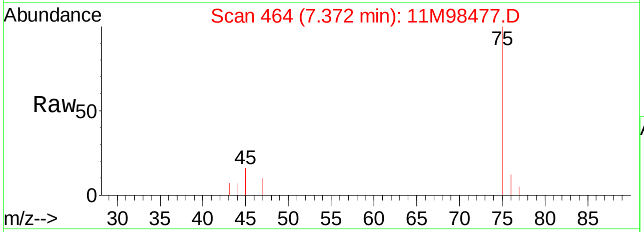


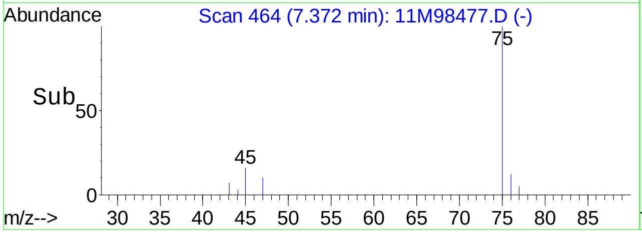


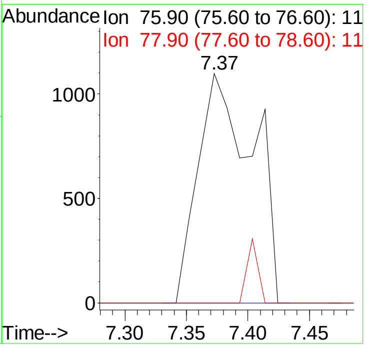
```
#20
Carbon Disulfide
Concen:     0.14 ug/L
RT: 7.37 min  Scan# 464
Delta R.T.    -0.01 min
Lab File:   11M98477.D
Acq: 19 Jan 2014  21:57

Tgt Ion: 76 Resp:    3410
Ion  Ratio  Lower  Upper
 76  100
 78    5.6    5.6   13.2#
```









```
                          Quantitation Report    (Not Reviewed)

Data File : C:\MSDCHEM\1\DATA\011914\11M98478.D          Vial: 17
Acq On    : 19 Jan 2014  22:28                       Operator: adc
Sample    : L14010285-03 A 826-LOW                   Inst    : hpms11
Misc      : 1,1                                      Multiplr: 1.00
MS Integration Params: rteint.p
Quant Time: Jan 20 13:43:36 2014          Quant Results File: 8260_WT.RES

Quant Method : C:\MSDCHEM\1\METHODS\8260_WT.M (RTE Integrator)
Title        : 8260B/624 (SOP: OVL MSV01) Water 11/05/13 HPMS11
Last Update  : Mon Dec 16 17:06:06 2013
Response via : Initial Calibration
DataAcq Meth : 8260_WT

 Internal Standards                 R.T. QIon  Response  Conc Units Dev(Min)
-------------------------------------------------------------------------
   1) Fluorobenzene                10.61   96   754871    25.00 ug/L   -0.02
  56) Chlorobenzene-d5             14.24  117   618653    25.00 ug/L   -0.02
  76) 1,4-Dichlorobenzene-d4       17.05  152   332116    25.00 ug/L   -0.02

 System Monitoring Compounds
  37) Dibromofluoromethane          9.62  111   229294    25.1099 ug/L -0.02
   Spiked Amount     25.000   Range  86 - 118    Recovery   =  100.44%
  43) 1,2-Dichloroethane-d4        10.23   65   258270    25.0434 ug/L -0.02
   Spiked Amount     25.000   Range  80 - 120    Recovery   =  100.16%
  57) Toluene-d8                   12.47   98   834394    26.8553 ug/L -0.02
   Spiked Amount     25.000   Range  88 - 110    Recovery   =  107.44%
  78) p-Bromofluorobenzene         15.63   95   340113    25.4995 ug/L -0.02
   Spiked Amount     25.000   Range  86 - 115    Recovery   =  102.00%

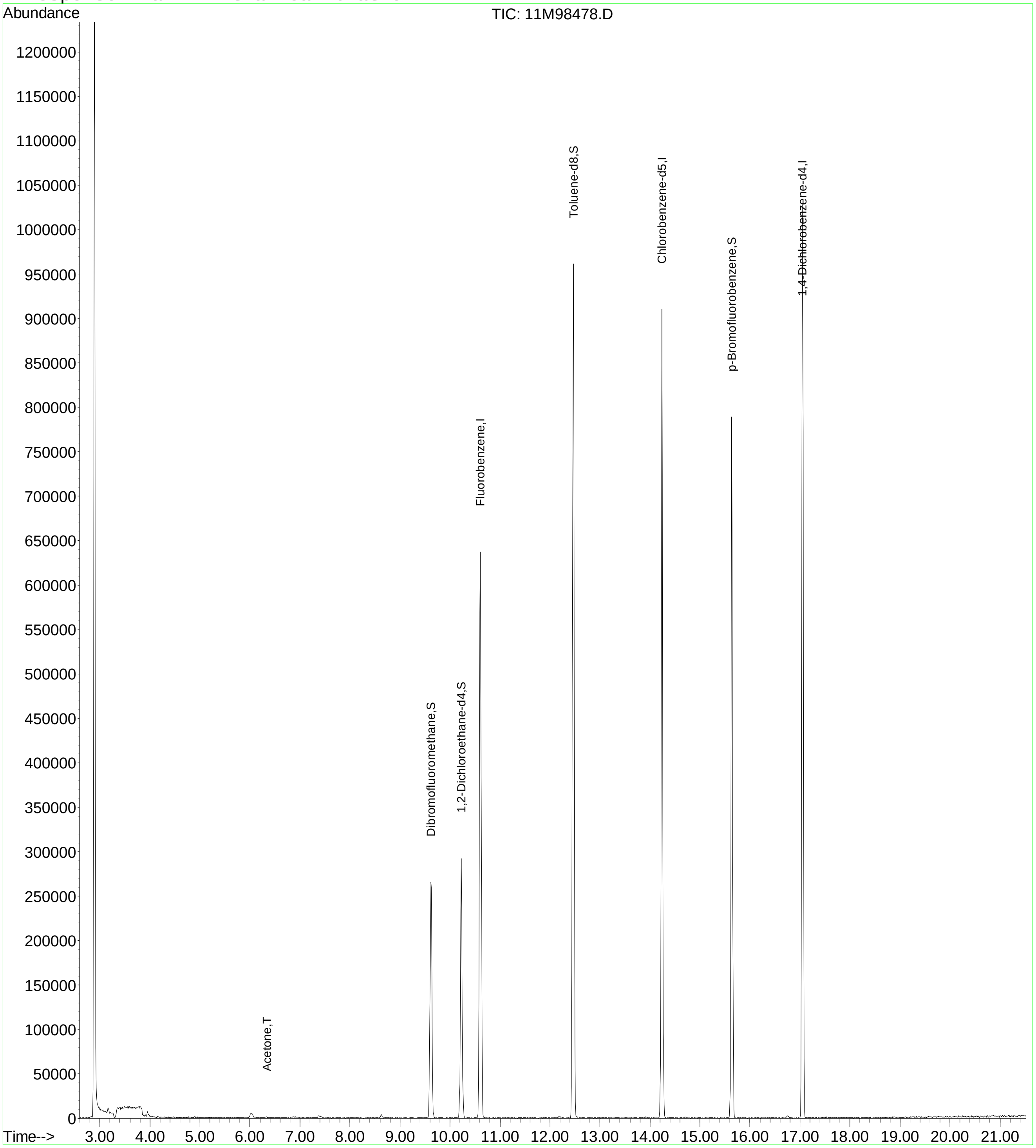
 Target Compounds                                                   Qvalue
  13) Acetone                       6.34   43     2085     1.1890 ug/L #  52

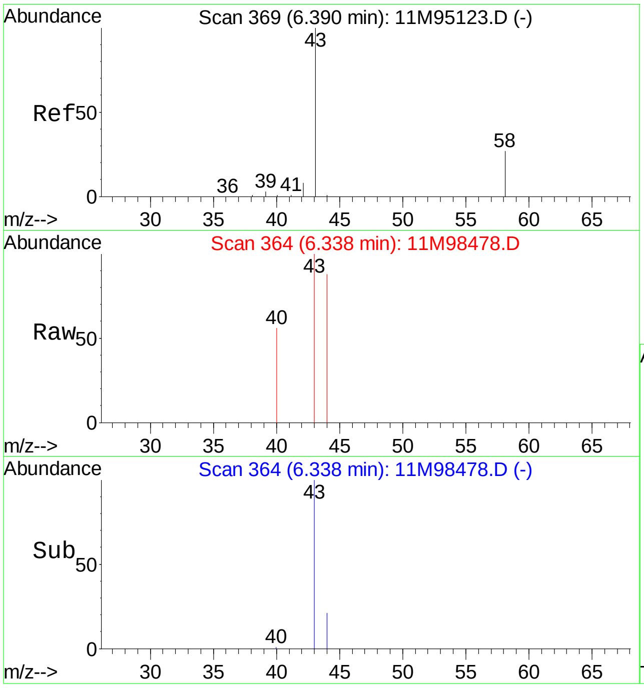
-------------------------------------------------------------------------
 (#) = qualifier out of range (m) = manual integration
 11M98478.D  8260_WT.M      Mon Jan 20 13:43:37 2014                        Page 1
```

Quantitation Report   (Not Reviewed)

```
Data File : C:\MSDCHEM\1\DATA\011914\11M98478.D          Vial: 17
Acq On    : 19 Jan 2014  22:28                        Operator: adc
Sample    : L14010285-03 A 826-LOW                    Inst    : hpms11
Misc      : 1,1                                       Multiplr: 1.00
MS Integration Params: rteint.p
Quant Time: Jan 20 13:43 2014           Quant Results File: 8260_WT.RES

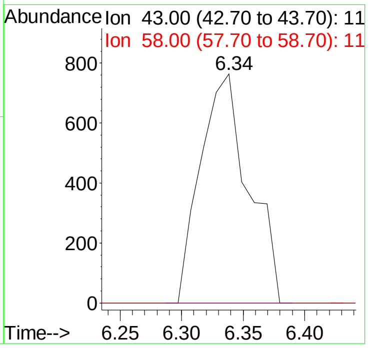
Method       : C:\MSDCHEM\1\METHODS\8260_WT.M (RTE Integrator)
Title        : 8260B/624 (SOP: OVL MSV01) Water 11/05/13 HPMS11
Last Update  : Mon Dec 16 17:06:06 2013
Response via : Initial Calibration
```





```
#13
Acetone
Concen:    1.19 ug/L
RT: 6.34 min  Scan# 364
Delta R.T.   -0.01 min
Lab File:   11M98478.D
Acq: 19 Jan 2014  22:28

Tgt Ion: 43 Resp:    2085
Ion  Ratio   Lower  Upper
 43  100
 58    0.0   13.9   32.3#
```



```
                              Quantitation Report    (Not Reviewed)
Data File : C:\MSDCHEM\1\DATA\011914\11M98479.D          Vial: 18
Acq On    : 19 Jan 2014  23:00                       Operator: adc
Sample    : L14010285-04 A 826-LOW                   Inst    : hpms11
Misc      : 1,1                                      Multiplr: 1.00
MS Integration Params: rteint.p
Quant Time: Jan 20 13:43:37 2014          Quant Results File: 8260_WT.RES

Quant Method : C:\MSDCHEM\1\METHODS\8260_WT.M (RTE Integrator)
Title        : 8260B/624 (SOP: OVL MSV01) Water 11/05/13 HPMS11
Last Update  : Mon Dec 16 17:06:06 2013
Response via : Initial Calibration
DataAcq Meth : 8260_WT

 Internal Standards                 R.T. QIon  Response  Conc Units Dev(Min)
-------------------------------------------------------------------------
   1) Fluorobenzene                10.61   96   744936    25.00 ug/L   -0.02
  56) Chlorobenzene-d5             14.24  117   614712    25.00 ug/L   -0.02
  76) 1,4-Dichlorobenzene-d4       17.05  152   329278    25.00 ug/L   -0.02

 System Monitoring Compounds
  37) Dibromofluoromethane          9.62  111   225657    25.0411 ug/L -0.02
   Spiked Amount     25.000   Range  86 - 118    Recovery   =  100.16%
  43) 1,2-Dichloroethane-d4        10.23   65   254615    25.0183 ug/L -0.02
   Spiked Amount     25.000   Range  80 - 120    Recovery   =  100.08%
  57) Toluene-d8                   12.47   98   827114    26.7916 ug/L -0.02
   Spiked Amount     25.000   Range  88 - 110    Recovery   =  107.16%
  78) p-Bromofluorobenzene         15.63   95   338702    25.6126 ug/L -0.02
   Spiked Amount     25.000   Range  86 - 115    Recovery   =  102.44%

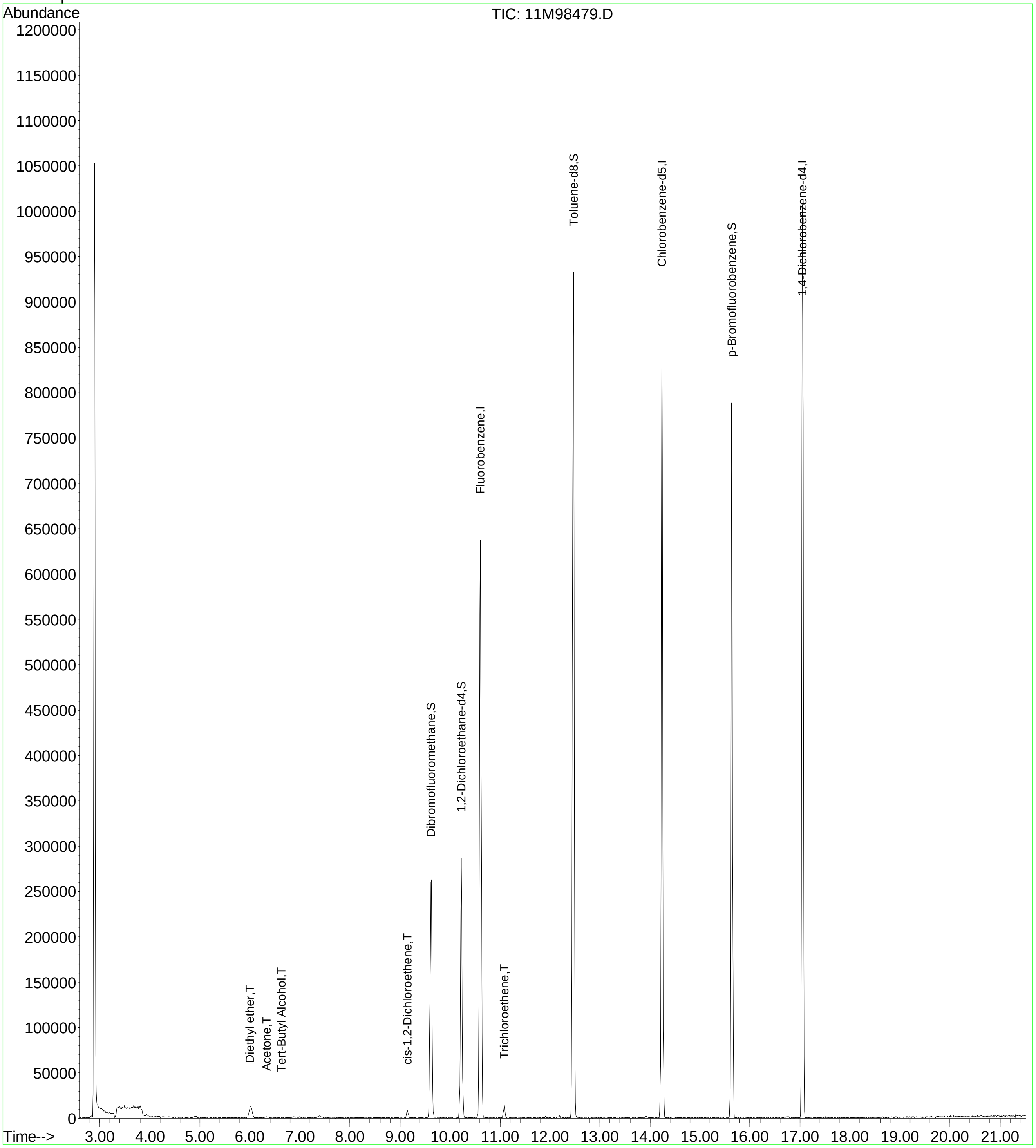
 Target Compounds                                                   Qvalue
   9) Diethyl ether                 6.00   59     8110     1.4126 ug/L #   1
  13) Acetone                       6.33   43     2268     1.3106 ug/L #  52
  15) Tert-Butyl Alcohol            6.63   59      399     0.7422 ug/L #  58
  32) cis-1,2-Dichloroethene        9.15   96     5027     0.5519 ug/L    85
  46) Trichloroethene              11.08  130     6438     0.7214 ug/L    95

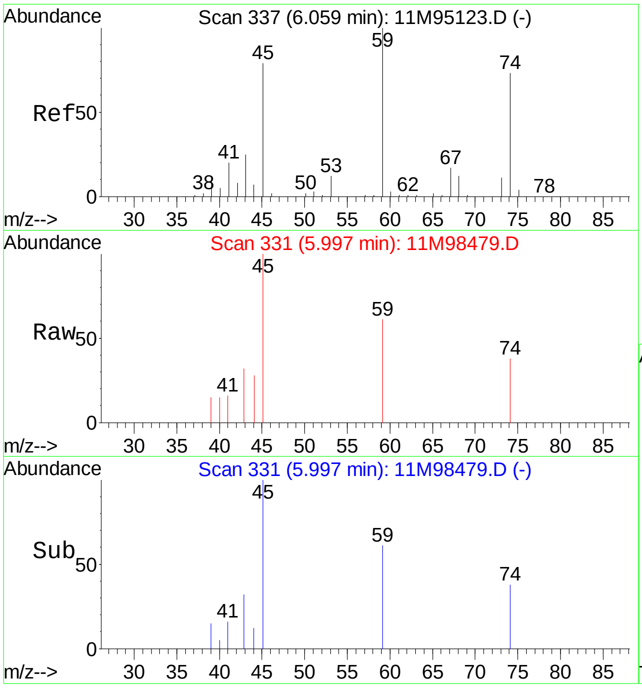
-------------------------------------------------------------------------
(#) = qualifier out of range (m) = manual integration
11M98479.D  8260_WT.M      Mon Jan 20 13:43:38 2014                        Page 1
```

```
                    Quantitation Report    (Not Reviewed)

Data File : C:\MSDCHEM\1\DATA\011914\11M98479.D         Vial: 18
Acq On    : 19 Jan 2014  23:00                       Operator: adc
Sample    : L14010285-04 A 826-LOW                   Inst    : hpms11
Misc      : 1,1                                      Multiplr: 1.00
MS Integration Params: rteint.p
Quant Time: Jan 20 13:43 2014           Quant Results File: 8260_WT.RES

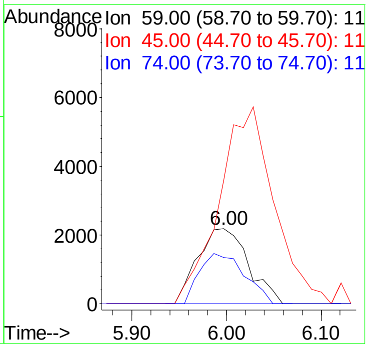
Method       : C:\MSDCHEM\1\METHODS\8260_WT.M (RTE Integrator)
Title        : 8260B/624 (SOP: OVL MSV01) Water 11/05/13 HPMS11
Last Update  : Mon Dec 16 17:06:06 2013
Response via : Initial Calibration
```

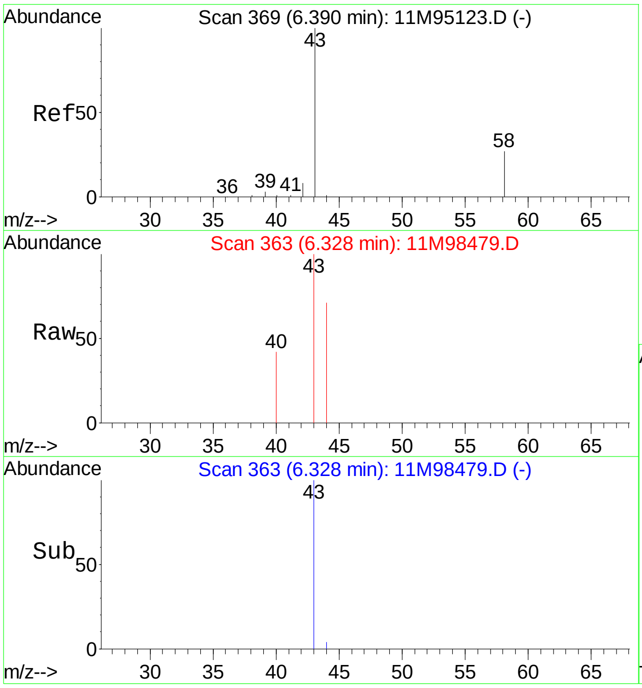




```
#9
Diethyl ether
Concen:    1.41 ug/L
RT: 6.00 min  Scan# 331
Delta R.T.   -0.01 min
Lab File:   11M98479.D
Acq: 19 Jan 2014  23:00

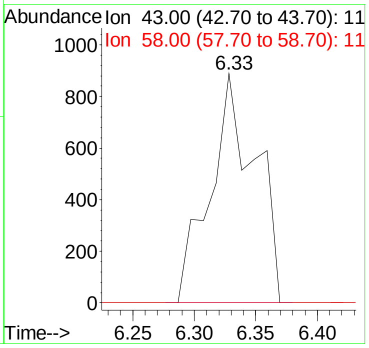
Tgt Ion: 59 Resp:    8110
Ion  Ratio  Lower  Upper
 59  100
 45  284.1   47.9  111.7#
 74   60.0   36.2   84.6
```

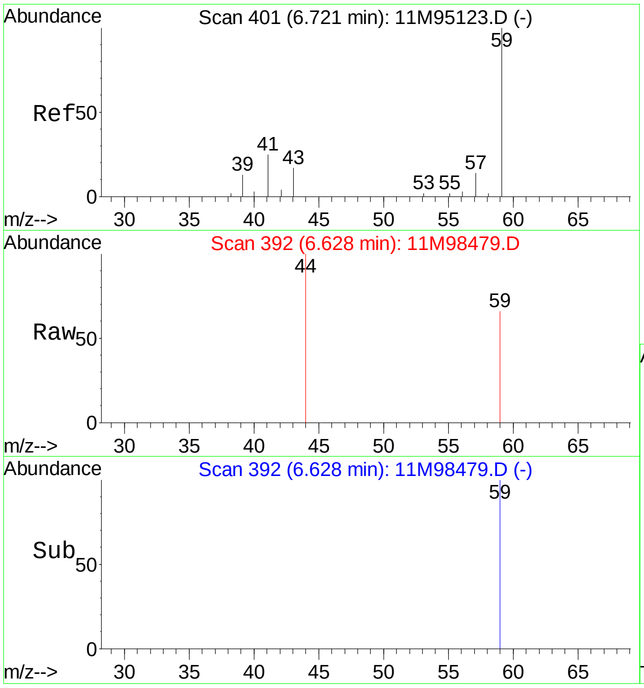




```
#13
Acetone
Concen:    1.31 ug/L
RT: 6.33 min  Scan# 363
Delta R.T.   -0.02 min
Lab File:   11M98479.D
Acq: 19 Jan 2014  23:00

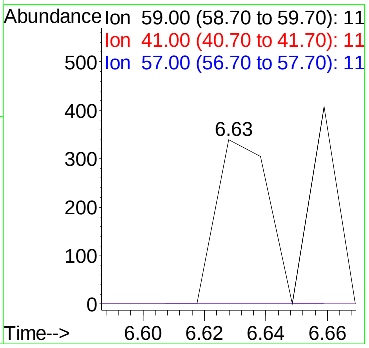
Tgt Ion: 43 Resp:    2268
Ion  Ratio  Lower  Upper
 43  100
 58    0.0   13.9   32.3#
```

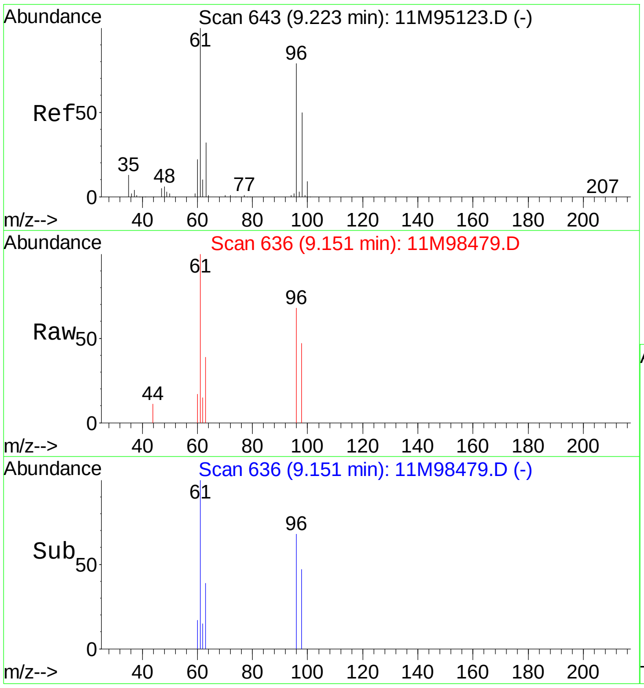




```
#15
Tert-Butyl Alcohol
Concen:     0.74 ug/L
RT: 6.63 min   Scan# 392
Delta R.T.    -0.04 min
Lab File:    11M98479.D
Acq: 19 Jan 2014  23:00

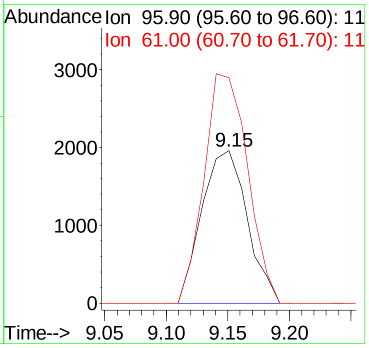
Tgt Ion: 59 Resp:      399
Ion   Ratio  Lower   Upper
 59   100
 41     0.0    14.0    32.6#
 57     0.0     7.2    16.8#
```

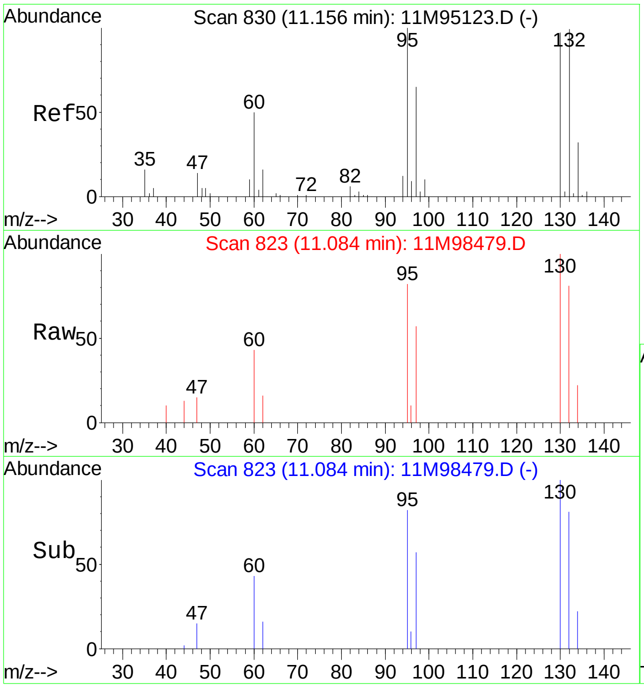




```
#32
cis-1,2-Dichloroethene
Concen:     0.55 ug/L
RT: 9.15 min   Scan# 636
Delta R.T.    -0.02 min
Lab File:    11M98479.D
Acq: 19 Jan 2014  23:00

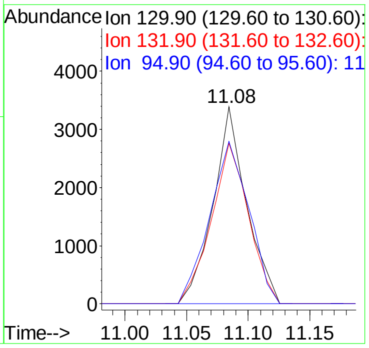
Tgt Ion: 96 Resp:     5027
Ion   Ratio  Lower   Upper
 96   100
 61   144.8    99.2   231.4
```





```
#46
Trichloroethene
Concen:    0.72 ug/L
RT: 11.08 min  Scan# 823
Delta R.T.   -0.02 min
Lab File:   11M98479.D
Acq: 19 Jan 2014  23:00

Tgt Ion:130 Resp:    6438
Ion  Ratio  Lower  Upper
130  100
132   90.2   57.9  135.1
 95   96.9   60.4  140.8
```



```
                              Quantitation Report    (Not Reviewed)

Data File : C:\MSDCHEM\1\DATA\011914\11M98471.D          Vial: 10
Acq On    : 19 Jan 2014  18:47                       Operator: adc
Sample    : L14010285-05 A 826-LOW                   Inst    : hpms11
Misc      : 1,1                                      Multiplr: 1.00
MS Integration Params: rteint.p
Quant Time: Jan 20 13:43:20 2014          Quant Results File: 8260_WT.RES

Quant Method : C:\MSDCHEM\1\METHODS\8260_WT.M (RTE Integrator)
Title        : 8260B/624 (SOP: OVL MSV01) Water 11/05/13 HPMS11
Last Update  : Mon Dec 16 17:06:06 2013
Response via : Initial Calibration
DataAcq Meth : 8260_WT

 Internal Standards                 R.T. QIon  Response  Conc Units Dev(Min)
 ------------------------------------------------------------------------
   1) Fluorobenzene                10.61   96   780944    25.00 ug/L   -0.02
  56) Chlorobenzene-d5             14.24  117   639042    25.00 ug/L   -0.02
  76) 1,4-Dichlorobenzene-d4       17.05  152   349221    25.00 ug/L   -0.02

 System Monitoring Compounds
  37) Dibromofluoromethane          9.62  111   234435    24.8157 ug/L -0.02
   Spiked Amount     25.000   Range  86 - 118    Recovery   =   99.28%
  43) 1,2-Dichloroethane-d4        10.23   65   260750    24.4397 ug/L -0.02
   Spiked Amount     25.000   Range  80 - 120    Recovery   =   97.76%
  57) Toluene-d8                   12.47   98   861868    26.8545 ug/L -0.02
   Spiked Amount     25.000   Range  88 - 110    Recovery   =  107.40%
  78) p-Bromofluorobenzene         15.63   95   347678    24.7899 ug/L -0.02
   Spiked Amount     25.000   Range  86 - 115    Recovery   =   99.16%

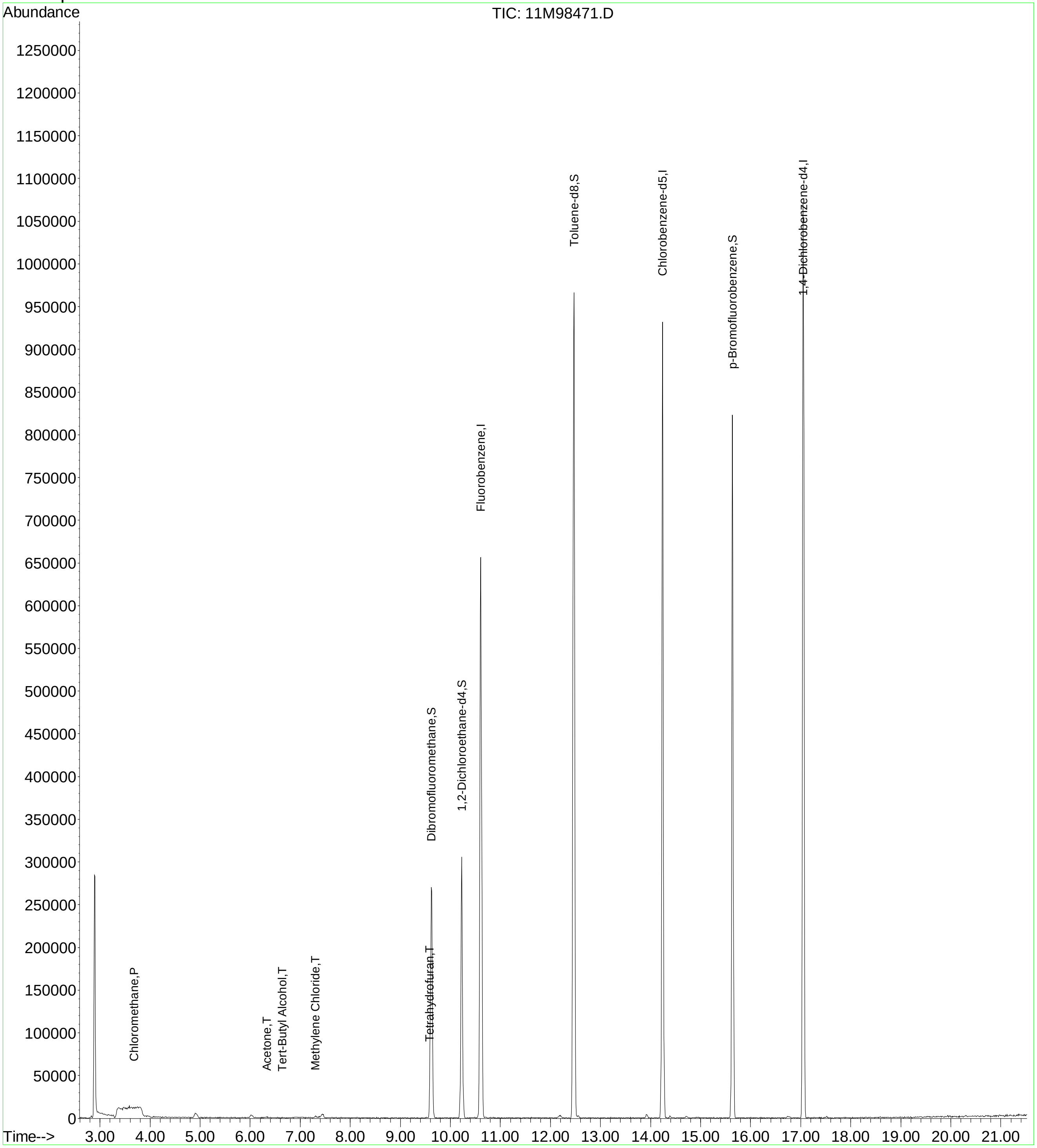
 Target Compounds                                                   Qvalue
   3) Chloromethane                 3.68   50     1589     0.1461 ug/L #  41
  13) Acetone                       6.33   43     1900     1.0473 ug/L    85
  15) Tert-Butyl Alcohol            6.64   59      194     0.3442 ug/L #  58
  19) Methylene Chloride            7.30   84     1832     0.2022 ug/L    81
  36) Tetrahydrofuran               9.59   42      494     0.3156 ug/L #  39

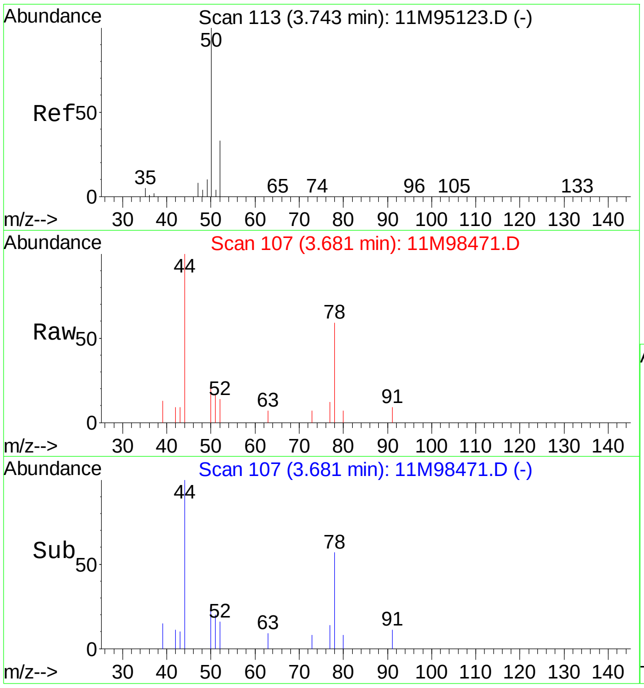
 ------------------------------------------------------------------------
 (#) = qualifier out of range (m) = manual integration
 11M98471.D  8260_WT.M      Mon Jan 20 13:43:21 2014                     Page 1
```

```
                          Quantitation Report    (Not Reviewed)

  Data File : C:\MSDCHEM\1\DATA\011914\11M98471.D         Vial: 10
  Acq On    : 19 Jan 2014  18:47                      Operator: adc
  Sample    : L14010285-05 A 826-LOW                  Inst    : hpms11
  Misc      : 1,1                                     Multiplr: 1.00
  MS Integration Params: rteint.p
  Quant Time: Jan 20 13:43 2014           Quant Results File: 8260_WT.RES

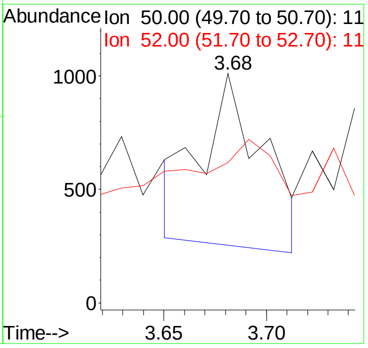
  Method       : C:\MSDCHEM\1\METHODS\8260_WT.M (RTE Integrator)
  Title        : 8260B/624 (SOP: OVL MSV01) Water 11/05/13 HPMS11
  Last Update  : Mon Dec 16 17:06:06 2013
  Response via : Initial Calibration
```

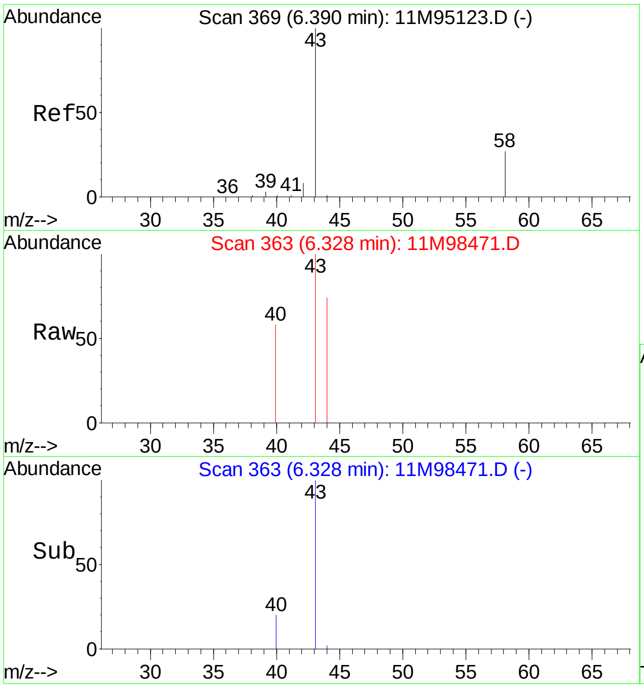




```
#3
Chloromethane
Concen:     0.15 ug/L
RT: 3.68 min   Scan# 107
Delta R.T.    -0.02 min
Lab File:    11M98471.D
Acq: 19 Jan 2014   18:47

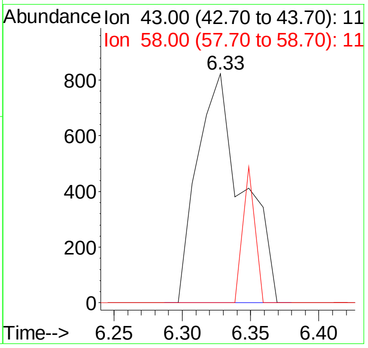
Tgt Ion: 50 Resp:     1589
Ion   Ratio   Lower   Upper
 50   100
 52     0.0    20.3    47.3#
```

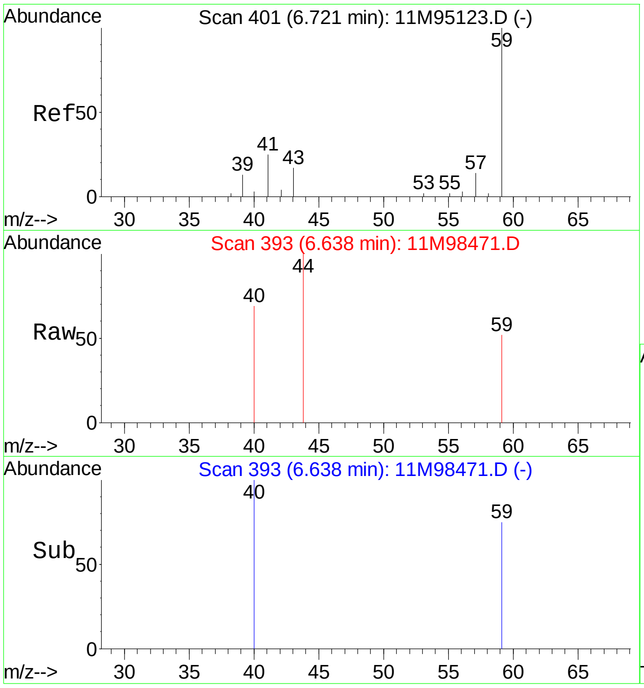




```
#13
Acetone
Concen:     1.05 ug/L
RT: 6.33 min   Scan# 363
Delta R.T.    -0.02 min
Lab File:    11M98471.D
Acq: 19 Jan 2014   18:47

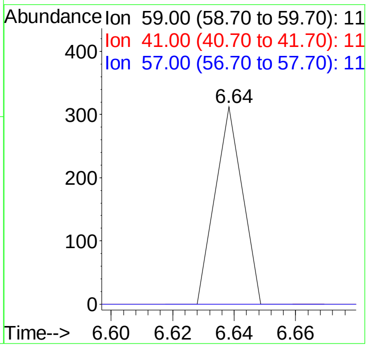
Tgt Ion: 43 Resp:     1900
Ion   Ratio   Lower   Upper
 43   100
 58    15.9    13.9    32.3
```

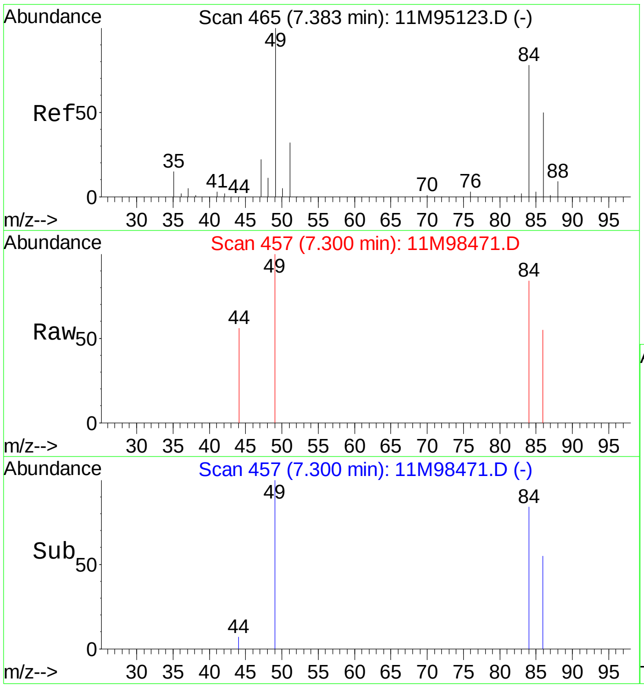




```
#15
Tert-Butyl Alcohol
Concen:     0.34 ug/L
RT: 6.64 min   Scan# 393
Delta R.T.    -0.03 min
Lab File:   11M98471.D
Acq: 19 Jan 2014   18:47

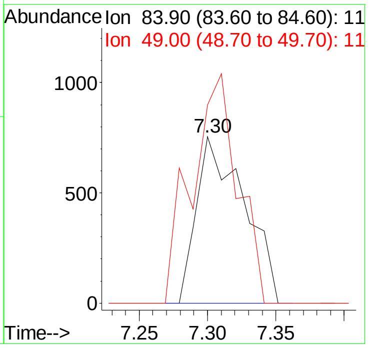
Tgt Ion: 59 Resp:      194
Ion   Ratio   Lower   Upper
 59   100
 41     0.0    14.0    32.6#
 57     0.0     7.2    16.8#
```

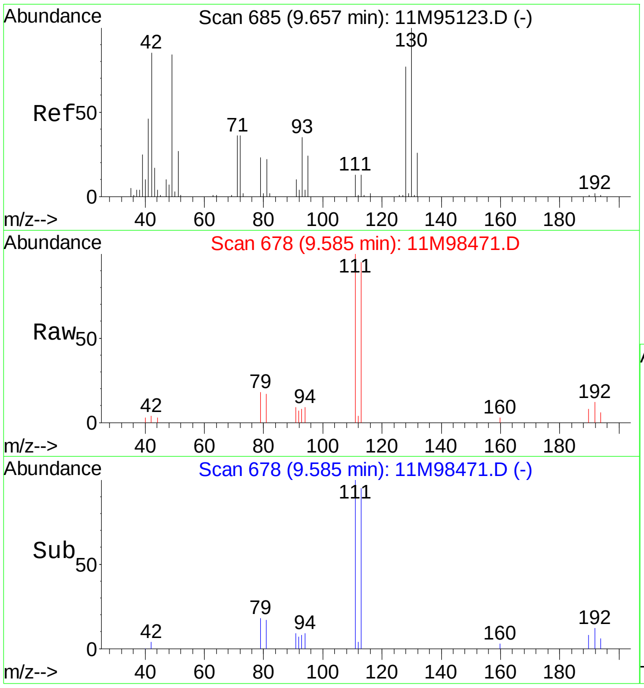




```
#19
Methylene Chloride
Concen:     0.20 ug/L
RT: 7.30 min   Scan# 457
Delta R.T.    -0.03 min
Lab File:   11M98471.D
Acq: 19 Jan 2014   18:47

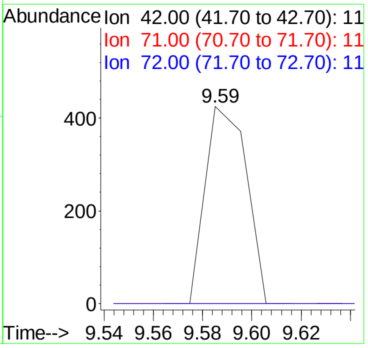
Tgt Ion: 84 Resp:     1832
Ion   Ratio   Lower   Upper
 84   100
 49   133.4    94.9   221.5
```





```
#36
Tetrahydrofuran
Concen:    0.32 ug/L
RT: 9.59 min   Scan# 678
Delta R.T.    -0.02 min
Lab File:   11M98471.D
Acq: 19 Jan 2014  18:47

Tgt Ion: 42 Resp:      494
Ion  Ratio   Lower  Upper
 42  100
 71    0.0    21.3   49.7#
 72    0.0    22.3   51.9#
```



2.1.1.4 Standards Data

```
                          Quantitation Report    (Not Reviewed)

Data File : C:\MSDchem\1\data\110513\11M96662.D          Vial: 2
Acq On    :  5 Nov 2013  16:30                       Operator: FJB
Sample    : WG451178-02 0.3ug/L STD 8260             Inst    : hpms11
Misc      : 1,1 STD61183                             Multiplr: 1.00
MS Integration Params: rteint.p
Quant Time: Nov 05 16:52:30 2013          Quant Results File: 8260_WT.RES

Quant Method : C:\MSDCHEM\1\METHODS\8260_WT.M (RTE Integrator)
Title        : 8260B/624 (SOP: OVL MSV01) Water 11/05/13 HPMS11
Last Update  : Wed Oct 23 10:24:39 2013
Response via : Initial Calibration
DataAcq Meth : 8260_WT

 Internal Standards                R.T. QIon  Response  Conc Units Dev(Min)
 -----------------------------------------------------------------------
   1) Fluorobenzene              10.63   96   933145    25.00 ug/L    0.00
  56) Chlorobenzene-d5           14.26  117   709314    25.00 ug/L   -0.01
  76) 1,4-Dichlorobenzene-d4     17.07  152   369417    25.00 ug/L   -0.01

 System Monitoring Compounds
  37) Dibromofluoromethane        9.65  111    25894     2.7055 ug/L  0.00
   Spiked Amount     25.000   Range  86 - 118    Recovery   =   10.84%#
  43) 1,2-Dichloroethane-d4      10.25   65    33809     3.8581 ug/L  0.00
   Spiked Amount     25.000   Range  80 - 120    Recovery   =   15.44%#
  57) Toluene-d8                 12.49   98    65817     2.0713 ug/L  0.00
   Spiked Amount     25.000   Range  88 - 110    Recovery   =    8.28%#
  78) p-Bromofluorobenzene       15.65   95    24158     1.8736 ug/L -0.01
   Spiked Amount     25.000   Range  86 - 115    Recovery   =    7.48%#

 Target Compounds                                                 Qvalue
   2) Dichlorodifluoromethane     3.24   85     2952     0.4419 ug/L    92
   3) Chloromethane               3.71   50     5824     0.9972 ug/L #  74
   4) Vinyl Chloride              3.95   62     4522     0.5633 ug/L    96
   5) 1,3-Butadiene               3.99   54     4718     0.9110 ug/L #  60
   6) Bromomethane                4.86   94     1710     0.4273 ug/L    93
   7) Chloroethane                5.01   64     2257     0.3939 ug/L #  58
   8) Trichlorofluoromethane      5.50  101     6143     0.4781 ug/L    99
  10) Isoprene                    6.06   67     4858     0.3959 ug/L    72
  12) 1,1,2-Trichloro-1,2,2-Trif  6.26  101     3318     0.4095 ug/L    78
  13) Acetone                     6.37   43     4143     2.2806 ug/L #  52
  14) 1,1-Dichloroethene          6.58   61     6251     0.5271 ug/L    92
  16) Dimethyl Sulfide            6.82   62     2667     0.3185 ug/L    79
  18) Methyl acetate              7.10   43     3279     0.7168 ug/L #  66
  19) Methylene Chloride          7.33   84     6696     0.5875 ug/L    86
  20) Carbon Disulfide            7.38   76    15909     0.5715 ug/L #  38
  22) Methyl Tert Butyl Ether     7.54   73     7050     0.3167 ug/L #  68
  23) trans-1,2-Dichloroethene    7.78   96     4404     0.4831 ug/L    94
  24) n-Hexane                    7.84   57     6117     0.6621 ug/L #  78
  26) Vinyl Acetate               8.33   43     4058     0.3348 ug/L #  76
  27) 1,1-Dichloroethane          8.35   63     6499     0.4376 ug/L    94
  29) 2-Butanone                  8.89   43     1587     0.5972 ug/L #  59
  31) 2,2-Dichloropropane         9.11   77     6094     0.4698 ug/L    97
  32) cis-1,2-Dichloroethene      9.17   96     4316     0.4267 ug/L    84
  33) Chloroform                  9.37   83     6629     0.4266 ug/L    93
  34) 1-Bromopropane              9.49  122      643     0.3903 ug/L    32
  35) Bromochloromethane          9.60  130     2104     0.3463 ug/L    89
  38) 1,1,1-Trichloroethane       9.87   97     5531     0.3998 ug/L #  87
  39) Cyclohexane                 9.91   56     7265     0.5731 ug/L    89
  40) 1,1-Dichloropropene        10.06   75     5588     0.4722 ug/L    94
  41) Carbon Tetrachloride       10.21  117     5223     0.4033 ug/L    97
  44) 1,2-Dichloroethane         10.37   62     4049     0.3784 ug/L    92
  45) Benzene                    10.40   78    16451     0.4737 ug/L    91
  46) Trichloroethene            11.10  130     4445     0.4432 ug/L    99
  47) Methylcyclohexane          11.20   83     5582     0.4397 ug/L    98
  48) 1,2-Dichloropropane        11.30   63     3274     0.3781 ug/L    84
  49) 1,4-Dioxane                11.59   88      224     2.7369 ug/L #  61
  50) Bromodichloromethane       11.59   83     4568     0.3917 ug/L #  94
  51) Dibromomethane             11.68   93     1627     0.3065 ug/L    90
  52) 2-Chloroethyl Vinyl Ether  11.85   63      941     0.2157 ug/L #  47
  54) cis-1,3-Dichloropropene    12.19   75    19400     1.3471 ug/L #  77
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 (#) = qualifier out of range (m) = manual integration
 11M96662.D  8260_WT.M      Tue Nov 05 16:52:31 2013                          Page 1
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                          Quantitation Report    (Not Reviewed)

Data File : C:\MSDchem\1\data\110513\11M96662.D          Vial: 2
Acq On    :  5 Nov 2013  16:30                         Operator: FJB
Sample    : WG451178-02 0.3ug/L STD 8260               Inst    : hpms11
Misc      : 1,1 STD61183                               Multiplr: 1.00
MS Integration Params: rteint.p
Quant Time: Nov 05 16:52:30 2013          Quant Results File: 8260_WT.RES

Quant Method : C:\MSDCHEM\1\METHODS\8260_WT.M (RTE Integrator)
Title        : 8260B/624 (SOP: OVL MSV01) Water 11/05/13 HPMS11
Last Update  : Wed Oct 23 10:24:39 2013
Response via : Initial Calibration
DataAcq Meth : 8260_WT


      Compound                     R.T. QIon  Response  Conc Unit   Qvalue
 ---------------------------------------------------------------------------
  55) Dimethyl Disulfide          12.45   79     2475     0.2873 ug/L #  40
  58) Toluene                     12.58   91    19910     0.5577 ug/L    96
  59) Ethyl Methacrylate          12.66   69     2524     0.5444 ug/L #  28
  60) trans-1,3-Dichloropropene   12.75   75     4010     0.3188 ug/L #  80
  61) 1,1,2-Trichloroethane       12.96   97     2426     0.3362 ug/L    91
  62) 2-Hexanone                  12.87   43     1993     0.5270 ug/L #  26
  63) 1,3-Dichloropropane         13.23   76     3872     0.3134 ug/L    80
  64) Tetrachloroethene           13.36  164     2925     0.3463 ug/L    95
  65) Dibromochloromethane        13.60  129     2914     0.3166 ug/L    96
  66) 1,2-Dibromoethane           13.84  107     2151     0.2952 ug/L    96
  67) 1-Chlorohexane              13.91   91     4872     0.4159 ug/L    82
  68) Chlorobenzene               14.31  112    14102     0.5445 ug/L    98
  69) 1,1,1,2-Tetrachloroethane   14.34  131     2986     0.2971 ug/L    98
  70) Ethylbenzene                14.33  106     5316     0.4066 ug/L    86
  71) m-,p-Xylene                 14.41  106    15266     0.9981 ug/L    93
  72) o-Xylene                    14.94  106     6249     0.4006 ug/L    99
  73) Styrene                     14.97  104     9242     0.3619 ug/L #  63
  74) Bromoform                   15.45  173     1395     0.5196 ug/L #  51
  75) Isopropylbenzene            15.33  105    14801     0.4104 ug/L    95
  77) 1,1,2,2-Tetrachloroethane   15.53   83     2369     0.2817 ug/L    84
  79) 1,2,3-Trichloropropane      15.72  110      548     0.2186 ug/L #  31
  80) trans-1,4-Dichloro-2-Buten  15.75   53      694     0.5885 ug/L #  12
  81) n-Propylbenzene             15.80   91    20371     0.4858 ug/L    96
  82) Bromobenzene                15.93  156     3815     0.3307 ug/L #  10
  83) 1,3,5-Trimethylbenzene      15.97  105    15927     0.5344 ug/L    97
  84) 2-Chlorotoluene             16.06   91    12076     0.3958 ug/L    97
  85) 4-Chlorotoluene             16.11   91    13142     0.5141 ug/L    92
  86) a-Methylstyrene             16.35  118     5740     0.3308 ug/L    94
  87) tert-Butylbenzene           16.40  134     2364     0.3409 ug/L    90
  88) 1,2,4-Trimethylbenzene      16.46  105    15175     0.4968 ug/L    96
  89) sec-Butylbenzene            16.66  105    15837     0.4617 ug/L    96
  90) p-Isopropyltoluene          16.80  119    12500     0.4146 ug/L    95
  91) 1,3-Dichlorobenzene         17.00  146     8705     0.4287 ug/L    94
  92) 1,4-Dichlorobenzene         17.11  146     8980     0.4275 ug/L #  62
  93) n-Butylbenzene              17.29   91    13824     0.5182 ug/L    99
  94) 1,2-Dichlorobenzene         17.58  146     6646     0.3366 ug/L    98
  96) 1,2,4-Trichlorobenzene      19.56  180     5557     0.3915 ug/L    97
  97) Hexachlorobutadiene         19.69  225     1796     0.3337 ug/L    82
  98) Naphthalene                 19.91  128     9863     0.3620 ug/L #  96
  99) 1,2,3-Trichlorobenzene      20.20  180     4516     0.3445 ug/L    90













 ---------------------------------------------------------------------------
 (#) = qualifier out of range (m) = manual integration
 11M96662.D  8260_WT.M      Tue Nov 05 16:52:31 2013                  Page 2
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                    Quantitation Report    (Not Reviewed)
Data File : C:\MSDchem\1\data\110513\11M96662.D         Vial: 2
Acq On    :  5 Nov 2013  16:30                       Operator: FJB
Sample    : WG451178-02 0.3ug/L STD 8260             Inst    : hpms11
Misc      : 1,1 STD61183                             Multiplr: 1.00
MS Integration Params: rteint.p
Quant Time: Nov  5 16:52 2013            Quant Results File: 8260_WT.RES

Method       : C:\MSDCHEM\1\METHODS\8260_WT.M (RTE Integrator)
Title        : 8260B/624 (SOP: OVL MSV01) Water 11/05/13 HPMS11
Last Update  : Wed Oct 23 10:24:39 2013
Response via : Initial Calibration
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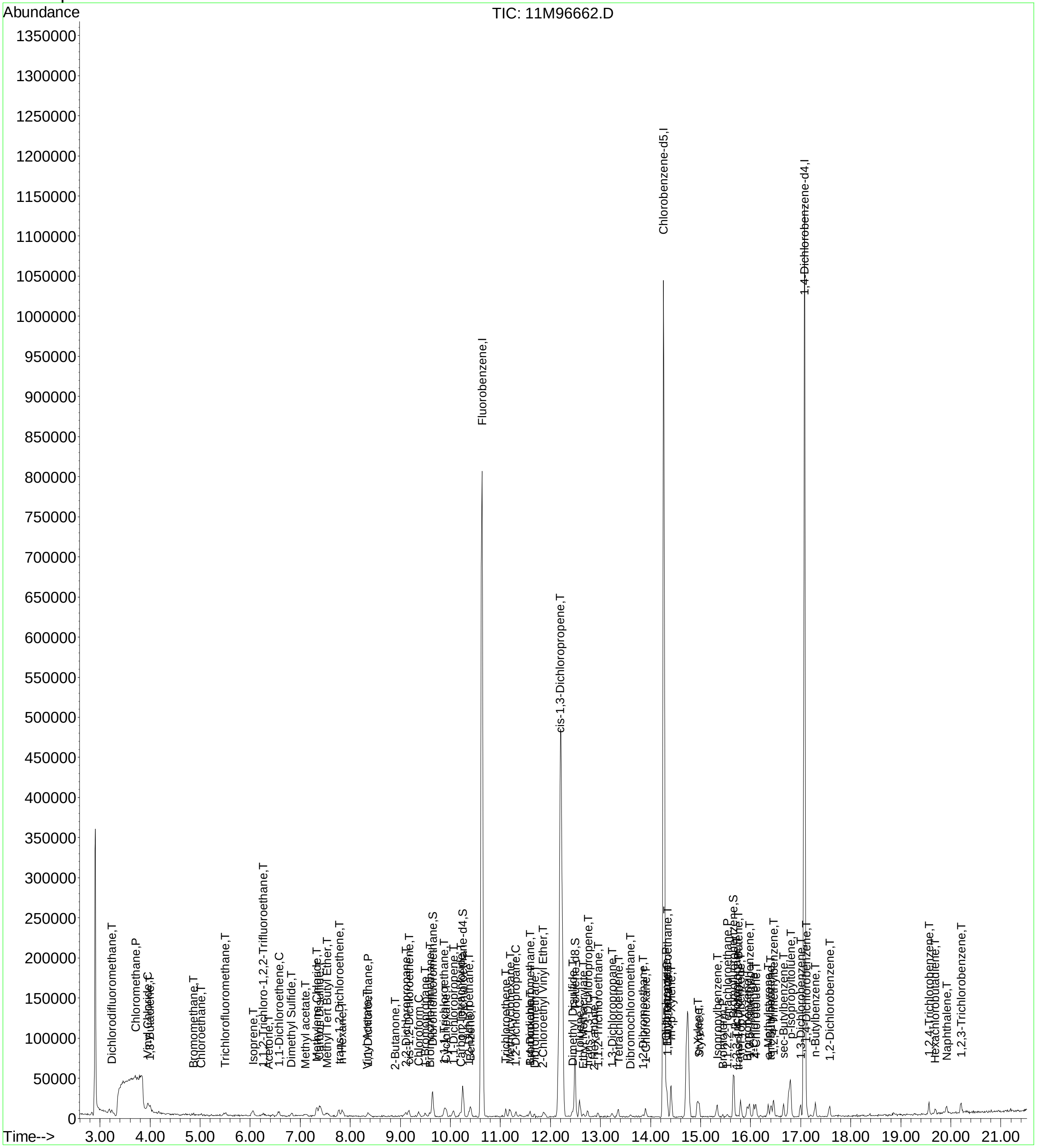

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11M96662.D  8260_WT.M       Tue Nov 05 16:52:32 2013                Page 3
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                         Quantitation Report    (Not Reviewed)

Data File : C:\MSDchem\1\data\110513\11M96663.D          Vial: 3
Acq On    :  5 Nov 2013  17:02                       Operator: FJB
Sample    : WG451178-03 0.4ug/L STD 8260             Inst    : hpms11
Misc      : 1,1 STD61183                             Multiplr: 1.00
MS Integration Params: rteint.p
Quant Time: Nov 05 17:23:53 2013          Quant Results File: 8260_WT.RES

Quant Method : C:\MSDCHEM\1\METHODS\8260_WT.M (RTE Integrator)
Title        : 8260B/624 (SOP: OVL MSV01) Water 11/05/13 HPMS11
Last Update  : Wed Oct 23 10:24:39 2013
Response via : Initial Calibration
DataAcq Meth : 8260_WT

 Internal Standards                 R.T. QIon  Response  Conc Units Dev(Min)
 -------------------------------------------------------------------------
   1) Fluorobenzene               10.63   96   904392    25.00 ug/L    0.00
  56) Chlorobenzene-d5            14.26  117   709205    25.00 ug/L   -0.01
  76) 1,4-Dichlorobenzene-d4      17.07  152   365433    25.00 ug/L   -0.01

 System Monitoring Compounds
  37) Dibromofluoromethane         9.64  111     1154     0.1244 ug/L -0.01
   Spiked Amount     25.000   Range  86 - 118    Recovery   =    0.48%#
  43) 1,2-Dichloroethane-d4       10.25   65     1915     0.2255 ug/L  0.00
   Spiked Amount     25.000   Range  80 - 120    Recovery   =    0.92%#
  57) Toluene-d8                  12.49   98     7720     0.2430 ug/L  0.00
   Spiked Amount     25.000   Range  88 - 110    Recovery   =    0.96%#
  78) p-Bromofluorobenzene        15.65   95     3789     0.2971 ug/L -0.01
   Spiked Amount     25.000   Range  86 - 115    Recovery   =    1.20%#

 Target Compounds                                                Qvalue
   2) Dichlorodifluoromethane      3.24   85     3373     0.5210 ug/L #  64
   3) Chloromethane                3.70   50     5671     1.0018 ug/L    95
   4) Vinyl Chloride               3.94   62     4969     0.6386 ug/L    95
   5) 1,3-Butadiene                3.99   54     5478     1.0913 ug/L    82
   6) Bromomethane                 4.86   94     1903     0.4906 ug/L    78
   7) Chloroethane                 5.00   64     2544     0.4581 ug/L #  72
   8) Trichlorofluoromethane       5.49  101     6883     0.5528 ug/L    94
  10) Isoprene                     6.06   67     5909     0.4968 ug/L    84
  12) 1,1,2-Trichloro-1,2,2-Trif   6.29  101     4056     0.5166 ug/L    74
  13) Acetone                      6.36   43     2838     1.6119 ug/L #  52
  14) 1,1-Dichloroethene           6.57   61     6474     0.5632 ug/L    87
  16) Dimethyl Sulfide             6.82   62     3512     0.4327 ug/L    77
  18) Methyl acetate               7.08   43     3931     0.8867 ug/L #  66
  19) Methylene Chloride           7.33   84     5633     0.4986 ug/L    87
  20) Carbon Disulfide             7.38   76    12880     0.4774 ug/L #  65
  22) Methyl Tert Butyl Ether      7.54   73     9264     0.4293 ug/L    87
  23) trans-1,2-Dichloroethene     7.78   96     4243     0.4802 ug/L    89
  24) n-Hexane                     7.84   57     6088     0.6799 ug/L #  69
  26) Vinyl Acetate                8.33   43     4290     0.3652 ug/L #  85
  27) 1,1-Dichloroethane           8.36   63     7630     0.5300 ug/L #  89
  29) 2-Butanone                   8.90   43     1732     0.6725 ug/L #  59
  31) 2,2-Dichloropropane          9.10   77     8496     0.6758 ug/L    92
  32) cis-1,2-Dichloroethene       9.17   96     4234     0.4319 ug/L    88
  33) Chloroform                   9.37   83     8022     0.5326 ug/L    97
  34) 1-Bromopropane               9.50  122      414     0.2864 ug/L    70
  35) Bromochloromethane           9.58  130     1909     0.3242 ug/L    84
  38) 1,1,1-Trichloroethane        9.87   97     7002     0.5222 ug/L #  93
  39) Cyclohexane                  9.90   56     8181     0.6659 ug/L    89
  40) 1,1-Dichloropropene         10.05   75     5638     0.4916 ug/L    98
  41) Carbon Tetrachloride        10.19  117     6262     0.4989 ug/L    96
  44) 1,2-Dichloroethane          10.36   62     5152     0.4968 ug/L    93
  45) Benzene                     10.40   78    18854     0.5602 ug/L    94
  46) Trichloroethene             11.10  130     4707     0.4842 ug/L    98
  47) Methylcyclohexane           11.19   83     6346     0.5158 ug/L    94
  48) 1,2-Dichloropropane         11.30   63     4241     0.5054 ug/L    84
  50) Bromodichloromethane        11.59   83     5652     0.5000 ug/L    94
  51) Dibromomethane              11.67   93     2197     0.4271 ug/L    83
  52) 2-Chloroethyl Vinyl Ether   11.86   63     1835     0.4340 ug/L #  47
  53) 4-Methyl-2-Pentanone        11.89   58      274     0.1201 ug/L #  36
  54) cis-1,3-Dichloropropene     12.18   75     6277     0.4497 ug/L    96
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 (#) = qualifier out of range (m) = manual integration
 11M96663.D  8260_WT.M      Tue Nov 05 17:23:54 2013                      Page 1
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                              Quantitation Report    (Not Reviewed)

Data File : C:\MSDchem\1\data\110513\11M96663.D         Vial: 3
Acq On    :  5 Nov 2013  17:02                       Operator: FJB
Sample    : WG451178-03 0.4ug/L STD 8260             Inst    : hpms11
Misc      : 1,1 STD61183                             Multiplr: 1.00
MS Integration Params: rteint.p
Quant Time: Nov 05 17:23:53 2013          Quant Results File: 8260_WT.RES

Quant Method : C:\MSDCHEM\1\METHODS\8260_WT.M (RTE Integrator)
Title        : 8260B/624 (SOP: OVL MSV01) Water 11/05/13 HPMS11
Last Update  : Wed Oct 23 10:24:39 2013
Response via : Initial Calibration
DataAcq Meth : 8260_WT


      Compound                     R.T. QIon  Response  Conc Unit   Qvalue
 ------------------------------------------------------------------------
  55) Dimethyl Disulfide          12.44   79      3590     0.4300 ug/L    95
  58) Toluene                     12.58   91     17992     0.5040 ug/L    97
  59) Ethyl Methacrylate          12.66   69      3809     0.6689 ug/L    80
  60) trans-1,3-Dichloropropene   12.74   75      5318     0.4229 ug/L    95
  61) 1,1,2-Trichloroethane       12.96   97      2632     0.3648 ug/L    76
  62) 2-Hexanone                  12.88   43      2624     0.6939 ug/L #  24
  63) 1,3-Dichloropropane         13.22   76      5388     0.4362 ug/L    66
  64) Tetrachloroethene           13.36  164      3649     0.4321 ug/L    94
  65) Dibromochloromethane        13.60  129      3986     0.4332 ug/L    84
  66) 1,2-Dibromoethane           13.84  107      2686     0.3687 ug/L    98
  67) 1-Chlorohexane              13.91   91      5366     0.4582 ug/L    98
  68) Chlorobenzene               14.31  112     12546     0.4845 ug/L    94
  69) 1,1,1,2-Tetrachloroethane   14.33  131      3965     0.3946 ug/L    92
  70) Ethylbenzene                14.32  106      6268     0.4795 ug/L    88
  71) m-,p-Xylene                 14.40  106     15816     1.0342 ug/L    96
  72) o-Xylene                    14.93  106      7575     0.4856 ug/L    93
  73) Styrene                     14.97  104     11616     0.4549 ug/L    87
  74) Bromoform                   15.45  173      1984     0.6005 ug/L    74
  75) Isopropylbenzene            15.33  105     18489     0.5128 ug/L   100
  77) 1,1,2,2-Tetrachloroethane   15.53   83      3218     0.3868 ug/L    91
  79) 1,2,3-Trichloropropane      15.71  110       752     0.3032 ug/L #   1
  80) trans-1,4-Dichloro-2-Buten  15.74   53       481     0.5021 ug/L #   1
  81) n-Propylbenzene             15.80   91     22205     0.5353 ug/L    98
  82) Bromobenzene                15.94  156      3969     0.3478 ug/L #  18
  83) 1,3,5-Trimethylbenzene      15.96  105     15610     0.5294 ug/L    99
  84) 2-Chlorotoluene             16.07   91     17009     0.5636 ug/L    84
  85) 4-Chlorotoluene             16.07   91     17009     0.6726 ug/L    98
  86) a-Methylstyrene             16.35  118      7454     0.4342 ug/L    93
  87) tert-Butylbenzene           16.40  134      2781     0.4054 ug/L    79
  88) 1,2,4-Trimethylbenzene      16.45  105     15900     0.5263 ug/L    99
  89) sec-Butylbenzene            16.66  105     18015     0.5309 ug/L   100
  90) p-Isopropyltoluene          16.80  119     14830     0.4972 ug/L    99
  91) 1,3-Dichlorobenzene         16.99  146      9380     0.4670 ug/L    92
  92) 1,4-Dichlorobenzene         17.11  146      8471     0.4076 ug/L #  58
  93) n-Butylbenzene              17.29   91     14492     0.5492 ug/L    94
  94) 1,2-Dichlorobenzene         17.58  146      7683     0.3934 ug/L    96
  95) 1,2-Dibromo-3-Chloropropan  18.51   75       433     0.2938 ug/L #  43
  96) 1,2,4-Trichlorobenzene      19.56  180      5186     0.3694 ug/L    92
  97) Hexachlorobutadiene         19.70  225      2594     0.4873 ug/L    82
  98) Naphthalene                 19.91  128     10450     0.3878 ug/L #  91
  99) 1,2,3-Trichlorobenzene      20.20  180      5380     0.4149 ug/L    85

 ------------------------------------------------------------------------
 (#) = qualifier out of range (m) = manual integration
 11M96663.D  8260_WT.M      Tue Nov 05 17:23:54 2013                    Page 2
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Quantitation Report (Not Reviewed)

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Data File : C:\MSDchem\1\data\110513\11M96663.D          Vial: 3
Acq On    :  5 Nov 2013  17:02                        Operator: FJB
Sample    : WG451178-03 0.4ug/L STD 8260              Inst    : hpms11
Misc      : 1,1 STD61183                              Multiplr: 1.00
MS Integration Params: rteint.p
Quant Time: Nov  5 17:23 2013            Quant Results File: 8260_WT.RES

Method       : C:\MSDCHEM\1\METHODS\8260_WT.M (RTE Integrator)
Title        : 8260B/624 (SOP: OVL MSV01) Water 11/05/13 HPMS11
Last Update  : Wed Oct 23 10:24:39 2013
Response via : Initial Calibration
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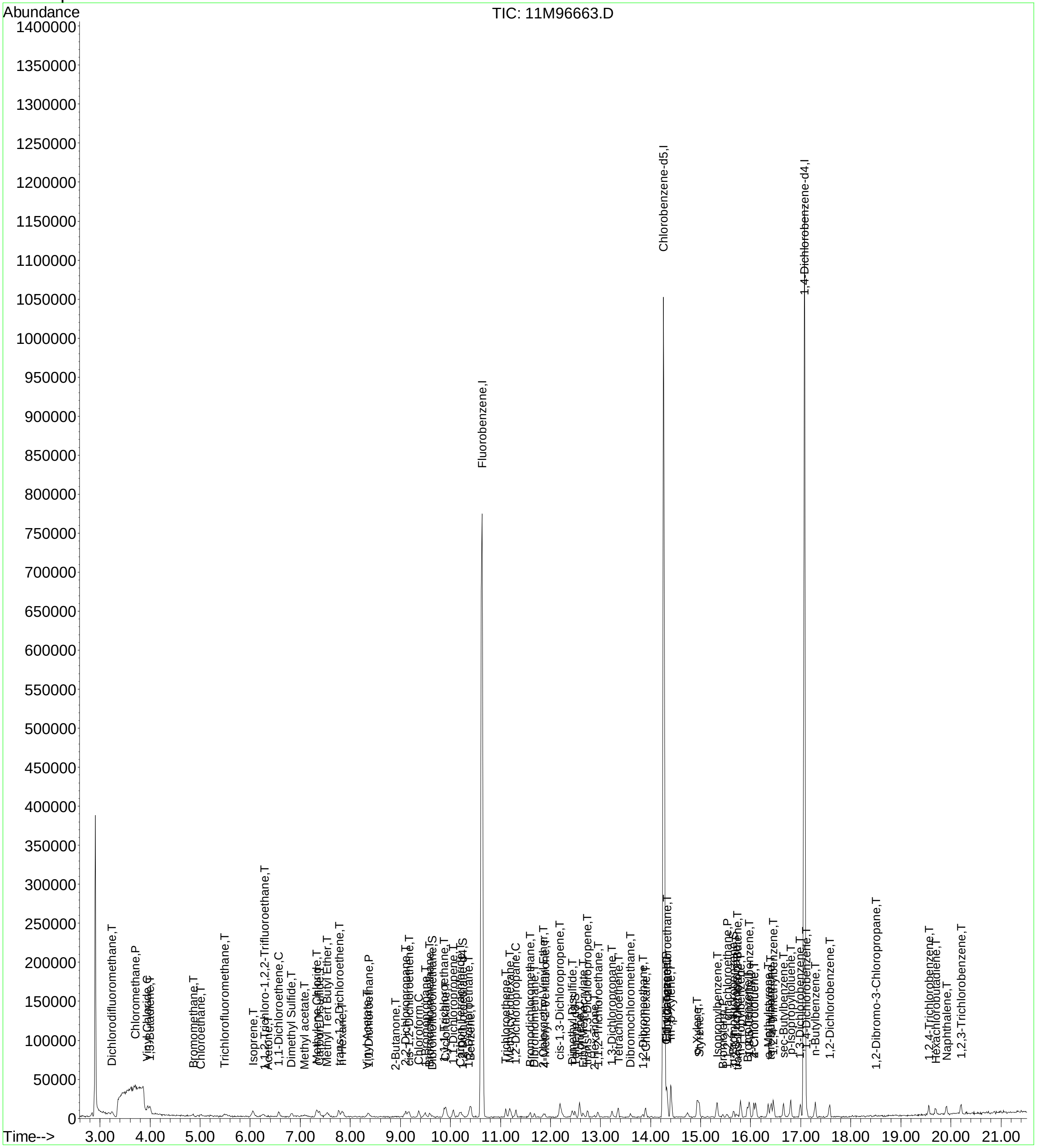

11M96663.D 8260_WT.M   Tue Nov 05 17:23:54 2013   Page 3

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                          Quantitation Report    (Not Reviewed)

Data File : C:\MSDchem\1\data\110513\11M96664.D         Vial: 4
Acq On    :  5 Nov 2013  17:37                      Operator: FJB
Sample    : WG451178-04 1ug/L STD 8260              Inst    : hpms11
Misc      : 1,1 STD61183                            Multiplr: 1.00
MS Integration Params: rteint.p
Quant Time: Nov 05 17:59:12 2013          Quant Results File: 8260_WT.RES

Quant Method : C:\MSDCHEM\1\METHODS\8260_WT.M (RTE Integrator)
Title        : 8260B/624 (SOP: OVL MSV01) Water 11/05/13 HPMS11
Last Update  : Wed Oct 23 10:24:39 2013
Response via : Initial Calibration
DataAcq Meth : 8260_WT

 Internal Standards                 R.T. QIon  Response  Conc Units Dev(Min)
 -----------------------------------------------------------------------------
   1) Fluorobenzene               10.63   96   869794    25.00 ug/L    0.00
  56) Chlorobenzene-d5            14.26  117   680013    25.00 ug/L   -0.01
  76) 1,4-Dichlorobenzene-d4      17.07  152   356992    25.00 ug/L   -0.01

 System Monitoring Compounds
  37) Dibromofluoromethane         9.64  111     6086     0.6822 ug/L -0.01
   Spiked Amount     25.000   Range  86 - 118    Recovery   =    2.72%#
  43) 1,2-Dichloroethane-d4       10.25   65     7298     0.8935 ug/L  0.00
   Spiked Amount     25.000   Range  80 - 120    Recovery   =    3.56%#
  57) Toluene-d8                  12.49   98    22946     0.7533 ug/L  0.00
   Spiked Amount     25.000   Range  88 - 110    Recovery   =    3.00%#
  78) p-Bromofluorobenzene        15.66   95     9406     0.7549 ug/L  0.00
   Spiked Amount     25.000   Range  86 - 115    Recovery   =    3.00%#

 Target Compounds                                                   Qvalue
   2) Dichlorodifluoromethane      3.23   85     7176     1.1524 ug/L    89
   3) Chloromethane                3.70   50    11415     2.0968 ug/L #  63
   4) Vinyl Chloride               3.94   62    10627     1.4202 ug/L    95
   5) 1,3-Butadiene                3.99   54    10726     2.2219 ug/L    82
   6) Bromomethane                 4.85   94     4060     1.0883 ug/L   100
   7) Chloroethane                 5.00   64     6139     1.1493 ug/L    94
   8) Trichlorofluoromethane       5.49  101    14187     1.1846 ug/L    99
   9) Diethyl ether                6.01   59    32785     5.7623 ug/L    95
  10) Isoprene                     6.05   67    12047     1.0532 ug/L    77
  11) Acrolein                     6.27   56      210     5.7222 ug/L #  50
  12) 1,1,2-Trichloro-1,2,2-Trif   6.26  101     7917     1.0484 ug/L    88
  13) Acetone                      6.36   43     3197     1.8880 ug/L #  52
  14) 1,1-Dichloroethene           6.57   61    14198     1.2843 ug/L    90
  15) Tert-Butyl Alcohol           6.67   59     5759    10.8034 ug/L    92
  16) Dimethyl Sulfide             6.82   62     7913     1.0137 ug/L    89
  18) Methyl acetate               7.09   43     6010     1.4095 ug/L #  77
  19) Methylene Chloride           7.33   84     9612     0.9510 ug/L    91
  20) Carbon Disulfide             7.37   76    26278     1.0128 ug/L #  85
  21) Acrylonitrile                7.51   53     5508     2.5049 ug/L    91
  22) Methyl Tert Butyl Ether      7.53   73    23154     1.1158 ug/L   100
  23) trans-1,2-Dichloroethene     7.78   96     9906     1.1657 ug/L    82
  24) n-Hexane                     7.84   57    12288     1.4270 ug/L #  93
  25) Diisopropyl ether            8.17   45   162959     6.7230 ug/L    98
  26) Vinyl Acetate                8.33   43    10526     0.9316 ug/L #  91
  27) 1,1-Dichloroethane           8.36   63    17422     1.2584 ug/L    98
  28) Ethyl-Tert-Butyl ether       8.71   59   149211     6.6172 ug/L    98
  29) 2-Butanone                   8.90   43     2958     1.1942 ug/L #  59
  30) Propionitrile                9.01   54     3837     4.9967 ug/L    85
  31) 2,2-Dichloropropane          9.11   77    15735     1.3015 ug/L    92
  32) cis-1,2-Dichloroethene       9.17   96    10049     1.0659 ug/L    96
  33) Chloroform                   9.37   83    17305     1.1947 ug/L   100
  34) 1-Bromopropane               9.50  122     1530     0.8708 ug/L    96
  35) Bromochloromethane           9.60  130     5518     0.9743 ug/L    91
  36) Tetrahydrofuran              9.62   42     9065     5.6603 ug/L    90
  38) 1,1,1-Trichloroethane        9.87   97    14961     1.1601 ug/L    91
  39) Cyclohexane                  9.91   56    16918     1.4318 ug/L    98
  40) 1,1-Dichloropropene         10.06   75    12561     1.1387 ug/L   100
  41) Carbon Tetrachloride        10.21  117    13838     1.1464 ug/L    97
  42) Tert-Amyl-Methyl ether      10.15   73   123525     5.5800 ug/L    94
  44) 1,2-Dichloroethane          10.36   62    12395     1.2427 ug/L    97
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 (#) = qualifier out of range (m) = manual integration
 11M96664.D  8260_WT.M      Tue Nov 05 17:59:12 2013                          Page 1
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                        Quantitation Report    (Not Reviewed)

Data File : C:\MSDchem\1\data\110513\11M96664.D          Vial: 4
Acq On    :  5 Nov 2013  17:37                        Operator: FJB
Sample    : WG451178-04 1ug/L STD 8260                Inst    : hpms11
Misc      : 1,1 STD61183                              Multiplr: 1.00
MS Integration Params: rteint.p
Quant Time: Nov 05 17:59:12 2013          Quant Results File: 8260_WT.RES

Quant Method : C:\MSDCHEM\1\METHODS\8260_WT.M (RTE Integrator)
Title        : 8260B/624 (SOP: OVL MSV01) Water 11/05/13 HPMS11
Last Update  : Wed Oct 23 10:24:39 2013
Response via : Initial Calibration
DataAcq Meth : 8260_WT


      Compound                     R.T. QIon  Response  Conc Unit   Qvalue
 -------------------------------------------------------------------------
  45) Benzene                     10.40   78    40477     1.2505 ug/L    99
  46) Trichloroethene             11.12  130     9533     1.0196 ug/L    97
  47) Methylcyclohexane           11.19   83    13310     1.1248 ug/L    96
  48) 1,2-Dichloropropane         11.31   63     9119     1.1299 ug/L    85
  50) Bromodichloromethane        11.59   83    13302     1.2236 ug/L    93
  51) Dibromomethane              11.67   93     4703     0.9506 ug/L    93
  52) 2-Chloroethyl Vinyl Ether   11.86   63     3801     0.9348 ug/L    93
  53) 4-Methyl-2-Pentanone        11.89   58     1872     0.8529 ug/L    96
  54) cis-1,3-Dichloropropene     12.18   75    13977     1.0413 ug/L    90
  55) Dimethyl Disulfide          12.44   79     7277     0.9062 ug/L    78
  58) Toluene                     12.58   91    38329     1.1199 ug/L   100
  59) Ethyl Methacrylate          12.66   69     8392     1.1477 ug/L    98
  60) trans-1,3-Dichloropropene   12.74   75    13282     1.1015 ug/L    96
  61) 1,1,2-Trichloroethane       12.95   97     6269     0.9063 ug/L    95
  62) 2-Hexanone                  12.87   43     3900     1.0756 ug/L #  77
  63) 1,3-Dichloropropane         13.22   76    11903     1.0049 ug/L   100
  64) Tetrachloroethene           13.35  164     7320     0.9040 ug/L    97
  65) Dibromochloromethane        13.60  129     8398     0.9519 ug/L    98
  66) 1,2-Dibromoethane           13.84  107     6558     0.9389 ug/L    96
  67) 1-Chlorohexane              13.91   91    12197     1.0861 ug/L    91
  68) Chlorobenzene               14.31  112    26169     1.0541 ug/L    98
  69) 1,1,1,2-Tetrachloroethane   14.33  131     9881     1.0256 ug/L    99
  70) Ethylbenzene                14.32  106    13364     1.0663 ug/L    90
  71) m-,p-Xylene                 14.40  106    33667     2.2960 ug/L    97
  72) o-Xylene                    14.94  106    16823     1.1249 ug/L    84
  73) Styrene                     14.97  104    26870     1.0975 ug/L   100
  74) Bromoform                   15.45  173     4751     1.0087 ug/L    86
  75) Isopropylbenzene            15.33  105    39681     1.1478 ug/L    97
  77) 1,1,2,2-Tetrachloroethane   15.53   83     6747     0.8301 ug/L    87
  79) 1,2,3-Trichloropropane      15.71  110     2036     0.8403 ug/L #   1
  80) trans-1,4-Dichloro-2-Buten  15.75   53     1849     1.0957 ug/L #   1
  81) n-Propylbenzene             15.80   91    47708     1.1772 ug/L    98
  82) Bromobenzene                15.93  156    10746     0.9639 ug/L #  52
  83) 1,3,5-Trimethylbenzene      15.97  105    35196     1.2219 ug/L    97
  84) 2-Chlorotoluene             16.06   91    30125     1.0218 ug/L    91
  85) 4-Chlorotoluene             16.10   91    31590     1.2787 ug/L    99
  86) a-Methylstyrene             16.35  118    15850     0.9452 ug/L    96
  87) tert-Butylbenzene           16.41  134     6623     0.9884 ug/L    93
  88) 1,2,4-Trimethylbenzene      16.46  105    36098     1.2230 ug/L    99
  89) sec-Butylbenzene            16.66  105    38497     1.1613 ug/L    98
  90) p-Isopropyltoluene          16.80  119    33760     1.1587 ug/L    99
  91) 1,3-Dichlorobenzene         17.00  146    18293     0.9323 ug/L    96
  92) 1,4-Dichlorobenzene         17.11  146    20952     1.0320 ug/L #  68
  93) n-Butylbenzene              17.29   91    28323     1.0986 ug/L   100
  94) 1,2-Dichlorobenzene         17.58  146    18938     0.9926 ug/L    98
  95) 1,2-Dibromo-3-Chloropropan  18.50   75     1356     0.9419 ug/L    68
  96) 1,2,4-Trichlorobenzene      19.56  180    13167     0.9600 ug/L    96
  97) Hexachlorobutadiene         19.70  225     4276     0.8222 ug/L    90
  98) Naphthalene                 19.91  128    23752     0.9022 ug/L    99
  99) 1,2,3-Trichlorobenzene      20.20  180    10774     0.8506 ug/L    95



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 (#) = qualifier out of range (m) = manual integration
 11M96664.D  8260_WT.M      Tue Nov 05 17:59:12 2013                          Page 2
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                         Quantitation Report    (Not Reviewed)
  Data File : C:\MSDchem\1\data\110513\11M96664.D          Vial: 4
  Acq On    :  5 Nov 2013  17:37                        Operator: FJB
  Sample    : WG451178-04 1ug/L STD 8260                Inst    : hpms11
  Misc      : 1,1 STD61183                              Multiplr: 1.00
  MS Integration Params: rteint.p
  Quant Time: Nov  5 17:59 2013           Quant Results File: 8260_WT.RES

  Method       : C:\MSDCHEM\1\METHODS\8260_WT.M (RTE Integrator)
  Title        : 8260B/624 (SOP: OVL MSV01) Water 11/05/13 HPMS11
  Last Update  : Wed Oct 23 10:24:39 2013
  Response via : Initial Calibration
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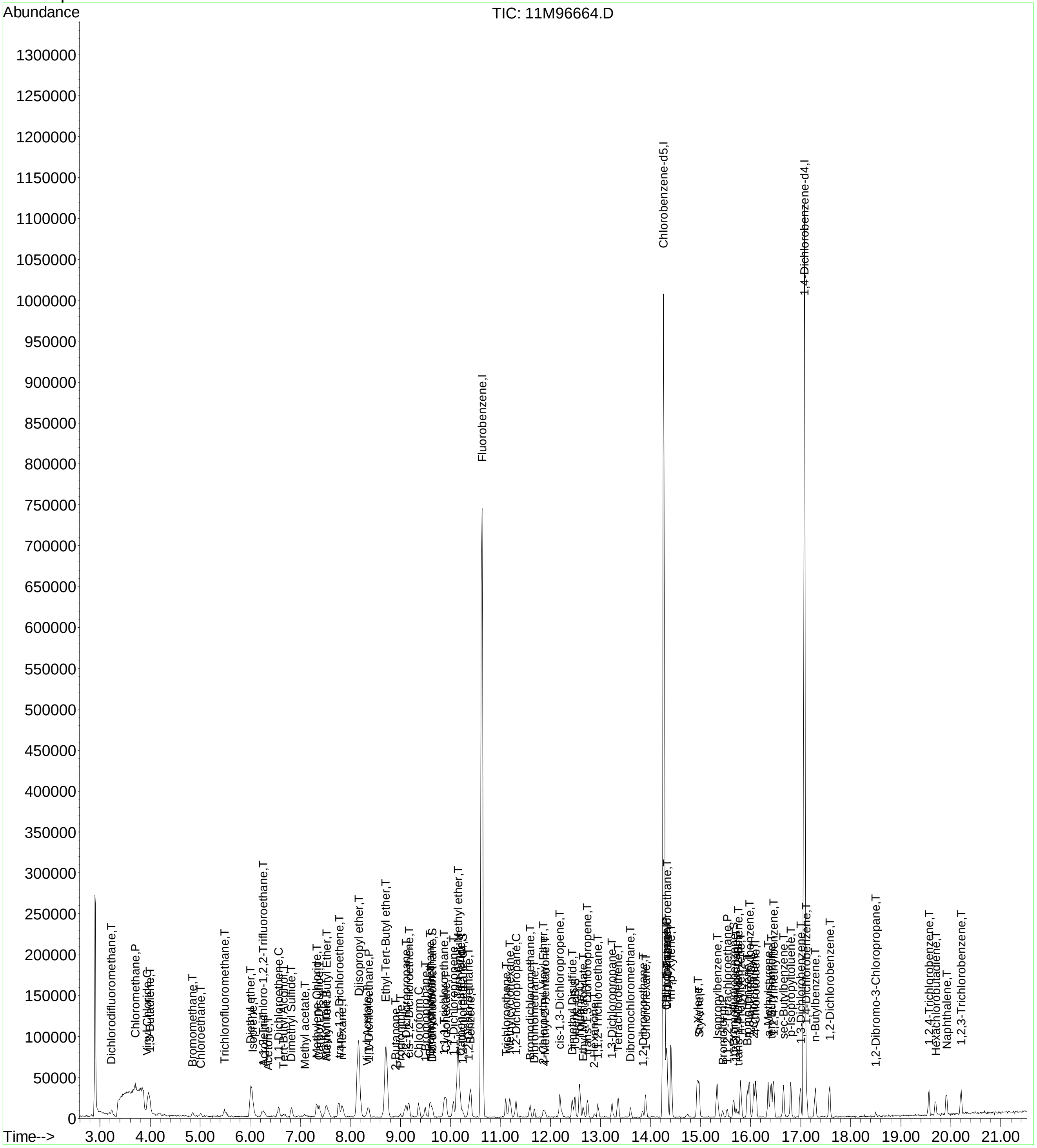

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11M96664.D  8260_WT.M       Tue Nov 05 17:59:13 2013                  Page 3
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                               Quantitation Report    (Not Reviewed)
Data File : C:\MSDchem\1\data\110513\11M96665.D          Vial: 5
Acq On    :  5 Nov 2013  18:22                       Operator: FJB
Sample    : WG451178-05 2ug/L STD 8260               Inst     : hpms11
Misc      : 1,1 STD61183                             Multiplr: 1.00
MS Integration Params: rteint.p
Quant Time: Nov 05 18:44:33 2013           Quant Results File: 8260_WT.RES

Quant Method : C:\MSDCHEM\1\METHODS\8260_WT.M (RTE Integrator)
Title        : 8260B/624 (SOP: OVL MSV01) Water 11/05/13 HPMS11
Last Update  : Wed Oct 23 10:24:39 2013
Response via : Initial Calibration
DataAcq Meth : 8260_WT

 Internal Standards                R.T. QIon  Response  Conc Units Dev(Min)
 -------------------------------------------------------------------------
   1) Fluorobenzene               10.63   96   901580    25.00 ug/L    0.00
  56) Chlorobenzene-d5            14.26  117   711345    25.00 ug/L   -0.01
  76) 1,4-Dichlorobenzene-d4      17.07  152   376475    25.00 ug/L   -0.01

 System Monitoring Compounds
  37) Dibromofluoromethane         9.65  111    13378     1.4467 ug/L  0.00
   Spiked Amount     25.000   Range  86 - 118    Recovery   =    5.80%#
  43) 1,2-Dichloroethane-d4       10.25   65    14545     1.7179 ug/L  0.00
   Spiked Amount     25.000   Range  80 - 120    Recovery   =    6.88%#
  57) Toluene-d8                  12.49   98    45270     1.4206 ug/L  0.00
   Spiked Amount     25.000   Range  88 - 110    Recovery   =    5.68%#
  78) p-Bromofluorobenzene        15.65   95    19645     1.4950 ug/L -0.01
   Spiked Amount     25.000   Range  86 - 115    Recovery   =    5.96%#

 Target Compounds                                                   Qvalue
   2) Dichlorodifluoromethane      3.24   85    17284     2.6778 ug/L    91
   3) Chloromethane                3.70   50    27725     4.9132 ug/L    99
   4) Vinyl Chloride               3.94   62    26255     3.3850 ug/L    97
   5) 1,3-Butadiene                3.99   54    24444     4.8850 ug/L    96
   6) Bromomethane                 4.85   94    11327     2.9292 ug/L    95
   7) Chloroethane                 5.01   64    15044     2.7172 ug/L   100
   8) Trichlorofluoromethane       5.48  101    34424     2.7731 ug/L    97
   9) Diethyl ether                6.01   59   172250    29.2072 ug/L    92
  10) Isoprene                     6.05   67    28707     2.4212 ug/L    82
  11) Acrolein                     6.25   56     1463    10.0317 ug/L    98
  12) 1,1,2-Trichloro-1,2,2-Trif   6.27  101    21141     2.7008 ug/L    85
  13) Acetone                      6.35   43     6235     3.5523 ug/L #  77
  14) 1,1-Dichloroethene           6.58   61    35667     3.1126 ug/L    97
  15) Tert-Butyl Alcohol           6.66   59    31690    57.3517 ug/L    96
  16) Dimethyl Sulfide             6.82   62    19355     2.3920 ug/L    91
  17) Iodomethane                  7.08  142      795     2.5690 ug/L #  26
  18) Methyl acetate               7.08   43    13224     2.9921 ug/L #  89
  19) Methylene Chloride           7.33   84    22204     2.2254 ug/L    93
  20) Carbon Disulfide             7.38   76    65672     2.4419 ug/L    95
  21) Acrylonitrile                7.51   53    29226    12.8227 ug/L    99
  22) Methyl Tert Butyl Ether      7.54   73    50259     2.3365 ug/L    97
  23) trans-1,2-Dichloroethene     7.77   96    21800     2.4749 ug/L    91
  24) n-Hexane                     7.85   57    28167     3.1557 ug/L   100
  25) Diisopropyl ether            8.16   45   862941    34.3459 ug/L    98
  26) Vinyl Acetate                8.33   43    23428     2.0004 ug/L    97
  27) 1,1-Dichloroethane           8.36   63    40444     2.8183 ug/L    98
  28) Ethyl-Tert-Butyl ether       8.71   59   767663    32.8442 ug/L    97
  29) 2-Butanone                   8.89   43     7012     2.7310 ug/L #  79
  30) Propionitrile                9.00   54    19375    24.3415 ug/L    94
  31) 2,2-Dichloropropane          9.11   77    38268     3.0536 ug/L    99
  32) cis-1,2-Dichloroethene       9.17   96    23233     2.3774 ug/L    99
  33) Chloroform                   9.37   83    40862     2.7216 ug/L    96
  34) 1-Bromopropane               9.50  122     4384     2.2647 ug/L    88
  35) Bromochloromethane           9.59  130    13455     2.2920 ug/L    99
  36) Tetrahydrofuran              9.61   42    40665    24.4966 ug/L    93
  38) 1,1,1-Trichloroethane        9.87   97    36551     2.7343 ug/L    95
  39) Cyclohexane                  9.91   56    38137     3.1138 ug/L    99
  40) 1,1-Dichloropropene         10.06   75    30359     2.6552 ug/L    96
  41) Carbon Tetrachloride        10.21  117    32535     2.6003 ug/L    97
  42) Tert-Amyl-Methyl ether      10.15   73   620284    27.0322 ug/L    92
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 (#) = qualifier out of range (m) = manual integration
 11M96665.D  8260_WT.M      Tue Nov 05 18:44:34 2013                               Page 1
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                              Quantitation Report    (Not Reviewed)

     Data File : C:\MSDchem\1\data\110513\11M96665.D          Vial: 5
     Acq On    :  5 Nov 2013  18:22                         Operator: FJB
     Sample    : WG451178-05 2ug/L STD 8260                 Inst    : hpms11
     Misc      : 1,1 STD61183                               Multiplr: 1.00
     MS Integration Params: rteint.p
     Quant Time: Nov 05 18:44:33 2013          Quant Results File: 8260_WT.RES

     Quant Method : C:\MSDCHEM\1\METHODS\8260_WT.M (RTE Integrator)
     Title        : 8260B/624 (SOP: OVL MSV01) Water 11/05/13 HPMS11
     Last Update  : Wed Oct 23 10:24:39 2013
     Response via : Initial Calibration
     DataAcq Meth : 8260_WT


           Compound                     R.T. QIon  Response  Conc Unit   Qvalue
      -------------------------------------------------------------------------
       44) 1,2-Dichloroethane          10.36   62    28940     2.7993 ug/L    98
       45) Benzene                     10.40   78    87018     2.5936 ug/L   100
       46) Trichloroethene             11.10  130    22821     2.3548 ug/L    98
       47) Methylcyclohexane           11.19   83    32334     2.6362 ug/L    94
       48) 1,2-Dichloropropane         11.30   63    21037     2.5147 ug/L    87
       49) 1,4-Dioxane                 11.56   88     2496    31.5644 ug/L    83
       50) Bromodichloromethane        11.59   83    29362     2.6056 ug/L    99
       51) Dibromomethane              11.67   93    11477     2.2379 ug/L    90
       52) 2-Chloroethyl Vinyl Ether   11.86   63     9343     2.2167 ug/L    99
       53) 4-Methyl-2-Pentanone        11.89   58     4948     2.1747 ug/L    88
       54) cis-1,3-Dichloropropene     12.18   75    35192     2.5293 ug/L    96
       55) Dimethyl Disulfide          12.44   79    17940     2.1554 ug/L    95
       58) Toluene                     12.58   91    89629     2.5034 ug/L    99
       59) Ethyl Methacrylate          12.66   69    17994     2.0377 ug/L    98
       60) trans-1,3-Dichloropropene   12.74   75    28369     2.2490 ug/L    94
       61) 1,1,2-Trichloroethane       12.95   97    14956     2.0670 ug/L    97
       62) 2-Hexanone                  12.88   43     8807     2.3220 ug/L #  76
       63) 1,3-Dichloropropane         13.23   76    27035     2.1819 ug/L    97
       64) Tetrachloroethene           13.36  164    18648     2.2016 ug/L    99
       65) Dibromochloromethane        13.61  129    18791     2.0361 ug/L   100
       66) 1,2-Dibromoethane           13.84  107    14721     2.0147 ug/L    97
       67) 1-Chlorohexane              13.91   91    28349     2.4133 ug/L    91
       68) Chlorobenzene               14.31  112    62012     2.3878 ug/L    96
       69) 1,1,1,2-Tetrachloroethane   14.33  131    22092     2.1921 ug/L    98
       70) Ethylbenzene                14.33  106    33714     2.5715 ug/L    99
       71) m-,p-Xylene                 14.41  106    79332     5.1719 ug/L    94
       72) o-Xylene                    14.94  106    38746     2.4766 ug/L    90
       73) Styrene                     14.97  104    61121     2.3864 ug/L    94
       74) Bromoform                   15.44  173    10486     1.7643 ug/L    98
       75) Isopropylbenzene            15.33  105    94817     2.6218 ug/L    97
       77) 1,1,2,2-Tetrachloroethane   15.53   83    16502     1.9252 ug/L    95
       79) 1,2,3-Trichloropropane      15.71  110     5471     2.1411 ug/L #  55
       80) trans-1,4-Dichloro-2-Buten  15.75   53     4349     2.0749 ug/L #   1
       81) n-Propylbenzene             15.80   91   115582     2.7044 ug/L    99
       82) Bromobenzene                15.93  156    23592     2.0066 ug/L #  45
       83) 1,3,5-Trimethylbenzene      15.97  105    80300     2.6436 ug/L    92
       84) 2-Chlorotoluene             16.06   91    72449     2.3303 ug/L    91
       85) 4-Chlorotoluene             16.10   91    74013     2.8408 ug/L    91
       86) a-Methylstyrene             16.35  118    39384     2.2270 ug/L    91
       87) tert-Butylbenzene           16.41  134    17223     2.4372 ug/L    79
       88) 1,2,4-Trimethylbenzene      16.46  105    82068     2.6366 ug/L    97
       89) sec-Butylbenzene            16.66  105    96593     2.7629 ug/L    98
       90) p-Isopropyltoluene          16.80  119    77353     2.5175 ug/L    96
       91) 1,3-Dichlorobenzene         17.00  146    46629     2.2535 ug/L   100
       92) 1,4-Dichlorobenzene         17.11  146    46755     2.1838 ug/L    83
       93) n-Butylbenzene              17.29   91    70083     2.5778 ug/L    99
       94) 1,2-Dichlorobenzene         17.58  146    41997     2.0874 ug/L    99
       95) 1,2-Dibromo-3-Chloropropan  18.50   75     2906     1.9140 ug/L    96
       96) 1,2,4-Trichlorobenzene      19.56  180    29129     2.0139 ug/L    99
       97) Hexachlorobutadiene         19.70  225    12068     2.2005 ug/L    92
       98) Naphthalene                 19.91  128    52856     1.9038 ug/L    99
       99) 1,2,3-Trichlorobenzene      20.20  180    24365     1.8240 ug/L    99


      -------------------------------------------------------------------------
      (#) = qualifier out of range (m) = manual integration
      11M96665.D  8260_WT.M      Tue Nov 05 18:44:34 2013                              Page 2
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                        Quantitation Report    (Not Reviewed)

Data File : C:\MSDchem\1\data\110513\11M96665.D          Vial: 5
Acq On    :  5 Nov 2013  18:22                       Operator: FJB
Sample    : WG451178-05 2ug/L STD 8260               Inst    : hpms11
Misc      : 1,1 STD61183                             Multiplr: 1.00
MS Integration Params: rteint.p
Quant Time: Nov  5 18:44 2013           Quant Results File: 8260_WT.RES

Method       : C:\MSDCHEM\1\METHODS\8260_WT.M (RTE Integrator)
Title        : 8260B/624 (SOP: OVL MSV01) Water 11/05/13 HPMS11
Last Update  : Wed Oct 23 10:24:39 2013
Response via : Initial Calibration
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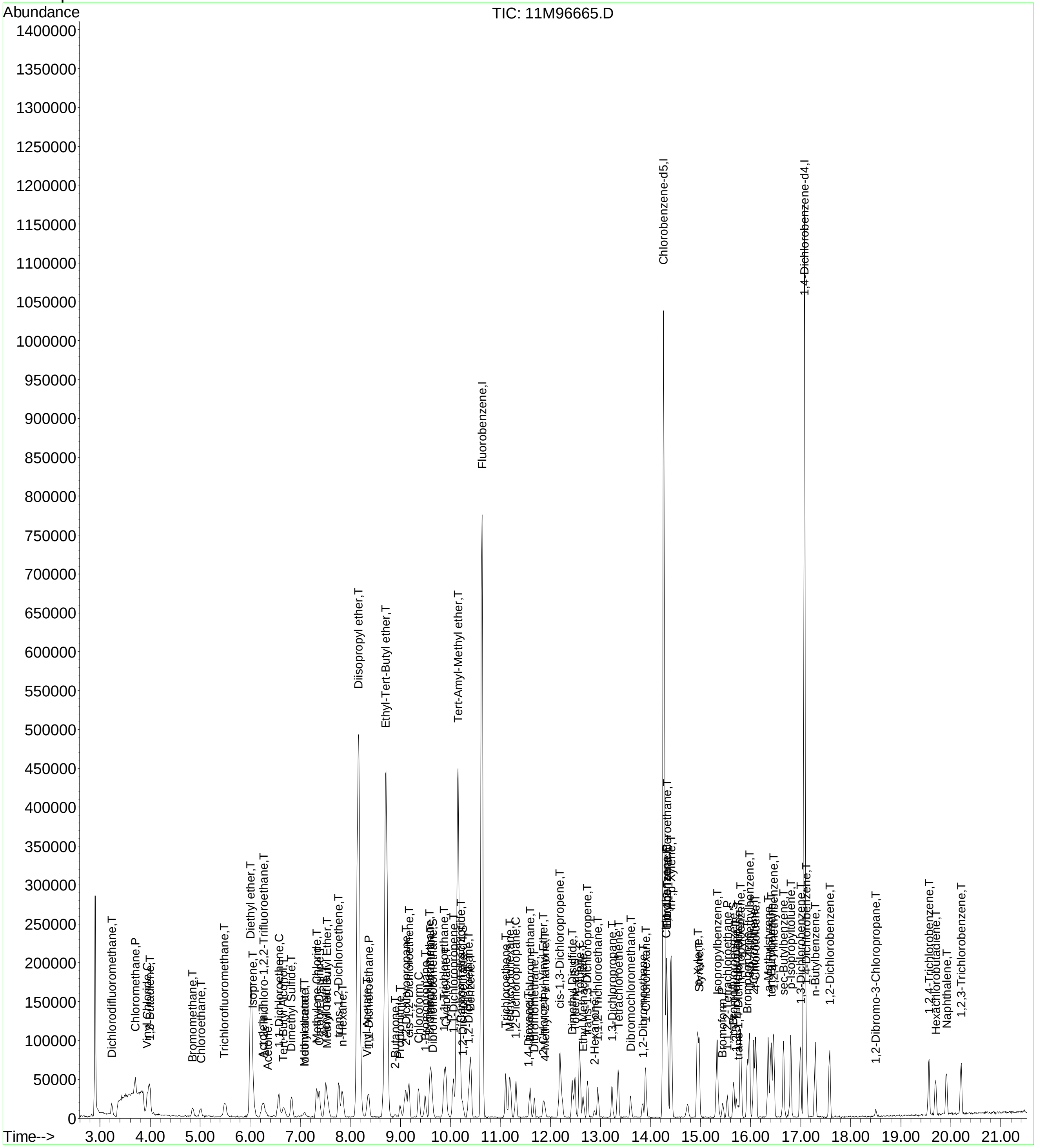

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11M96665.D  8260_WT.M       Tue Nov 05 18:44:34 2013                     Page 3
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                               Quantitation Report    (Not Reviewed)
Data File : C:\MSDchem\1\data\110513\11M96666.D          Vial: 6
Acq On    :  5 Nov 2013  18:54                       Operator: FJB
Sample    : WG451178-06 5ug/L STD 8260               Inst    : hpms11
Misc      : 1,1 STD61183                             Multiplr: 1.00
MS Integration Params: rteint.p
Quant Time: Nov 05 19:15:53 2013           Quant Results File: 8260_WT.RES

Quant Method : C:\MSDCHEM\1\METHODS\8260_WT.M (RTE Integrator)
Title        : 8260B/624 (SOP: OVL MSV01) Water 11/05/13 HPMS11
Last Update  : Wed Oct 23 10:24:39 2013
Response via : Initial Calibration
DataAcq Meth : 8260_WT

 Internal Standards                R.T. QIon  Response  Conc Units Dev(Min)
 -------------------------------------------------------------------------
   1) Fluorobenzene               10.63   96   878017    25.00 ug/L    0.00
  56) Chlorobenzene-d5            14.26  117   690625    25.00 ug/L   -0.01
  76) 1,4-Dichlorobenzene-d4      17.07  152   368283    25.00 ug/L   -0.01

 System Monitoring Compounds
  37) Dibromofluoromethane         9.64  111    24366     2.7057 ug/L -0.01
   Spiked Amount     25.000   Range  86 - 118    Recovery   =   10.84%#
  43) 1,2-Dichloroethane-d4       10.25   65    27748     3.3653 ug/L  0.00
   Spiked Amount     25.000   Range  80 - 120    Recovery   =   13.48%#
  57) Toluene-d8                  12.49   98    83340     2.6938 ug/L  0.00
   Spiked Amount     25.000   Range  88 - 110    Recovery   =   10.76%#
  78) p-Bromofluorobenzene        15.65   95    36300     2.8239 ug/L -0.01
   Spiked Amount     25.000   Range  86 - 115    Recovery   =   11.28%#

 Target Compounds                                                   Qvalue
   2) Dichlorodifluoromethane      3.24   85    37399     5.9498 ug/L    99
   3) Chloromethane                3.70   50    53518     9.7385 ug/L    99
   4) Vinyl Chloride               3.94   62    53508     7.0837 ug/L    95
   5) 1,3-Butadiene                3.98   54    50506    10.3643 ug/L    97
   6) Bromomethane                 4.85   94    22756     6.0427 ug/L    97
   7) Chloroethane                 5.01   64    32399     6.0089 ug/L    99
   8) Trichlorofluoromethane       5.49  101    75121     6.2140 ug/L   100
   9) Diethyl ether                6.01   59   319942    55.7061 ug/L    93
  10) Isoprene                     6.05   67    60753     5.2615 ug/L    82
  11) Acrolein                     6.26   56     3426    17.1428 ug/L    91
  12) 1,1,2-Trichloro-1,2,2-Trif   6.26  101    43992     5.7709 ug/L    89
  13) Acetone                      6.35   43    12446     7.2812 ug/L    94
  14) 1,1-Dichloroethene           6.57   61    75512     6.7666 ug/L    96
  15) Tert-Butyl Alcohol           6.67   59    59569   110.6996 ug/L    97
  16) Dimethyl Sulfide             6.82   62    44068     5.5923 ug/L    80
  17) Iodomethane                  7.09  142     3461     2.8691 ug/L    84
  18) Methyl acetate               7.08   43    30520     7.0909 ug/L    96
  19) Methylene Chloride           7.33   84    46204     4.8559 ug/L    89
  20) Carbon Disulfide             7.38   76   138008     5.2693 ug/L    98
  21) Acrylonitrile                7.51   53    54685    24.6366 ug/L    97
  22) Methyl Tert Butyl Ether      7.53   73   116405     5.5568 ug/L    98
  23) trans-1,2-Dichloroethene     7.77   96    47791     5.5712 ug/L    89
  24) n-Hexane                     7.84   57    58034     6.6763 ug/L    98
  25) Diisopropyl ether            8.16   45  1524483    62.3043 ug/L    97
  26) Vinyl Acetate                8.32   43    55082     4.8294 ug/L    97
  27) 1,1-Dichloroethane           8.36   63    87006     6.2257 ug/L    98
  28) Ethyl-Tert-Butyl ether       8.72   59  1417356    62.2685 ug/L    98
  29) 2-Butanone                   8.89   43    14250     5.6989 ug/L    95
  30) Propionitrile                9.00   54    37301    48.1202 ug/L    97
  31) 2,2-Dichloropropane          9.11   77    82145     6.7308 ug/L   100
  32) cis-1,2-Dichloroethene       9.17   96    52949     5.5636 ug/L    93
  33) Chloroform                   9.37   83    85083     5.8190 ug/L   100
  34) 1-Bromopropane               9.50  122     8466     4.4112 ug/L    95
  35) Bromochloromethane           9.60  130    29118     5.0933 ug/L    95
  36) Tetrahydrofuran              9.61   42    81899    50.6600 ug/L    93
  38) 1,1,1-Trichloroethane        9.87   97    77637     5.9638 ug/L    91
  39) Cyclohexane                  9.91   56    80459     6.7456 ug/L    95
  40) 1,1-Dichloropropene         10.06   75    67741     6.0836 ug/L    99
  41) Carbon Tetrachloride        10.21  117    72040     5.9123 ug/L    98
  42) Tert-Amyl-Methyl ether      10.15   73  1167666    52.2530 ug/L    92
 -------------------------------------------------------------------------
 (#) = qualifier out of range (m) = manual integration
 11M96666.D  8260_WT.M      Tue Nov 05 19:15:54 2013                                  Page 1
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                         Quantitation Report    (Not Reviewed)

   Data File : C:\MSDchem\1\data\110513\11M96666.D         Vial: 6
   Acq On    :  5 Nov 2013  18:54                        Operator: FJB
   Sample    : WG451178-06 5ug/L STD 8260                Inst    : hpms11
   Misc      : 1,1 STD61183                              Multiplr: 1.00
   MS Integration Params: rteint.p
   Quant Time: Nov 05 19:15:53 2013          Quant Results File: 8260_WT.RES

   Quant Method : C:\MSDCHEM\1\METHODS\8260_WT.M (RTE Integrator)
   Title        : 8260B/624 (SOP: OVL MSV01) Water 11/05/13 HPMS11
   Last Update  : Wed Oct 23 10:24:39 2013
   Response via : Initial Calibration
   DataAcq Meth : 8260_WT


         Compound                     R.T. QIon  Response  Conc Unit   Qvalue
    -------------------------------------------------------------------------
     44) 1,2-Dichloroethane          10.36   62    64644     6.4206 ug/L    96
     45) Benzene                     10.40   78   183719     5.6228 ug/L    99
     46) Trichloroethene             11.10  130    49339     5.2278 ug/L    99
     47) Methylcyclohexane           11.19   83    67185     5.6245 ug/L    92
     48) 1,2-Dichloropropane         11.31   63    46822     5.7472 ug/L    87
     49) 1,4-Dioxane                 11.57   88     5230    67.9134 ug/L    92
     50) Bromodichloromethane        11.59   83    65784     5.9944 ug/L    99
     51) Dibromomethane              11.67   93    26777     5.3614 ug/L    90
     52) 2-Chloroethyl Vinyl Ether   11.86   63    22206     5.4100 ug/L   100
     53) 4-Methyl-2-Pentanone        11.89   58    11091     5.0055 ug/L    98
     54) cis-1,3-Dichloropropene     12.18   75    77267     5.7023 ug/L   100
     55) Dimethyl Disulfide          12.44   79    40021     4.9373 ug/L    90
     58) Toluene                     12.58   91   194308     5.5899 ug/L    98
     59) Ethyl Methacrylate          12.66   69    46348     4.9101 ug/L    87
     60) trans-1,3-Dichloropropene   12.74   75    66205     5.4059 ug/L    96
     61) 1,1,2-Trichloroethane       12.95   97    34374     4.8931 ug/L    95
     62) 2-Hexanone                  12.87   43    21160     5.7464 ug/L    82
     63) 1,3-Dichloropropane         13.23   76    62363     5.1841 ug/L    98
     64) Tetrachloroethene           13.35  164    38559     4.6889 ug/L   100
     65) Dibromochloromethane        13.60  129    42680     4.7633 ug/L    99
     66) 1,2-Dibromoethane           13.84  107    33982     4.7904 ug/L    95
     67) 1-Chlorohexane              13.91   91    62414     5.4725 ug/L    83
     68) Chlorobenzene               14.31  112   132858     5.2691 ug/L    98
     69) 1,1,1,2-Tetrachloroethane   14.33  131    47261     4.8301 ug/L    99
     70) Ethylbenzene                14.33  106    70889     5.5693 ug/L    97
     71) m-,p-Xylene                 14.41  106   172457    11.5804 ug/L    92
     72) o-Xylene                    14.93  106    86231     5.6772 ug/L    88
     73) Styrene                     14.97  104   139208     5.5984 ug/L    92
     74) Bromoform                   15.45  173    25532     3.9303 ug/L    97
     75) Isopropylbenzene            15.32  105   208470     5.9374 ug/L    97
     77) 1,1,2,2-Tetrachloroethane   15.53   83    41392     4.9364 ug/L   100
     79) 1,2,3-Trichloropropane      15.71  110    11609     4.6442 ug/L #  41
     80) trans-1,4-Dichloro-2-Buten  15.75   53    11380     5.0480 ug/L #   1
     81) n-Propylbenzene             15.80   91   245769     5.8785 ug/L    99
     82) Bromobenzene                15.93  156    53302     4.6344 ug/L    55
     83) 1,3,5-Trimethylbenzene      15.97  105   178019     5.9909 ug/L    97
     84) 2-Chlorotoluene             16.06   91   157690     5.1848 ug/L    92
     85) 4-Chlorotoluene             16.10   91   157986     6.1988 ug/L    87
     86) a-Methylstyrene             16.35  118    92225     5.3310 ug/L    90
     87) tert-Butylbenzene           16.40  134    37048     5.3592 ug/L    81
     88) 1,2,4-Trimethylbenzene      16.45  105   176786     5.8060 ug/L    95
     89) sec-Butylbenzene            16.66  105   204471     5.9788 ug/L   100
     90) p-Isopropyltoluene          16.80  119   174143     5.7936 ug/L    97
     91) 1,3-Dichlorobenzene         17.00  146   101351     5.0071 ug/L    98
     92) 1,4-Dichlorobenzene         17.11  146   102181     4.8789 ug/L    92
     93) n-Butylbenzene              17.29   91   151486     5.6960 ug/L    99
     94) 1,2-Dichlorobenzene         17.58  146    95142     4.8340 ug/L   100
     95) 1,2-Dibromo-3-Chloropropan  18.50   75     7138     4.8060 ug/L   100
     96) 1,2,4-Trichlorobenzene      19.56  180    63866     4.5137 ug/L    96
     97) Hexachlorobutadiene         19.70  225    22632     4.2185 ug/L    92
     98) Naphthalene                 19.91  128   129022     4.7505 ug/L #  96
     99) 1,2,3-Trichlorobenzene      20.20  180    57432     4.3952 ug/L    98


    -------------------------------------------------------------------------
    (#) = qualifier out of range (m) = manual integration
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                        Quantitation Report    (Not Reviewed)

  Data File : C:\MSDchem\1\data\110513\11M96666.D         Vial: 6
  Acq On    :  5 Nov 2013  18:54                       Operator: FJB
  Sample    : WG451178-06 5ug/L STD 8260               Inst    : hpms11
  Misc      : 1,1 STD61183                             Multiplr: 1.00
  MS Integration Params: rteint.p
  Quant Time: Nov  5 19:15 2013           Quant Results File: 8260_WT.RES

  Method       : C:\MSDCHEM\1\METHODS\8260_WT.M (RTE Integrator)
  Title        : 8260B/624 (SOP: OVL MSV01) Water 11/05/13 HPMS11
  Last Update  : Wed Oct 23 10:24:39 2013
  Response via : Initial Calibration
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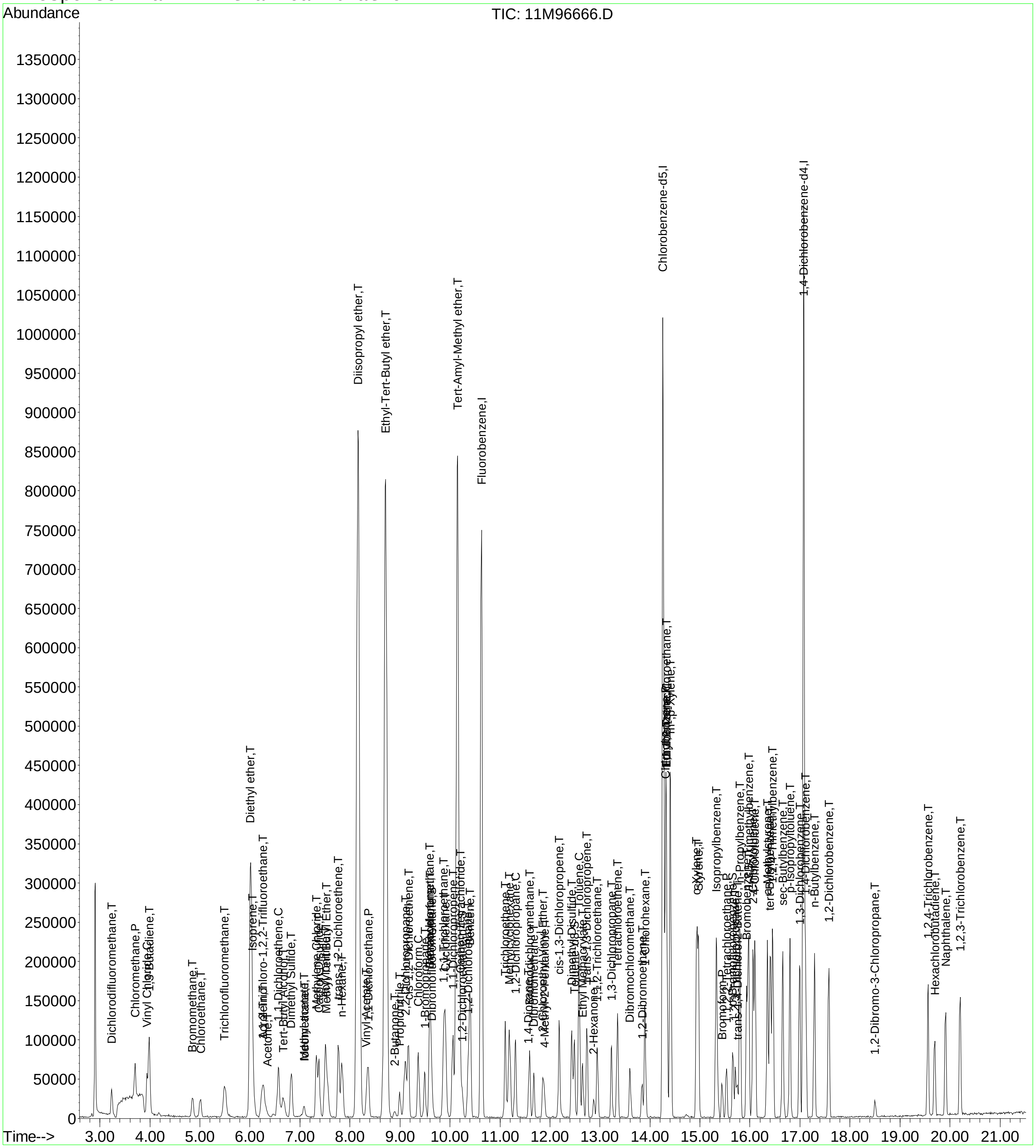

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11M96666.D  8260_WT.M       Tue Nov 05 19:15:54 2013                    Page 3
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                              Quantitation Report    (Not Reviewed)

Data File : C:\MSDchem\1\data\110513\11M96667.D          Vial: 7
Acq On    :  5 Nov 2013  19:34                       Operator: FJB
Sample    : WG451178-07 20ug/L STD 8260              Inst    : hpms11
Misc      : 1,1 STD61183                             Multiplr: 1.00
MS Integration Params: rteint.p
Quant Time: Nov 05 19:55:59 2013          Quant Results File: 8260_WT.RES

Quant Method : C:\MSDCHEM\1\METHODS\8260_WT.M (RTE Integrator)
Title        : 8260B/624 (SOP: OVL MSV01) Water 11/05/13 HPMS11
Last Update  : Wed Oct 23 10:24:39 2013
Response via : Initial Calibration
DataAcq Meth : 8260_WT

 Internal Standards                R.T. QIon  Response  Conc Units Dev(Min)
------------------------------------------------------------------------
   1) Fluorobenzene               10.63   96   884471    25.00 ug/L    0.00
  56) Chlorobenzene-d5            14.26  117   697676    25.00 ug/L   -0.01
  76) 1,4-Dichlorobenzene-d4      17.07  152   367950    25.00 ug/L   -0.01

 System Monitoring Compounds
  37) Dibromofluoromethane         9.64  111   102424    11.2904 ug/L -0.01
   Spiked Amount     25.000   Range  86 - 118    Recovery   =   45.16%#
  43) 1,2-Dichloroethane-d4       10.25   65   115545    13.9111 ug/L  0.00
   Spiked Amount     25.000   Range  80 - 120    Recovery   =   55.64%#
  57) Toluene-d8                  12.49   98   353911    11.3238 ug/L  0.00
   Spiked Amount     25.000   Range  88 - 110    Recovery   =   45.28%#
  78) p-Bromofluorobenzene        15.65   95   147150    11.4576 ug/L -0.01
   Spiked Amount     25.000   Range  86 - 115    Recovery   =   45.84%#

 Target Compounds                                                  Qvalue
   2) Dichlorodifluoromethane      3.24   85   190865    30.1430 ug/L    98
   3) Chloromethane                3.70   50   252456    45.6033 ug/L    99
   4) Vinyl Chloride               3.94   62   249561    32.7973 ug/L    98
   5) 1,3-Butadiene                3.99   54   189971    38.6992 ug/L    97
   6) Bromomethane                 4.85   94    92554    24.3977 ug/L   100
   7) Chloroethane                 5.00   64   138316    25.4657 ug/L    99
   8) Trichlorofluoromethane       5.49  101   332052    27.2667 ug/L    98
   9) Diethyl ether                6.01   59   526680    91.0327 ug/L    93
  10) Isoprene                     6.06   67   271169    23.3134 ug/L    84
  11) Acrolein                     6.25   56     4681    21.4809 ug/L    77
  12) 1,1,2-Trichloro-1,2,2-Trif   6.27  101   191466    24.9333 ug/L    90
  13) Acetone                      6.34   43    34564    20.0733 ug/L    91
  14) 1,1-Dichloroethene           6.57   61   327808    29.1604 ug/L    95
  15) Tert-Butyl Alcohol           6.67   59    93841   173.1162 ug/L    98
  16) Dimethyl Sulfide             6.82   62   187984    23.6813 ug/L    85
  17) Iodomethane                  7.08  142    89257    12.3787 ug/L    91
  18) Methyl acetate               7.08   43   110210    25.4190 ug/L    97
  19) Methylene Chloride           7.33   84   195000    20.7066 ug/L    88
  20) Carbon Disulfide             7.38   76   617503    23.4050 ug/L    99
  21) Acrylonitrile                7.50   53    94733    42.3675 ug/L    98
  22) Methyl Tert Butyl Ether      7.54   73   468781    22.2150 ug/L    99
  23) trans-1,2-Dichloroethene     7.77   96   203574    23.5582 ug/L    89
  24) n-Hexane                     7.84   57   257418    29.3977 ug/L    97
  25) Diisopropyl ether            8.17   45  2551927   103.5339 ug/L    98
  26) Vinyl Acetate                8.32   43   254221    22.1266 ug/L    98
  27) 1,1-Dichloroethane           8.36   63   372378    26.4511 ug/L    97
  28) Ethyl-Tert-Butyl ether       8.72   59  2315735   100.9945 ug/L    97
  29) 2-Butanone                   8.89   43    51326    20.3767 ug/L    90
  30) Propionitrile                9.00   54    63262    81.0158 ug/L    97
  31) 2,2-Dichloropropane          9.10   77   350243    28.4887 ug/L   100
  32) cis-1,2-Dichloroethene       9.17   96   219500    22.8955 ug/L    97
  33) Chloroform                   9.37   83   365518    24.8163 ug/L    99
  34) 1-Bromopropane               9.50  122    40118    20.4516 ug/L    97
  35) Bromochloromethane           9.59  130   126167    21.9079 ug/L    99
  36) Tetrahydrofuran              9.61   42   129529    79.5378 ug/L    92
  38) 1,1,1-Trichloroethane        9.87   97   336788    25.6820 ug/L    92
  39) Cyclohexane                  9.91   56   344004    28.6305 ug/L    94
  40) 1,1-Dichloropropene         10.06   75   287384    25.6205 ug/L    99
  41) Carbon Tetrachloride        10.20  117   309376    25.2050 ug/L    96
  42) Tert-Amyl-Methyl ether      10.15   73  1903474    84.5587 ug/L    92
------------------------------------------------------------------------
 (#) = qualifier out of range (m) = manual integration
 11M96667.D  8260_WT.M      Tue Nov 05 19:56:00 2013                     Page 1
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                              Quantitation Report    (Not Reviewed)

Data File : C:\MSDchem\1\data\110513\11M96667.D          Vial: 7
Acq On    :  5 Nov 2013  19:34                       Operator: FJB
Sample    : WG451178-07 20ug/L STD 8260              Inst    : hpms11
Misc      : 1,1 STD61183                             Multiplr: 1.00
MS Integration Params: rteint.p
Quant Time: Nov 05 19:55:59 2013          Quant Results File: 8260_WT.RES

Quant Method : C:\MSDCHEM\1\METHODS\8260_WT.M (RTE Integrator)
Title        : 8260B/624 (SOP: OVL MSV01) Water 11/05/13 HPMS11
Last Update  : Wed Oct 23 10:24:39 2013
Response via : Initial Calibration
DataAcq Meth : 8260_WT


      Compound                     R.T. QIon  Response  Conc Unit   Qvalue
 -------------------------------------------------------------------------
  44) 1,2-Dichloroethane          10.36   62   270808    26.7009 ug/L    97
  45) Benzene                     10.40   78   782267    23.7671 ug/L    98
  46) Trichloroethene             11.10  130   212554    22.3571 ug/L    98
  47) Methylcyclohexane           11.19   83   306327    25.4577 ug/L    89
  48) 1,2-Dichloropropane         11.31   63   201732    24.5812 ug/L    87
  49) 1,4-Dioxane                 11.57   88     9441   121.7001 ug/L    90
  50) Bromodichloromethane        11.59   83   279691    25.3000 ug/L    99
  51) Dibromomethane              11.67   93   109310    21.7267 ug/L    90
  52) 2-Chloroethyl Vinyl Ether   11.86   63    94091    22.7561 ug/L   100
  53) 4-Methyl-2-Pentanone        11.89   58    45226    20.2623 ug/L    98
  54) cis-1,3-Dichloropropene     12.18   75   328997    24.1028 ug/L    99
  55) Dimethyl Disulfide          12.44   79   178807    21.8983 ug/L    89
  58) Toluene                     12.58   91   818982    23.3228 ug/L    99
  59) Ethyl Methacrylate          12.66   69   187570    18.7686 ug/L    90
  60) trans-1,3-Dichloropropene   12.74   75   286459    23.1543 ug/L    96
  61) 1,1,2-Trichloroethane       12.95   97   142197    20.0371 ug/L    96
  62) 2-Hexanone                  12.87   43    80077    21.5265 ug/L    85
  63) 1,3-Dichloropropane         13.23   76   257547    21.1930 ug/L    93
  64) Tetrachloroethene           13.35  164   166385    20.0285 ug/L   100
  65) Dibromochloromethane        13.61  129   188027    20.7726 ug/L    99
  66) 1,2-Dibromoethane           13.84  107   144931    20.2242 ug/L    99
  67) 1-Chlorohexane              13.91   91   275875    23.9446 ug/L    84
  68) Chlorobenzene               14.31  112   556332    21.8411 ug/L    99
  69) 1,1,1,2-Tetrachloroethane   14.33  131   202232    20.4594 ug/L    99
  70) Ethylbenzene                14.33  106   303846    23.6299 ug/L    95
  71) m-,p-Xylene                 14.41  106   730068    48.5283 ug/L    93
  72) o-Xylene                    14.94  106   364361    23.7459 ug/L    88
  73) Styrene                     14.97  104   598126    23.8111 ug/L    91
  74) Bromoform                   15.45  173   108223    15.4432 ug/L    98
  75) Isopropylbenzene            15.32  105   882051    24.8675 ug/L    96
  77) 1,1,2,2-Tetrachloroethane   15.53   83   166753    19.9049 ug/L    97
  79) 1,2,3-Trichloropropane      15.72  110    47587    19.0546 ug/L #  41
  80) trans-1,4-Dichloro-2-Buten  15.75   53    54545    23.0788 ug/L #   1
  81) n-Propylbenzene             15.80   91  1067400    25.5539 ug/L    99
  82) Bromobenzene                15.93  156   223367    19.4384 ug/L #  51
  83) 1,3,5-Trimethylbenzene      15.97  105   752621    25.3511 ug/L    93
  84) 2-Chlorotoluene             16.06   91   655090    21.5585 ug/L    92
  85) 4-Chlorotoluene             16.10   91   690414    27.1140 ug/L    99
  86) a-Methylstyrene             16.35  118   409058    23.6665 ug/L    90
  87) tert-Butylbenzene           16.41  134   153596    22.2387 ug/L    85
  88) 1,2,4-Trimethylbenzene      16.46  105   767991    25.2451 ug/L    95
  89) sec-Butylbenzene            16.66  105   875476    25.6223 ug/L   100
  90) p-Isopropyltoluene          16.80  119   752485    25.0571 ug/L    97
  91) 1,3-Dichlorobenzene         17.00  146   427720    21.1499 ug/L    99
  92) 1,4-Dichlorobenzene         17.11  146   433293    20.7073 ug/L    98
  93) n-Butylbenzene              17.29   91   668001    25.1401 ug/L    99
  94) 1,2-Dichlorobenzene         17.58  146   396086    20.1428 ug/L    99
  95) 1,2-Dibromo-3-Chloropropan  18.50   75    29476    19.8639 ug/L    94
  96) 1,2,4-Trichlorobenzene      19.56  180   271364    19.1957 ug/L    99
  97) Hexachlorobutadiene         19.70  225   104778    19.5479 ug/L    97
  98) Naphthalene                 19.91  128   524923    19.3447 ug/L    98
  99) 1,2,3-Trichlorobenzene      20.20  180   239253    18.3263 ug/L    99


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 (#) = qualifier out of range (m) = manual integration
 11M96667.D  8260_WT.M      Tue Nov 05 19:56:00 2013                           Page 2
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                              Quantitation Report    (Not Reviewed)
  Data File : C:\MSDchem\1\data\110513\11M96667.D         Vial: 7
  Acq On    :  5 Nov 2013  19:34                      Operator: FJB
  Sample    : WG451178-07 20ug/L STD 8260             Inst    : hpms11
  Misc      : 1,1 STD61183                            Multiplr: 1.00
  MS Integration Params: rteint.p
  Quant Time: Nov  5 19:55 2013           Quant Results File: 8260_WT.RES

  Method       : C:\MSDCHEM\1\METHODS\8260_WT.M (RTE Integrator)
  Title        : 8260B/624 (SOP: OVL MSV01) Water 11/05/13 HPMS11
  Last Update  : Wed Oct 23 10:24:39 2013
  Response via : Initial Calibration
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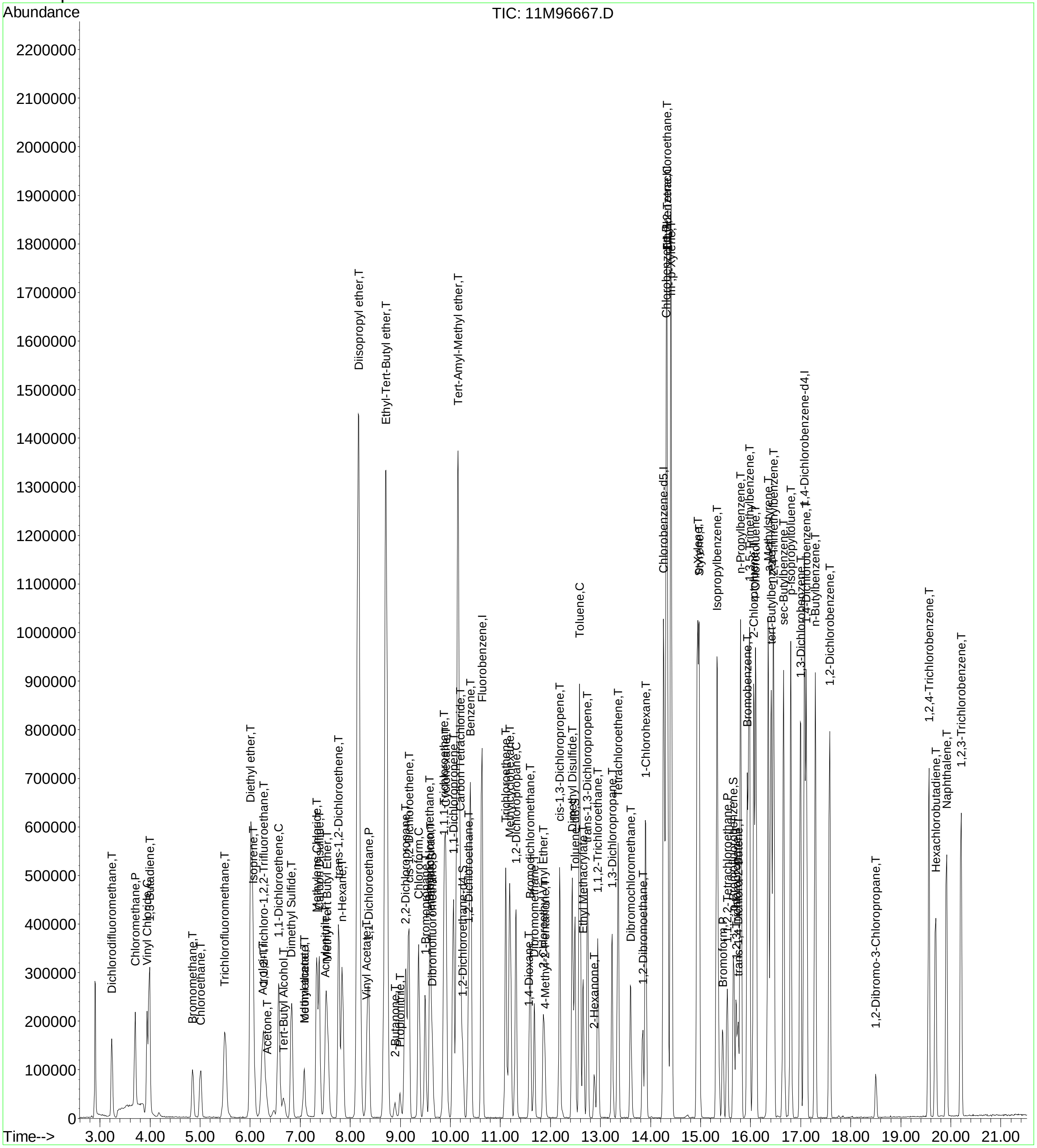

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Data File : C:\MSDchem\1\data\110513\11M96668.D          Vial: 8
Acq On    :  5 Nov 2013  20:05                       Operator: FJB
Sample    : WG451178-08 50ug/L STD 8260              Inst     : hpms11
Misc      : 1,1 STD61183                             Multiplr: 1.00
MS Integration Params: rteint.p
Quant Time: Nov 05 20:27:21 2013           Quant Results File: 8260_WT.RES

Quant Method : C:\MSDCHEM\1\METHODS\8260_WT.M (RTE Integrator)
Title        : 8260B/624 (SOP: OVL MSV01) Water 11/05/13 HPMS11
Last Update  : Wed Oct 23 10:24:39 2013
Response via : Initial Calibration
DataAcq Meth : 8260_WT

 Internal Standards                R.T. QIon  Response  Conc Units Dev(Min)
 -------------------------------------------------------------------------
   1) Fluorobenzene               10.63   96   886698    25.00 ug/L    0.00
  56) Chlorobenzene-d5            14.26  117   702242    25.00 ug/L   -0.01
  76) 1,4-Dichlorobenzene-d4      17.07  152   381974    25.00 ug/L   -0.01

 System Monitoring Compounds
  37) Dibromofluoromethane         9.64  111   248692    27.3450 ug/L -0.01
   Spiked Amount     25.000   Range  86 - 118    Recovery   =  109.36%
  43) 1,2-Dichloroethane-d4       10.25   65   279430    33.5576 ug/L  0.00
   Spiked Amount     25.000   Range  80 - 120    Recovery   =  134.24%#
  57) Toluene-d8                  12.49   98   859377    27.3180 ug/L  0.00
   Spiked Amount     25.000   Range  88 - 110    Recovery   =  109.28%
  78) p-Bromofluorobenzene        15.65   95   356239    26.7196 ug/L -0.01
   Spiked Amount     25.000   Range  86 - 115    Recovery   =  106.88%

 Target Compounds                                                   Qvalue
   2) Dichlorodifluoromethane      3.24   85   471547    74.2836 ug/L    97
   3) Chloromethane                3.70   50   584417   105.3030 ug/L    98
   4) Vinyl Chloride               3.94   62   620323    81.3182 ug/L    99
   5) 1,3-Butadiene                3.98   54   371170    75.4216 ug/L    96
   6) Bromomethane                 4.85   94   220267    57.9176 ug/L    99
   7) Chloroethane                 5.00   64   348134    63.9349 ug/L    99
   8) Trichlorofluoromethane       5.49  101   837300    68.5828 ug/L   100
   9) Diethyl ether                6.01   59   695575   119.9230 ug/L    93
  10) Isoprene                     6.05   67   656386    56.2901 ug/L    82
  11) Acrolein                     6.25   56     7420    31.0768 ug/L   100
  12) 1,1,2-Trichloro-1,2,2-Trif   6.27  101   481144    62.4988 ug/L    90
  13) Acetone                      6.34   43    94593    54.7976 ug/L    84
  14) 1,1-Dichloroethene           6.57   61   825030    73.2068 ug/L    95
  15) Tert-Butyl Alcohol           6.67   59   136256   250.7313 ug/L    99
  16) Dimethyl Sulfide             6.82   62   454147    57.0676 ug/L    84
  17) Iodomethane                  7.07  142   347703    40.9365 ug/L    90
  18) Methyl acetate               7.08   43   280363    64.5010 ug/L    94
  19) Methylene Chloride           7.33   84   480707    51.4721 ug/L    89
  20) Carbon Disulfide             7.38   76  1456333    55.0602 ug/L    99
  21) Acrylonitrile                7.50   53   131864    58.8255 ug/L    97
  22) Methyl Tert Butyl Ether      7.53   73  1234346    58.3473 ug/L    98
  23) trans-1,2-Dichloroethene     7.77   96   506096    58.4198 ug/L    90
  24) n-Hexane                     7.84   57   619433    70.5628 ug/L    98
  25) Diisopropyl ether            8.16   45  3259372   131.9035 ug/L    97
  26) Vinyl Acetate                8.32   43   655444    56.9046 ug/L    97
  27) 1,1-Dichloroethane           8.37   63   933451    66.1393 ug/L    98
  28) Ethyl-Tert-Butyl ether       8.71   59  3022768   131.4988 ug/L    96
  29) 2-Butanone                   8.89   43   145479    57.6110 ug/L    91
  30) Propionitrile                9.00   54    89121   113.8452 ug/L   100
  31) 2,2-Dichloropropane          9.11   77   874460    70.9498 ug/L    99
  32) cis-1,2-Dichloroethene       9.17   96   544951    56.6997 ug/L    97
  33) Chloroform                   9.37   83   914329    61.9210 ug/L    99
  34) 1-Bromopropane               9.50  122    95247    48.3230 ug/L    96
  35) Bromochloromethane           9.59  130   314769    54.5199 ug/L    99
  36) Tetrahydrofuran              9.61   42   187606   114.9108 ug/L    94
  38) 1,1,1-Trichloroethane        9.87   97   852193    64.8213 ug/L    93
  39) Cyclohexane                  9.91   56   827869    68.7281 ug/L    94
  40) 1,1-Dichloropropene         10.06   75   717453    63.8009 ug/L    97
  41) Carbon Tetrachloride        10.20  117   795546    64.6507 ug/L    97
  42) Tert-Amyl-Methyl ether      10.15   73  2489762   110.3258 ug/L    93
 -------------------------------------------------------------------------
 (#) = qualifier out of range (m) = manual integration
 11M96668.D  8260_WT.M      Tue Nov 05 20:27:22 2013                                   Page 1
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                              Quantitation Report    (Not Reviewed)

Data File : C:\MSDchem\1\data\110513\11M96668.D          Vial: 8
Acq On    :  5 Nov 2013  20:05                        Operator: FJB
Sample    : WG451178-08 50ug/L STD 8260               Inst    : hpms11
Misc      : 1,1 STD61183                              Multiplr: 1.00
MS Integration Params: rteint.p
Quant Time: Nov 05 20:27:21 2013          Quant Results File: 8260_WT.RES

Quant Method : C:\MSDCHEM\1\METHODS\8260_WT.M (RTE Integrator)
Title        : 8260B/624 (SOP: OVL MSV01) Water 11/05/13 HPMS11
Last Update  : Wed Oct 23 10:24:39 2013
Response via : Initial Calibration
DataAcq Meth : 8260_WT


      Compound                     R.T. QIon  Response  Conc Unit   Qvalue
 -------------------------------------------------------------------------
  44) 1,2-Dichloroethane          10.36   62   688980    67.7608 ug/L    96
  45) Benzene                     10.40   78  1912094    57.9480 ug/L    99
  46) Trichloroethene             11.11  130   530769    55.6878 ug/L    99
  47) Methylcyclohexane           11.19   83   721183    59.7842 ug/L    91
  48) 1,2-Dichloropropane         11.31   63   510551    62.0547 ug/L    85
  49) 1,4-Dioxane                 11.58   88    14182   182.3553 ug/L    96
  50) Bromodichloromethane        11.59   83   712040    64.2471 ug/L    99
  51) Dibromomethane              11.67   93   283941    56.2951 ug/L    91
  52) 2-Chloroethyl Vinyl Ether   11.86   63   244517    58.9884 ug/L   100
  53) 4-Methyl-2-Pentanone        11.89   58   130207    58.1892 ug/L    99
  54) cis-1,3-Dichloropropene     12.18   75   825770    60.3452 ug/L    99
  55) Dimethyl Disulfide          12.44   79   442731    54.0845 ug/L    89
  58) Toluene                     12.58   91  2009984    56.8676 ug/L    99
  59) Ethyl Methacrylate          12.66   69   497567    48.9732 ug/L    88
  60) trans-1,3-Dichloropropene   12.74   75   743314    59.6909 ug/L    95
  61) 1,1,2-Trichloroethane       12.95   97   370204    51.8266 ug/L    95
  62) 2-Hexanone                  12.87   43   237746    63.4960 ug/L    83
  63) 1,3-Dichloropropane         13.23   76   663165    54.2156 ug/L    93
  64) Tetrachloroethene           13.35  164   408178    48.8148 ug/L    99
  65) Dibromochloromethane        13.60  129   495355    54.3693 ug/L   100
  66) 1,2-Dibromoethane           13.84  107   378611    52.4892 ug/L    99
  67) 1-Chlorohexane              13.91   91   658002    56.7400 ug/L    85
  68) Chlorobenzene               14.31  112  1383496    53.9616 ug/L   100
  69) 1,1,1,2-Tetrachloroethane   14.33  131   518027    52.0670 ug/L   100
  70) Ethylbenzene                14.33  106   766780    59.2443 ug/L    90
  71) m-,p-Xylene                 14.40  106  1832089   120.9888 ug/L    86
  72) o-Xylene                    14.94  106   905589    58.6347 ug/L    87
  73) Styrene                     14.97  104  1505231    59.5330 ug/L    92
  74) Bromoform                   15.44  173   296229    41.4325 ug/L    99
  75) Isopropylbenzene            15.32  105  2177926    61.0025 ug/L    95
  77) 1,1,2,2-Tetrachloroethane   15.53   83   449132    51.6435 ug/L    98
  79) 1,2,3-Trichloropropane      15.71  110   129726    50.0372 ug/L #  44
  80) trans-1,4-Dichloro-2-Buten  15.75   53   148943    60.2173 ug/L #   1
  81) n-Propylbenzene             15.80   91  2607899    60.1417 ug/L    98
  82) Bromobenzene                15.93  156   561071    47.0343 ug/L #  50
  83) 1,3,5-Trimethylbenzene      15.97  105  1855474    60.2047 ug/L    92
  84) 2-Chlorotoluene             16.06   91  1634314    51.8094 ug/L    93
  85) 4-Chlorotoluene             16.10   91  1669549    63.1594 ug/L    85
  86) a-Methylstyrene             16.35  118  1012972    56.4549 ug/L    90
  87) tert-Butylbenzene           16.41  134   387746    54.0795 ug/L    83
  88) 1,2,4-Trimethylbenzene      16.45  105  1901198    60.2010 ug/L    93
  89) sec-Butylbenzene            16.66  105  2177050    61.3757 ug/L   100
  90) p-Isopropyltoluene          16.80  119  1867468    59.9019 ug/L    96
  91) 1,3-Dichlorobenzene         17.00  146  1068572    50.8988 ug/L    99
  92) 1,4-Dichlorobenzene         17.11  146  1080675    49.7498 ug/L    98
  93) n-Butylbenzene              17.29   91  1658552    60.1275 ug/L    99
  94) 1,2-Dichlorobenzene         17.58  146  1001362    49.0543 ug/L    98
  95) 1,2-Dibromo-3-Chloropropan  18.50   75    87783    56.9851 ug/L    99
  96) 1,2,4-Trichlorobenzene      19.56  180   685828    46.7329 ug/L   100
  97) Hexachlorobutadiene         19.70  225   256178    46.0392 ug/L    97
  98) Naphthalene                 19.91  128  1413964    50.1948 ug/L    98
  99) 1,2,3-Trichlorobenzene      20.20  180   616706    45.5041 ug/L    98


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 (#) = qualifier out of range (m) = manual integration
 11M96668.D  8260_WT.M      Tue Nov 05 20:27:22 2013                           Page 2
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                    Quantitation Report    (Not Reviewed)

Data File : C:\MSDchem\1\data\110513\11M96668.D         Vial: 8
Acq On    :  5 Nov 2013  20:05                       Operator: FJB
Sample    : WG451178-08 50ug/L STD 8260              Inst    : hpms11
Misc      : 1,1 STD61183                             Multiplr: 1.00
MS Integration Params: rteint.p
Quant Time: Nov  5 20:27 2013            Quant Results File: 8260_WT.RES

Method       : C:\MSDCHEM\1\METHODS\8260_WT.M (RTE Integrator)
Title        : 8260B/624 (SOP: OVL MSV01) Water 11/05/13 HPMS11
Last Update  : Wed Oct 23 10:24:39 2013
Response via : Initial Calibration
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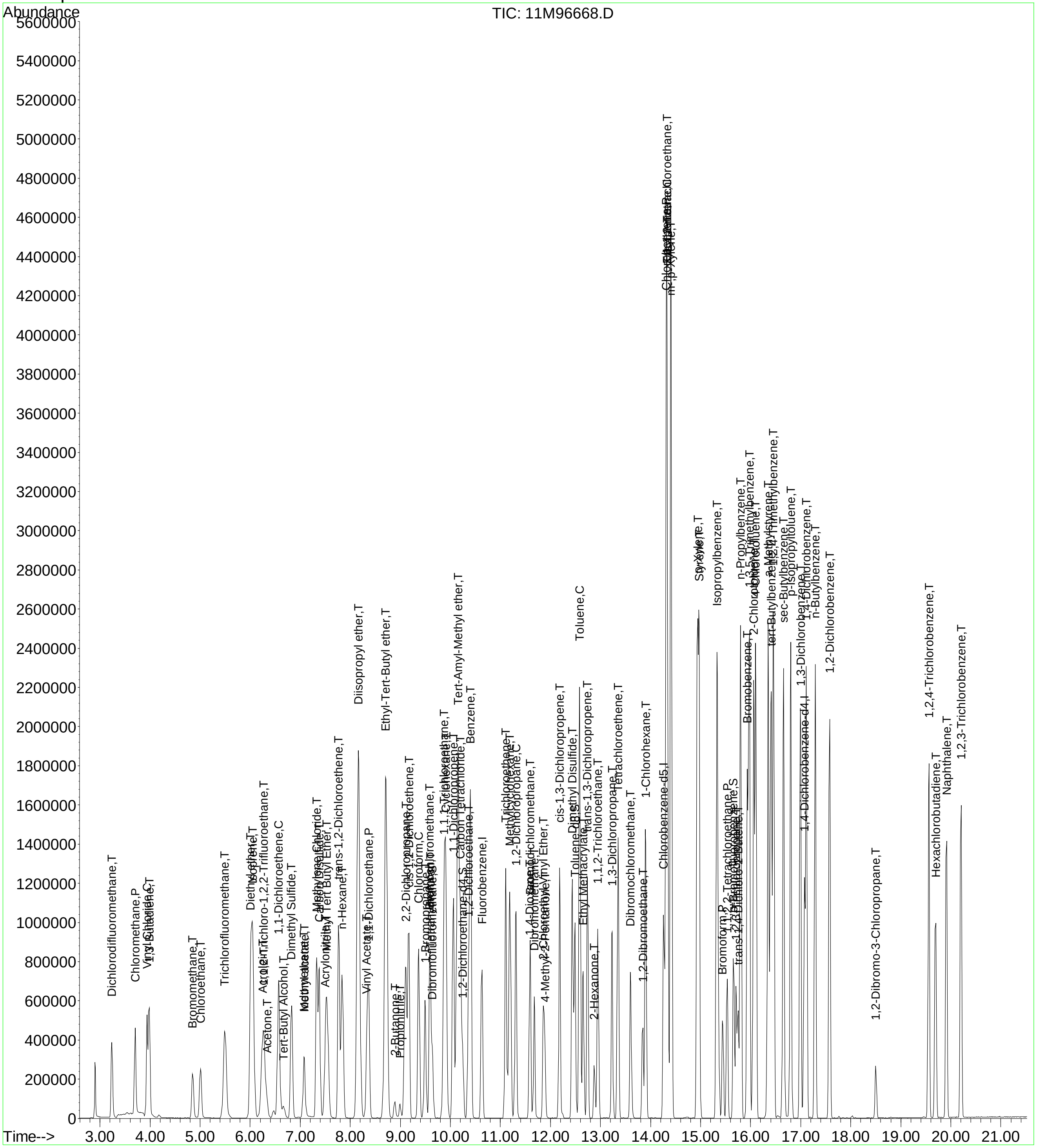

11M96668.D 8260_WT.M   Tue Nov 05 20:27:22 2013   Page 3

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                           Evaluate Continuing Calibration Report

   Data File : C:\MSDCHEM\1\DATA\110513\11M96668.D          Vial: 8
   Acq On    :  5 Nov 2013  20:05                       Operator: FJB
   Sample    : WG451178-08 50ug/L STD 8260              Inst     : hpms11
   Misc      : 1,1 STD61183                             Multiplr: 1.00
   MS Integration Params: rteint.p

   Method       : C:\MSDCHEM\1\METHODS\8260_WT.M (RTE Integrator)
   Title        : 8260B/624 (SOP: OVL MSV01) Water 11/05/13 HPMS11
   Last Update  : Wed Nov 06 14:52:21 2013
   Response via : Multiple Level Calibration

   Min. RRF     :   0.000  Min. Rel. Area :  50%  Max. R.T. Dev  0.50min
   Max. RRF Dev :  25%     Max. Rel. Area : 150%

        Compound                      AvgRF   CCRF       %Dev Area% Dev(min)
  ---------------------------------------------------------------------------
 1 I    Fluorobenzene                 1.0000   1.0000       0.0  100   0.00
 2 T    Dichlorodifluoromethane       0.2466   0.2659      -7.8  100   0.00
 3 P    Chloromethane                 0.3481   0.3296       5.3  100   0.00
 4 C    Vinyl Chloride                0.3298   0.3498      -6.0  100   0.00
 5 T    1,3-Butadiene                 0.2061   0.2093      -1.6  100   0.00
 6 T    Bromomethane                  0.1415   0.1242      12.2  100   0.00
 7 T    Chloroethane                  0.1919   0.1963      -2.3  100   0.00
 8 T    Trichlorofluoromethane        0.4592   0.4721      -2.8  100   0.00
 9 T    Diethyl ether                 0.1927   0.1961      -1.8  100   0.00
10 T    Isoprene                      0.3779   0.3701       2.1  100   0.00
11 T    Acrolein                      0.0037   0.0042     -13.0  100   0.00
12 T    1,1,2-Trichloro-1,2,2-Trifl   0.2680   0.2713      -1.2  100   0.00
13 T    Acetone                       0.0581   0.0533       8.2  100   0.00
14 C    1,1-Dichloroethene            0.4537   0.4652      -2.6  100   0.00
15 T    Tert-Butyl Alcohol            0.0180   0.0192      -6.5  100   0.00
16 T    Dimethyl Sulfide              0.2574   0.2561       0.5  100   0.00
17 T    Iodomethane                   0.1709   0.1961     -14.7  100   0.00
18 T    Methyl acetate                0.1683   0.1581       6.1  100   0.00
19 T    Methylene Chloride            0.2901   0.2711       6.6  100   0.00
20 T    Carbon Disulfide              0.8258   0.8212       0.6  100   0.00
21 T    Acrylonitrile                 0.0709   0.0744      -4.9  100   0.00
22 T    Methyl Tert Butyl Ether       0.6767   0.6960      -2.9  100   0.00
23 T    trans-1,2-Dichloroethene      0.2865   0.2854       0.4  100   0.00
24 T    n-Hexane                      0.3543   0.3493       1.4  100   0.00
25 T    Diisopropyl ether             0.9066   0.9190      -1.4  100   0.00
26 T    Vinyl Acetate                 0.3403   0.3696      -8.6  100   0.00
27 P    1,1-Dichloroethane            0.5205   0.5264      -1.1  100   0.00
28 T    Ethyl-Tert-Butyl ether        0.8335   0.8522      -2.2  100   0.00
29 T    2-Butanone                    0.0844   0.0820       2.8  100   0.00
30 T    Propionitrile                 0.0235   0.0251      -6.9  100   0.00
31 T    2,2-Dichloropropane           0.4971   0.4931       0.8  100   0.00
32 T    cis-1,2-Dichloroethene        0.3057   0.3073      -0.5  100   0.00
33 C    Chloroform                    0.5227   0.5156       1.4  100   0.00
34 T    1-Bromopropane                0.0546   0.0537       1.5  100   0.00
35 T    Bromochloromethane            0.1704   0.1775      -4.2  100   0.00
36 T    Tetrahydrofuran               0.0501   0.0529      -5.6  100   0.00
37 S    Dibromofluoromethane          0.3024   0.2805       7.3  100   0.00
38 T    1,1,1-Trichloroethane         0.4706   0.4805      -2.1  100   0.00
39 T    Cyclohexane                   0.4925   0.4668       5.2  100   0.00
40 T    1,1-Dichloropropene           0.3956   0.4046      -2.3  100   0.00
41 T    Carbon Tetrachloride          0.4328   0.4486      -3.7  100   0.00
42 T    Tert-Amyl-Methyl ether        0.6866   0.7020      -2.2  100   0.00
43 S    1,2-Dichloroethane-d4         0.3415   0.3151       7.7  100   0.00
44 T    1,2-Dichloroethane            0.3779   0.3885      -2.8  100   0.00
45 T    Benzene                       1.0910   1.0782       1.2  100   0.00
46 T    Trichloroethene               0.2995   0.2993       0.1  100   0.00
47 T    Methylcyclohexane             0.4144   0.4067       1.9  100   0.00
48 C    1,2-Dichloropropane           0.2838   0.2879      -1.4  100   0.00
49 T    1,4-Dioxane                   0.0019   0.0020      -7.5  100   0.00
50 T    Bromodichloromethane          0.3943   0.4015      -1.8  100   0.00
51 T    Dibromomethane                0.1552   0.1601      -3.1  100   0.00
52 T    2-Chloroethyl Vinyl Ether     0.1319   0.1379      -4.5  100   0.00
53 T    4-Methyl-2-Pentanone          0.0687   0.0734      -6.8  100   0.00
54 T    cis-1,3-Dichloropropene       0.4526   0.4656      -2.9  100   0.00
--------------------------------------------------------------------------
 (#) = Out of Range
 11M96668.D  8260_WT.M      Sat Nov 09 18:57:11 2013                           Page 1
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                    Evaluate Continuing Calibration Report

     Data File : C:\MSDCHEM\1\DATA\110513\11M96668.D          Vial: 8
     Acq On    :  5 Nov 2013  20:05                         Operator: FJB
     Sample    : WG451178-08 50ug/L STD 8260                Inst    : hpms11
     Misc      : 1,1 STD61183                               Multiplr: 1.00
     MS Integration Params: rteint.p

     Method       : C:\MSDCHEM\1\METHODS\8260_WT.M (RTE Integrator)
     Title        : 8260B/624 (SOP: OVL MSV01) Water 11/05/13 HPMS11
     Last Update  : Wed Nov 06 14:52:21 2013
     Response via : Multiple Level Calibration

     Min. RRF     :   0.000  Min. Rel. Area :  50%  Max. R.T. Dev  0.50min
     Max. RRF Dev :  25%     Max. Rel. Area : 150%

          Compound                       AvgRF   CCRF       %Dev Area% Dev(min)
    --------------------------------------------------------------------------
  55 T    Dimethyl Disulfide             0.2488   0.2497      -0.3  100   0.00
  56 I    Chlorobenzene-d5               1.0000   1.0000       0.0  100   0.00
  57 S    Toluene-d8                     1.2555   1.2238       2.5  100   0.00
  58 C    Toluene                        1.3907   1.4311      -2.9  100   0.00
  59 T    Ethyl Methacrylate             0.3426   0.3543      -3.4  100   0.00
  60 T    trans-1,3-Dichloropropene      0.5009   0.5292      -5.7  100   0.00
  61 T    1,1,2-Trichloroethane          0.2523   0.2636      -4.5  100   0.00
  62 T    2-Hexanone                     0.1585   0.1693      -6.8  100   0.00
  63 T    1,3-Dichloropropane            0.4610   0.4722      -2.4  100   0.00
  64 T    Tetrachloroethene              0.2937   0.2906       1.1  100   0.00
  65 T    Dibromochloromethane           0.3381   0.3527      -4.3  100   0.00
  66 T    1,2-Dibromoethane              0.2577   0.2696      -4.6  100   0.00
  67 T    1-Chlorohexane                 0.4694   0.4685       0.2  100   0.00
  68 P    Chlorobenzene                  0.9806   0.9851      -0.5  100   0.00
  69 T    1,1,1,2-Tetrachloroethane      0.3657   0.3688      -0.9  100   0.00
  70 C    Ethylbenzene                   0.5430   0.5460      -0.5  100   0.00
  71 T    m-,p-Xylene                    0.6296   0.6522      -3.6  100   0.00
  72 T    o-Xylene                       0.6434   0.6448      -0.2  100   0.00
  73 T    Styrene                        1.0243   1.0717      -4.6  100   0.00
  74 P    Bromoform                      0.1971   0.2109      -7.0  100   0.00
  75 T    Isopropylbenzene               1.4844   1.5507      -4.5  100   0.00

  76 I    1,4-Dichlorobenzene-d4         1.0000   1.0000       0.0  100   0.00
  77 P    1,1,2,2-Tetrachloroethane      0.5598   0.5879      -5.0  100   0.00
  78 S    p-Bromofluorobenzene           1.0040   0.9326       7.1  100   0.00
  79 T    1,2,3-Trichloropropane         0.1665   0.1698      -2.0  100   0.00
  80 T    trans-1,4-Dichloro-2-Butene    0.1803   0.1950      -8.1  100   0.00
  81 T    n-Propylbenzene                3.4087   3.4137      -0.1  100   0.00
  82 T    Bromobenzene                   0.7517   0.7344       2.3  100   0.00
  83 T    1,3,5-Trimethylbenzene         2.4115   2.4288      -0.7  100   0.00
  84 T    2-Chlorotoluene                2.2261   2.1393       3.9  100   0.00
  85 T    4-Chlorotoluene                2.2770   2.1854       4.0  100   0.00
  86 T    a-Methylstyrene                1.2900   1.3260      -2.8  100   0.00
  87 T    tert-Butylbenzene              0.5109   0.5076       0.7  100   0.00
  88 T    1,2,4-Trimethylbenzene         2.4480   2.4886      -1.7  100   0.00
  89 T    sec-Butylbenzene               2.7643   2.8497      -3.1  100   0.00
  90 T    p-Isopropyltoluene             2.3623   2.4445      -3.5  100   0.00
  91 T    1,3-Dichlorobenzene            1.4056   1.3987       0.5  100   0.00
  92 T    1,4-Dichlorobenzene            1.4766   1.4146       4.2  100   0.00
  93 T    n-Butylbenzene                 2.1041   2.1710      -3.2  100   0.00
  94 T    1,2-Dichlorobenzene            1.3224   1.3108       0.9  100   0.00
  95 T    1,2-Dibromo-3-Chloropropane    0.1035   0.1149     -11.0  100   0.00
  96 T    1,2,4-Trichlorobenzene         0.8940   0.8977      -0.4  100   0.00
  97 T    Hexachlorobutadiene            0.3454   0.3353       2.9  100   0.00
  98 T    Naphthalene                    1.7286   1.8509      -7.1  100   0.00
  99 T    1,2,3-Trichlorobenzene         0.8232   0.8073       1.9  100   0.00

  --------------------------------------------------------------------------
   (#) = Out of Range            SPCC's out = 0  CCC's out = 0
   11M96668.D  8260_WT.M      Sat Nov 09 18:57:11 2013                          Page 2
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                          Evaluate Continuing Calibration Report

   Data File : C:\MSDCHEM\1\DATA\110513\11M96668.D          Vial: 8
   Acq On    :  5 Nov 2013  20:05                          Operator: FJB
   Sample    : WG451178-08 50ug/L STD 8260                 Inst    : hpms11
   Misc      : 1,1 STD61183                                Multiplr: 1.00
   MS Integration Params: rteint.p

   Method       : C:\MSDCHEM\1\METHODS\8260_WT.M (RTE Integrator)
   Title        : 8260B/624 (SOP: OVL MSV01) Water 11/05/13 HPMS11
   Last Update  : Wed Nov 06 14:52:21 2013
   Response via : Multiple Level Calibration

   Min. RRF     :   0.000  Min. Rel. Area :  50%  Max. R.T. Dev  0.50min
   Max. RRF Dev :  25%     Max. Rel. Area : 150%

        Compound                       Amount  Calc.      %Dev Area% Dev(min)
  ---------------------------------------------------------------------------
   1 I    Fluorobenzene                 25.0000  25.0000       0.0  100   0.00
   2 T    Dichlorodifluoromethane       50.0000  74.2836     -48.6# 100   0.00
   3 P    Chloromethane                 50.0000 105.3030     -110.6# 100   0.00
   4 C    Vinyl Chloride                50.0000  81.3182     -62.6# 100   0.00
   5 T    1,3-Butadiene                 50.0000  75.4216     -50.8# 100   0.00
   6 T    Bromomethane                  50.0000  57.9176     -15.8  100   0.00
   7 T    Chloroethane                  50.0000  63.9349     -27.9# 100   0.00
   8 T    Trichlorofluoromethane        50.0000  68.5828     -37.2# 100   0.00
   9 T    Diethyl ether                100.0000 119.9230     -19.9  100   0.00
  10 T    Isoprene                      50.0000  56.2901     -12.6  100   0.00
  11 T    Acrolein                      50.0000  31.0769      37.8# 100   0.00
  12 T    1,1,2-Trichloro-1,2,2-Trifl   50.0000  62.4988     -25.0  100   0.00
  13 T    Acetone                       50.0000  54.7976      -9.6  100   0.00
  14 C    1,1-Dichloroethene            50.0000  73.2068     -46.4# 100   0.00
  15 T    Tert-Butyl Alcohol           200.0000 250.7313     -25.4# 100   0.00
  16 T    Dimethyl Sulfide              50.0000  57.0676     -14.1  100   0.00
  17 T    Iodomethane                   50.0000  40.9365      18.1  100   0.00
  18 T    Methyl acetate                50.0000  64.5010     -29.0# 100   0.00
  19 T    Methylene Chloride            50.0000  51.4721      -2.9  100   0.00
  20 T    Carbon Disulfide              50.0000  55.0602     -10.1  100   0.00
  21 T    Acrylonitrile                 50.0000  58.8255     -17.7  100   0.00
  22 T    Methyl Tert Butyl Ether       50.0000  58.3473     -16.7  100   0.00
  23 T    trans-1,2-Dichloroethene      50.0000  58.4198     -16.8  100   0.00
  24 T    n-Hexane                      50.0000  70.5628     -41.1# 100   0.00
  25 T    Diisopropyl ether            100.0000 131.9035     -31.9# 100   0.00
  26 T    Vinyl Acetate                 50.0000  56.9046     -13.8  100   0.00
  27 P    1,1-Dichloroethane            50.0000  66.1393     -32.3# 100   0.00
  28 T    Ethyl-Tert-Butyl ether       100.0000 131.4988     -31.5# 100   0.00
  29 T    2-Butanone                    50.0000  57.6110     -15.2  100   0.00
  30 T    Propionitrile                100.0000 113.8452     -13.8  100   0.00
  31 T    2,2-Dichloropropane           50.0000  70.9498     -41.9# 100   0.00
  32 T    cis-1,2-Dichloroethene        50.0000  56.6997     -13.4  100   0.00
  33 C    Chloroform                    50.0000  61.9210     -23.8# 100   0.00
  34 T    1-Bromopropane                50.0000  48.3230       3.4  100   0.00
  35 T    Bromochloromethane            50.0000  54.5199      -9.0  100   0.00
  36 T    Tetrahydrofuran              100.0000 114.9108     -14.9  100   0.00
  37 S    Dibromofluoromethane          25.0000  27.3450      -9.4  100   0.00
  38 T    1,1,1-Trichloroethane         50.0000  64.8213     -29.6# 100   0.00
  39 T    Cyclohexane                   50.0000  68.7281     -37.5# 100   0.00
  40 T    1,1-Dichloropropene           50.0000  63.8009     -27.6# 100   0.00
  41 T    Carbon Tetrachloride          50.0000  64.6507     -29.3# 100   0.00
  42 T    Tert-Amyl-Methyl ether       100.0000 110.3259     -10.3  100   0.00
  43 S    1,2-Dichloroethane-d4         25.0000  33.5576     -34.2# 100   0.00
  44 T    1,2-Dichloroethane            50.0000  67.7609     -35.5# 100   0.00
  45 T    Benzene                       50.0000  57.9480     -15.9  100   0.00
  46 T    Trichloroethene               50.0000  55.6878     -11.4  100   0.00
  47 T    Methylcyclohexane             50.0000  59.7842     -19.6  100   0.00
  48 C    1,2-Dichloropropane           50.0000  62.0547     -24.1# 100   0.00
  49 T    1,4-Dioxane                  200.0000 182.3553       8.8  100   0.00
  50 T    Bromodichloromethane          50.0000  64.2471     -28.5# 100   0.00
  51 T    Dibromomethane                50.0000  56.2951     -12.6  100   0.00
  52 T    2-Chloroethyl Vinyl Ether     50.0000  58.9884     -18.0  100   0.00
  53 T    4-Methyl-2-Pentanone          50.0000  58.1892     -16.4  100   0.00
  54 T    cis-1,3-Dichloropropene       50.0000  60.3452     -20.7  100   0.00
  --------------------------------------------------------------------------
   (#) = Out of Range
   11M96668.D  8260_WT.M      Sat Nov 09 18:57:08 2013                     Page 1
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                        Evaluate Continuing Calibration Report

     Data File : C:\MSDCHEM\1\DATA\110513\11M96668.D         Vial: 8
     Acq On    :  5 Nov 2013  20:05                       Operator: FJB
     Sample    : WG451178-08 50ug/L STD 8260              Inst    : hpms11
     Misc      : 1,1 STD61183                             Multiplr: 1.00
     MS Integration Params: rteint.p

     Method       : C:\MSDCHEM\1\METHODS\8260_WT.M (RTE Integrator)
     Title        : 8260B/624 (SOP: OVL MSV01) Water 11/05/13 HPMS11
     Last Update  : Wed Nov 06 14:52:21 2013
     Response via : Multiple Level Calibration

     Min. RRF     :   0.000  Min. Rel. Area :  50%  Max. R.T. Dev  0.50min
     Max. RRF Dev :  25%     Max. Rel. Area : 150%

          Compound                       Amount  Calc.      %Dev Area% Dev(min)
    ---------------------------------------------------------------------------
  55 T    Dimethyl Disulfide            50.0000  54.0845      -8.2  100   0.00
  56 I    Chlorobenzene-d5              25.0000  25.0000       0.0  100   0.00
  57 S    Toluene-d8                    25.0000  27.3180      -9.3  100   0.00
  58 C    Toluene                       50.0000  56.8676     -13.7  100   0.00
  59 T    Ethyl Methacrylate            50.0000  48.9732       2.1  100   0.00
  60 T    trans-1,3-Dichloropropene     50.0000  59.6909     -19.4  100   0.00
  61 T    1,1,2-Trichloroethane         50.0000  51.8266      -3.7  100   0.00
  62 T    2-Hexanone                    50.0000  63.4960     -27.0# 100   0.00
  63 T    1,3-Dichloropropane           50.0000  54.2156      -8.4  100   0.00
  64 T    Tetrachloroethene             50.0000  48.8148       2.4  100   0.00
  65 T    Dibromochloromethane          50.0000  54.3693      -8.7  100   0.00
  66 T    1,2-Dibromoethane             50.0000  52.4892      -5.0  100   0.00
  67 T    1-Chlorohexane                50.0000  56.7400     -13.5  100   0.00
  68 P    Chlorobenzene                 50.0000  53.9616      -7.9  100   0.00
  69 T    1,1,1,2-Tetrachloroethane     50.0000  52.0670      -4.1  100   0.00
  70 C    Ethylbenzene                  50.0000  59.2443     -18.5  100   0.00
  71 T    m-,p-Xylene                  100.0000 120.9888     -21.0  100   0.00
  72 T    o-Xylene                      50.0000  58.6347     -17.3  100   0.00
  73 T    Styrene                       50.0000  59.5330     -19.1  100   0.00
  74 P    Bromoform                     50.0000  41.4325      17.1  100   0.00
  75 T    Isopropylbenzene              50.0000  61.0025     -22.0  100   0.00

  76 I    1,4-Dichlorobenzene-d4        25.0000  25.0000       0.0  100   0.00
  77 P    1,1,2,2-Tetrachloroethane     50.0000  51.6435      -3.3  100   0.00
  78 S    p-Bromofluorobenzene          25.0000  26.7196      -6.9  100   0.00
  79 T    1,2,3-Trichloropropane        50.0000  50.0372      -0.1  100   0.00
  80 T    trans-1,4-Dichloro-2-Butene   50.0000  60.2173     -20.4  100   0.00
  81 T    n-Propylbenzene               50.0000  60.1417     -20.3  100   0.00
  82 T    Bromobenzene                  50.0000  47.0343       5.9  100   0.00
  83 T    1,3,5-Trimethylbenzene        50.0000  60.2047     -20.4  100   0.00
  84 T    2-Chlorotoluene               50.0000  51.8094      -3.6  100   0.00
  85 T    4-Chlorotoluene               50.0000  63.1594     -26.3# 100   0.00
  86 T    a-Methylstyrene               50.0000  56.4549     -12.9  100   0.00
  87 T    tert-Butylbenzene             50.0000  54.0795      -8.2  100   0.00
  88 T    1,2,4-Trimethylbenzene        50.0000  60.2010     -20.4  100   0.00
  89 T    sec-Butylbenzene              50.0000  61.3757     -22.8  100   0.00
  90 T    p-Isopropyltoluene            50.0000  59.9019     -19.8  100   0.00
  91 T    1,3-Dichlorobenzene           50.0000  50.8988      -1.8  100   0.00
  92 T    1,4-Dichlorobenzene           50.0000  49.7498       0.5  100   0.00
  93 T    n-Butylbenzene                50.0000  60.1275     -20.3  100   0.00
  94 T    1,2-Dichlorobenzene           50.0000  49.0543       1.9  100   0.00
  95 T    1,2-Dibromo-3-Chloropropane   50.0000  56.9851     -14.0  100   0.00
  96 T    1,2,4-Trichlorobenzene        50.0000  46.7329       6.5  100   0.00
  97 T    Hexachlorobutadiene           50.0000  46.0391       7.9  100   0.00
  98 T    Naphthalene                   50.0000  50.1948      -0.4  100   0.00
  99 T    1,2,3-Trichlorobenzene        50.0000  45.5041       9.0  100   0.00




  --------------------------------------------------------------------------
   (#) = Out of Range             SPCC's out = 0  CCC's out = 4
   11M96668.D  8260_WT.M      Sat Nov 09 18:57:08 2013                              Page 2
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                               Quantitation Report    (Not Reviewed)

Data File : C:\MSDchem\1\data\110513\11M96669.D          Vial: 9
Acq On    :  5 Nov 2013  20:36                        Operator: FJB
Sample    : WG451178-09 100ug/L STD 8260              Inst    : hpms11
Misc      : 1,1 STD61183                              Multiplr: 1.00
MS Integration Params: rteint.p
Quant Time: Nov 05 20:58:25 2013          Quant Results File: 8260_WT.RES

Quant Method : C:\MSDCHEM\1\METHODS\8260_WT.M (RTE Integrator)
Title        : 8260B/624 (SOP: OVL MSV01) Water 11/05/13 HPMS11
Last Update  : Wed Oct 23 10:24:39 2013
Response via : Initial Calibration
DataAcq Meth : 8260_WT

 Internal Standards                  R.T. QIon  Response  Conc Units Dev(Min)
-------------------------------------------------------------------------
   1) Fluorobenzene                 10.63   96   877253    25.00 ug/L    0.00
  56) Chlorobenzene-d5              14.26  117   718705    25.00 ug/L   -0.01
  76) 1,4-Dichlorobenzene-d4        17.07  152   382418    25.00 ug/L   -0.01

 System Monitoring Compounds
  37) Dibromofluoromethane           9.64  111   504630    56.0841 ug/L -0.01
   Spiked Amount     25.000   Range  86 - 118    Recovery   =  224.32%#
  43) 1,2-Dichloroethane-d4         10.25   65   568157    68.9663 ug/L  0.00
   Spiked Amount     25.000   Range  80 - 120    Recovery   =  275.88%#
  57) Toluene-d8                    12.49   98  1734885    53.8855 ug/L  0.00
   Spiked Amount     25.000   Range  88 - 110    Recovery   =  215.56%#
  78) p-Bromofluorobenzene          15.65   95   725137    54.3255 ug/L -0.01
   Spiked Amount     25.000   Range  86 - 115    Recovery   =  217.32%#

 Target Compounds                                                    Qvalue
   2) Dichlorodifluoromethane        3.24   85   945561   150.5595 ug/L    97
   3) Chloromethane                  3.70   50  1192855   217.2484 ug/L    99
   4) Vinyl Chloride                 3.94   62  1232124   163.2582 ug/L    98
   5) 1,3-Butadiene                  3.97   54   583844   119.9142 ug/L    96
   6) Bromomethane                   4.85   94   506625   134.6476 ug/L    97
   7) Chloroethane                   5.00   64   698615   129.6821 ug/L   100
   8) Trichlorofluoromethane         5.49  101  1678569   138.9710 ug/L   100
   9) Diethyl ether                  6.01   59  1390268   242.2747 ug/L    93
  10) Isoprene                       6.05   67  1367791   118.5614 ug/L    83
  11) Acrolein                       6.25   56    14519    56.6053 ug/L    99
  12) 1,1,2-Trichloro-1,2,2-Trif     6.26  101   968782   127.1960 ug/L    90
  13) Acetone                        6.34   43   200714   117.5251 ug/L    88
  14) 1,1-Dichloroethene             6.57   61  1639688   147.0598 ug/L    94
  15) Tert-Butyl Alcohol             6.67   59   273785   509.2294 ug/L    97
  16) Dimethyl Sulfide               6.82   62   950060   120.6688 ug/L    84
  17) Iodomethane                    7.07  142   806196    92.6031 ug/L    92
  18) Methyl acetate                 7.07   43   583617   135.7140 ug/L    94
  19) Methylene Chloride             7.33   84   976134   107.3796 ug/L    88
  20) Carbon Disulfide               7.38   76  3005892   114.8686 ug/L    99
  21) Acrylonitrile                  7.50   53   268192   120.9305 ug/L    95
  22) Methyl Tert Butyl Ether        7.53   73  2469451   117.9873 ug/L    98
  23) trans-1,2-Dichloroethene       7.77   96  1014538   118.3713 ug/L    90
  24) n-Hexane                       7.84   57  1273175   146.5955 ug/L    97
  25) Diisopropyl ether              8.16   45  6226893   254.7092 ug/L    97
  26) Vinyl Acetate                  8.32   43  1349475   118.4206 ug/L    97
  27) 1,1-Dichloroethane             8.36   63  1862681   133.4006 ug/L    97
  28) Ethyl-Tert-Butyl ether         8.72   59  5800390   255.0498 ug/L    94
  29) 2-Butanone                     8.88   43   300614   120.3276 ug/L    90
  30) Propionitrile                  9.00   54   179267   231.4653 ug/L   100
  31) 2,2-Dichloropropane            9.10   77  1754389   143.8759 ug/L   100
  32) cis-1,2-Dichloroethene         9.17   96  1105236   116.2330 ug/L    96
  33) Chloroform                     9.37   83  1816775   124.3619 ug/L    99
  34) 1-Bromopropane                 9.50  122   204639   104.8454 ug/L    99
  35) Bromochloromethane             9.58  130   638791   111.8337 ug/L    99
  36) Tetrahydrofuran                9.61   42   369880   228.9949 ug/L    93
  38) 1,1,1-Trichloroethane          9.87   97  1709079   131.3992 ug/L    92
  39) Cyclohexane                    9.91   56  1726826   144.9012 ug/L    94
  40) 1,1-Dichloropropene           10.06   75  1437529   129.2115 ug/L    98
  41) Carbon Tetrachloride          10.19  117  1590679   130.6596 ug/L    97
  42) Tert-Amyl-Methyl ether        10.15   73  4798550   214.9217 ug/L    94
-------------------------------------------------------------------------
(#) = qualifier out of range (m) = manual integration
11M96669.D  8260_WT.M      Tue Nov 05 20:58:25 2013                              Page 1
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                               Quantitation Report    (Not Reviewed)

Data File : C:\MSDchem\1\data\110513\11M96669.D         Vial: 9
Acq On    :  5 Nov 2013  20:36                       Operator: FJB
Sample    : WG451178-09 100ug/L STD 8260             Inst    : hpms11
Misc      : 1,1 STD61183                             Multiplr: 1.00
MS Integration Params: rteint.p
Quant Time: Nov 05 20:58:25 2013          Quant Results File: 8260_WT.RES

Quant Method : C:\MSDCHEM\1\METHODS\8260_WT.M (RTE Integrator)
Title        : 8260B/624 (SOP: OVL MSV01) Water 11/05/13 HPMS11
Last Update  : Wed Oct 23 10:24:39 2013
Response via : Initial Calibration
DataAcq Meth : 8260_WT


      Compound                     R.T. QIon  Response  Conc Unit   Qvalue
 -------------------------------------------------------------------------
  44) 1,2-Dichloroethane          10.36   62  1382782   137.4601 ug/L    95
  45) Benzene                     10.40   78  3752528   114.9486 ug/L   100
  46) Trichloroethene             11.10  130  1068392   113.3016 ug/L   100
  47) Methylcyclohexane           11.19   83  1495491   125.3071 ug/L    90
  48) 1,2-Dichloropropane         11.31   63  1018047   125.0704 ug/L    86
  49) 1,4-Dioxane                 11.58   88    27623   359.0068 ug/L    94
  50) Bromodichloromethane        11.59   83  1432667   130.6608 ug/L    99
  51) Dibromomethane              11.67   93   569124   114.0514 ug/L    91
  52) 2-Chloroethyl Vinyl Ether   11.86   63   496033   120.9537 ug/L    98
  53) 4-Methyl-2-Pentanone        11.89   58   263045   118.8198 ug/L    99
  54) cis-1,3-Dichloropropene     12.18   75  1660814   122.6749 ug/L    99
  55) Dimethyl Disulfide          12.44   79   937253   115.7286 ug/L    91
  58) Toluene                     12.58   91  3882606   107.3327 ug/L    96
  59) Ethyl Methacrylate          12.66   69  1047650   100.4361 ug/L    88
  60) trans-1,3-Dichloropropene   12.74   75  1492932   117.1419 ug/L    94
  61) 1,1,2-Trichloroethane       12.95   97   742582   101.5763 ug/L    94
  62) 2-Hexanone                  12.87   43   481113   125.5498 ug/L    85
  63) 1,3-Dichloropropane         13.23   76  1334582   106.6066 ug/L    92
  64) Tetrachloroethene           13.35  164   820730    95.9044 ug/L    99
  65) Dibromochloromethane        13.60  129  1001436   107.3981 ug/L    98
  66) 1,2-Dibromoethane           13.84  107   769649   104.2571 ug/L   100
  67) 1-Chlorohexane              13.91   91  1357436   114.3714 ug/L    85
  68) Chlorobenzene               14.31  112  2749755   104.7942 ug/L    99
  69) 1,1,1,2-Tetrachloroethane   14.33  131  1064040   104.4971 ug/L    99
  70) Ethylbenzene                14.33  106  1566134   118.2335 ug/L    83
  71) m-,p-Xylene                 14.41  106  3601315   232.3784 ug/L    78
  72) o-Xylene                    14.94  106  1844588   116.6968 ug/L    82
  73) Styrene                     14.97  104  3029449   117.0723 ug/L    93
  74) Bromoform                   15.45  173   613727    83.5376 ug/L    98
  75) Isopropylbenzene            15.32  105  4243359   116.1316 ug/L    93
  77) 1,1,2,2-Tetrachloroethane   15.53   83   900733   103.4507 ug/L    97
  79) 1,2,3-Trichloropropane      15.71  110   263577   101.5475 ug/L #  41
  80) trans-1,4-Dichloro-2-Buten  15.75   53   321169   129.3510 ug/L #   1
  81) n-Propylbenzene             15.80   91  4950991   114.0440 ug/L    94
  82) Bromobenzene                15.93  156  1143723    95.7664 ug/L    53
  83) 1,3,5-Trimethylbenzene      15.97  105  3680953   119.2974 ug/L    90
  84) 2-Chlorotoluene             16.06   91  3152020    99.8062 ug/L    95
  85) 4-Chlorotoluene             16.10   91  3278682   123.8892 ug/L    83
  86) a-Methylstyrene             16.35  118  2112187   117.5795 ug/L    91
  87) tert-Butylbenzene           16.41  134   794965   110.7462 ug/L    81
  88) 1,2,4-Trimethylbenzene      16.45  105  3750776   118.6295 ug/L    90
  89) sec-Butylbenzene            16.66  105  4213742   118.6565 ug/L    97
  90) p-Isopropyltoluene          16.80  119  3675400   117.7571 ug/L    95
  91) 1,3-Dichlorobenzene         17.00  146  2152888   102.4284 ug/L    98
  92) 1,4-Dichlorobenzene         17.11  146  2161815    99.4054 ug/L    97
  93) n-Butylbenzene              17.29   91  3207908   116.1613 ug/L    97
  94) 1,2-Dichlorobenzene         17.58  146  2010785    98.3892 ug/L    98
  95) 1,2-Dibromo-3-Chloropropan  18.50   75   179188   116.1864 ug/L    99
  96) 1,2,4-Trichlorobenzene      19.56  180  1346795    91.6653 ug/L   100
  97) Hexachlorobutadiene         19.70  225   496850    89.1880 ug/L    96
  98) Naphthalene                 19.91  128  2718036    96.3765 ug/L    99
  99) 1,2,3-Trichlorobenzene      20.20  180  1210049    89.1806 ug/L    98


 -------------------------------------------------------------------------
 (#) = qualifier out of range (m) = manual integration
 11M96669.D  8260_WT.M      Tue Nov 05 20:58:25 2013                           Page 2
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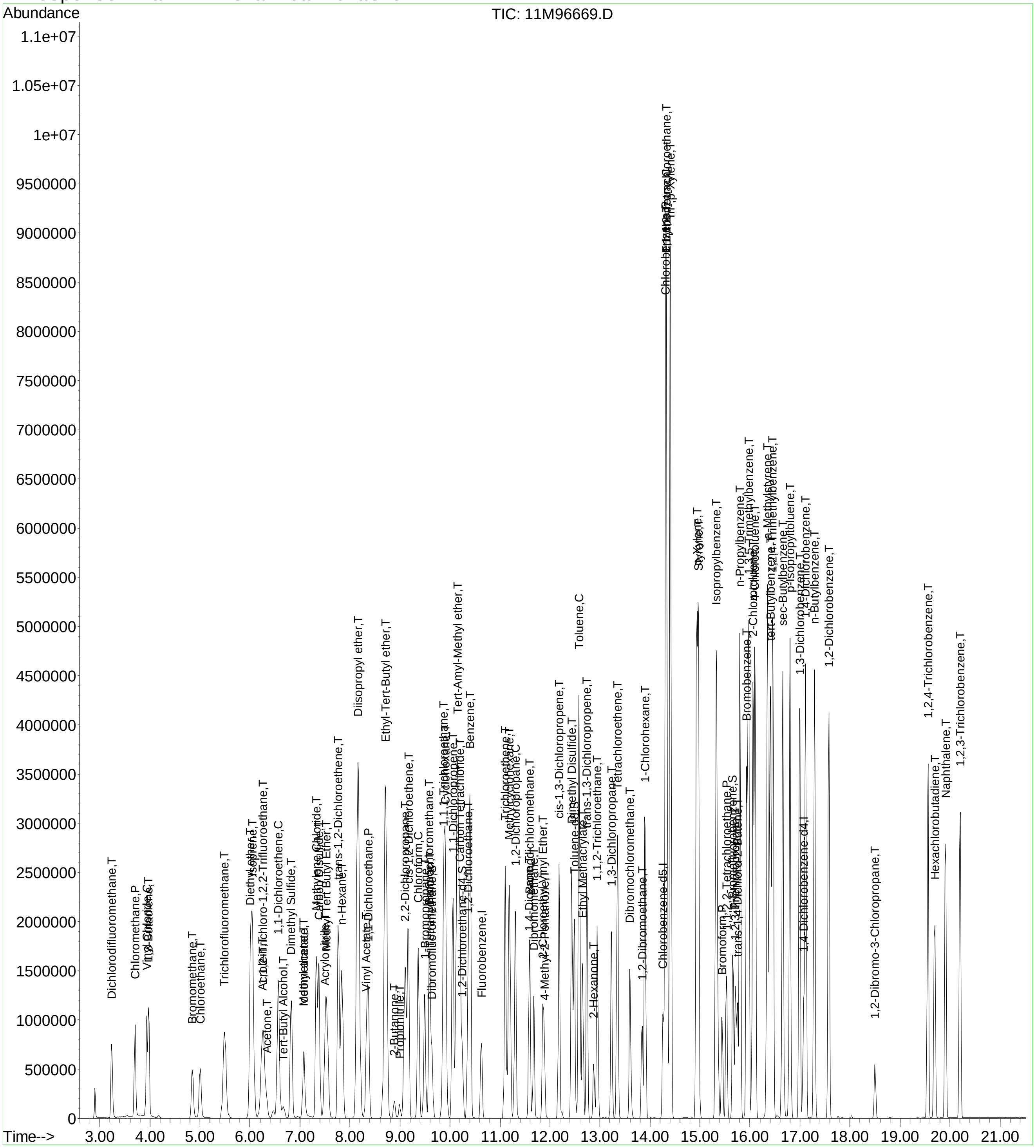
Quantitation Report (Not Reviewed)

Data File : C:\MSDchem\1\data\110513\11M96669.D Vial: 9
Acq On : 5 Nov 2013 20:36 Operator: FJB
Sample : WG451178-09 100ug/L STD 8260 Inst : hpms11
Misc : 1,1 STD61183 Multiplr: 1.00
MS Integration Params: rteint.p
Quant Time: Nov 5 20:58 2013 Quant Results File: 8260_WT.RES

Method : C:\MSDCHEM\1\METHODS\8260_WT.M (RTE Integrator)
Title : 8260B/624 (SOP: OVL MSV01) Water 11/05/13 HPMS11
Last Update : Wed Oct 23 10:24:39 2013
Response via : Initial Calibration



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                         Quantitation Report    (Not Reviewed)

Data File : C:\MSDchem\1\data\110513\11M96670.D         Vial: 10
Acq On    :  5 Nov 2013  21:08                        Operator: FJB
Sample    : WG451178-10 200ug/L STD 8260              Inst    : hpms11
Misc      : 1,1 STD61183                              Multiplr: 1.00
MS Integration Params: rteint.p
Quant Time: Nov 05 21:30:06 2013          Quant Results File: 8260_WT.RES

Quant Method : C:\MSDCHEM\1\METHODS\8260_WT.M (RTE Integrator)
Title        : 8260B/624 (SOP: OVL MSV01) Water 11/05/13 HPMS11
Last Update  : Wed Oct 23 10:24:39 2013
Response via : Initial Calibration
DataAcq Meth : 8260_WT

 Internal Standards                R.T. QIon  Response  Conc Units Dev(Min)
-------------------------------------------------------------------------
   1) Fluorobenzene               10.63   96   880967    25.00 ug/L    0.00
  56) Chlorobenzene-d5            14.26  117   700925    25.00 ug/L   -0.01
  76) 1,4-Dichlorobenzene-d4      17.07  152   380041    25.00 ug/L   -0.01

 System Monitoring Compounds
  37) Dibromofluoromethane         9.64  111   983884   108.8869 ug/L -0.01
   Spiked Amount     25.000   Range  86 - 118    Recovery   =  435.56%#
  43) 1,2-Dichloroethane-d4       10.25   65  1102637   133.2804 ug/L  0.00
   Spiked Amount     25.000   Range  80 - 120    Recovery   =  533.12%#
  57) Toluene-d8                  12.49   98  3264625   103.9713 ug/L  0.00
   Spiked Amount     25.000   Range  88 - 110    Recovery   =  415.88%#
  78) p-Bromofluorobenzene        15.65   95  1417196   106.8369 ug/L -0.01
   Spiked Amount     25.000   Range  86 - 115    Recovery   =  427.36%#

 Target Compounds                                                Qvalue
   2) Dichlorodifluoromethane      3.24   85  1787398   283.4035 ug/L    96
   3) Chloromethane                3.70   50  2327600   422.1264 ug/L   100
   4) Vinyl Chloride               3.93   62  2296308   302.9814 ug/L    97
   5) 1,3-Butadiene                3.97   54  1092757   223.4923 ug/L    96
   6) Bromomethane                 4.85   94  1129812   299.0084 ug/L    99
   7) Chloroethane                 5.00   64  1341426   247.9557 ug/L    99
   8) Trichlorofluoromethane       5.49  101  3180086   262.1736 ug/L   100
   9) Diethyl ether                6.02   59     8215     1.4255 ug/L    98
  10) Isoprene                     6.05   67  2590950   223.6392 ug/L    83
  11) Acrolein                     6.25   56     2077    12.3246 ug/L    81
  12) 1,1,2-Trichloro-1,2,2-Trif   6.27  101  1856780   242.7578 ug/L    90
  13) Acetone                      6.34   43   415708   242.3855 ug/L    88
  14) 1,1-Dichloroethene           6.57   61  3117301   278.4048 ug/L    93
  15) Tert-Butyl Alcohol           6.67   59     8498    15.7393 ug/L #  75
  16) Dimethyl Sulfide             6.82   62  1848034   233.7326 ug/L    84
  17) Iodomethane                  7.07  142  1585021   178.9170 ug/L    93
  18) Methyl acetate               7.07   43  1162152   269.1069 ug/L    92
  19) Methylene Chloride           7.33   84  1896931   214.2356 ug/L    86
  20) Carbon Disulfide             7.37   76  5466555   208.0208 ug/L    97
  21) Acrylonitrile                7.53   53    53472    24.0094 ug/L #  34
  22) Methyl Tert Butyl Ether      7.53   73  4775479   227.2045 ug/L    97
  23) trans-1,2-Dichloroethene     7.77   96  1939611   225.3503 ug/L    89
  24) n-Hexane                     7.84   57  2359400   270.5200 ug/L    97
  25) Diisopropyl ether            8.17   45    13716     0.5587 ug/L #  77
  26) Vinyl Acetate                8.32   43  2553671   223.1479 ug/L    97
  27) 1,1-Dichloroethane           8.36   63  3532569   251.9272 ug/L    96
  28) Ethyl-Tert-Butyl ether       8.72   59    12242     0.5360 ug/L    90
  29) 2-Butanone                   8.89   43   599182   238.8252 ug/L    90
  30) Propionitrile                9.00   54     4656     5.9864 ug/L #  59
  31) 2,2-Dichloropropane          9.10   77  3284462   268.2203 ug/L    98
  32) cis-1,2-Dichloroethene       9.17   96  2116311   221.6252 ug/L    96
  33) Chloroform                   9.37   83  3426833   233.5847 ug/L    97
  34) 1-Bromopropane               9.49  122   396928   202.4308 ug/L   100
  35) Bromochloromethane           9.59  130  1231956   214.7703 ug/L    99
  36) Tetrahydrofuran              9.62   42     7323     4.5146 ug/L    90
  38) 1,1,1-Trichloroethane        9.87   97  3208450   245.6354 ug/L    91
  39) Cyclohexane                  9.91   56  3267689   273.0420 ug/L    94
  40) 1,1-Dichloropropene         10.06   75  2705896   242.1925 ug/L    96
  41) Carbon Tetrachloride        10.20  117  2986425   244.2731 ug/L    97
  42) Tert-Amyl-Methyl ether      10.14   73    11003     0.4907 ug/L #  82
-------------------------------------------------------------------------
 (#) = qualifier out of range (m) = manual integration
 11M96670.D  8260_WT.M      Tue Nov 05 21:30:06 2013                           Page 1
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                              Quantitation Report    (Not Reviewed)

     Data File : C:\MSDchem\1\data\110513\11M96670.D          Vial: 10
     Acq On    :  5 Nov 2013  21:08                        Operator: FJB
     Sample    : WG451178-10 200ug/L STD 8260              Inst    : hpms11
     Misc      : 1,1 STD61183                              Multiplr: 1.00
     MS Integration Params: rteint.p
     Quant Time: Nov 05 21:30:06 2013          Quant Results File: 8260_WT.RES

     Quant Method : C:\MSDCHEM\1\METHODS\8260_WT.M (RTE Integrator)
     Title        : 8260B/624 (SOP: OVL MSV01) Water 11/05/13 HPMS11
     Last Update  : Wed Oct 23 10:24:39 2013
     Response via : Initial Calibration
     DataAcq Meth : 8260_WT


           Compound                     R.T. QIon  Response  Conc Unit   Qvalue
      ---------------------------------------------------------------------------
       44) 1,2-Dichloroethane          10.36   62  2646626   261.9877 ug/L    94
       45) Benzene                     10.40   78  6663051   203.2442 ug/L    96
       46) Trichloroethene             11.10  130  2044401   215.8921 ug/L   100
       47) Methylcyclohexane           11.19   83  2807705   234.2656 ug/L    91
       48) 1,2-Dichloropropane         11.31   63  1995749   244.1507 ug/L    86
       49) 1,4-Dioxane                 11.58   88     4582    59.2996 ug/L #  38
       50) Bromodichloromethane        11.59   83  2747041   249.4769 ug/L    98
       51) Dibromomethane              11.67   93  1117488   222.9984 ug/L    91
       52) 2-Chloroethyl Vinyl Ether   11.86   63   973802   236.4528 ug/L    98
       53) 4-Methyl-2-Pentanone        11.88   58   528597   237.7654 ug/L    99
       54) cis-1,3-Dichloropropene     12.18   75  3170436   233.1948 ug/L    97
       55) Dimethyl Disulfide          12.44   79  1857967   228.4478 ug/L    95
       58) Toluene                     12.58   91  6747612   191.2661 ug/L    91
       59) Ethyl Methacrylate          12.66   69  2061144   202.3050 ug/L    88
       60) trans-1,3-Dichloropropene   12.74   75  2866299   230.6072 ug/L    93
       61) 1,1,2-Trichloroethane       12.95   97  1448816   203.2078 ug/L    94
       62) 2-Hexanone                  12.87   43   959760   256.8093 ug/L    86
       63) 1,3-Dichloropropane         13.23   76  2575606   210.9587 ug/L    93
       64) Tetrachloroethene           13.35  164  1573837   188.5719 ug/L    99
       65) Dibromochloromethane        13.60  129  1974205   217.0924 ug/L    98
       66) 1,2-Dibromoethane           13.84  107  1513238   210.1839 ug/L   100
       67) 1-Chlorohexane              13.91   91  2576721   222.6100 ug/L    85
       68) Chlorobenzene               14.31  112  5097697   199.2032 ug/L    94
       69) 1,1,1,2-Tetrachloroethane   14.33  131  2089687   210.4295 ug/L   100
       70) Ethylbenzene                14.33  106  3077188   238.2017 ug/L    64
       71) m-,p-Xylene                 14.41  106  6458714   427.3265 ug/L    62
       72) o-Xylene                    14.94  106  3546479   230.0573 ug/L    73
       73) Styrene                     14.97  104  5610041   222.2981 ug/L    96
       74) Bromoform                   15.45  173  1231388   171.5157 ug/L    99
       75) Isopropylbenzene            15.32  105  7368811   206.7842 ug/L    86
       77) 1,1,2,2-Tetrachloroethane   15.53   83  1779833   205.6953 ug/L    96
       79) 1,2,3-Trichloropropane      15.71  110   526753   204.2098 ug/L #  40
       80) trans-1,4-Dichloro-2-Buten  15.75   53   644998   261.0920 ug/L #   1
       81) n-Propylbenzene             15.80   91  8147173   188.8404 ug/L    85
       82) Bromobenzene                15.93  156  2230424   187.9264 ug/L    58
       83) 1,3,5-Trimethylbenzene      15.97  105  6478737   211.2852 ug/L    84
       84) 2-Chlorotoluene             16.06   91  5528178   176.1401 ug/L   100
       85) 4-Chlorotoluene             16.06   91  5528178   210.1959 ug/L    79
       86) a-Methylstyrene             16.35  118  3958566   221.7405 ug/L    93
       87) tert-Butylbenzene           16.41  134  1541808   216.1319 ug/L    74
       88) 1,2,4-Trimethylbenzene      16.46  105  6527142   207.7316 ug/L    83
       89) sec-Butylbenzene            16.66  105  7228783   204.8314 ug/L    92
       90) p-Isopropyltoluene          16.80  119  6367837   205.2969 ug/L    89
       91) 1,3-Dichlorobenzene         17.00  146  3965300   189.8379 ug/L    94
       92) 1,4-Dichlorobenzene         17.11  146  3988774   184.5606 ug/L    94
       93) n-Butylbenzene              17.29   91  5569266   202.9296 ug/L    93
       94) 1,2-Dichlorobenzene         17.58  146  3717921   183.0584 ug/L    94
       95) 1,2-Dibromo-3-Chloropropan  18.50   75   347202   226.5356 ug/L    99
       96) 1,2,4-Trichlorobenzene      19.56  180  2496822   171.0010 ug/L    98
       97) Hexachlorobutadiene         19.70  225   925049   167.0912 ug/L    97
       98) Naphthalene                 19.91  128  4891254   174.5195 ug/L    98
       99) 1,2,3-Trichlorobenzene      20.20  180  2266711   168.1015 ug/L   100


      ---------------------------------------------------------------------------
      (#) = qualifier out of range (m) = manual integration
      11M96670.D  8260_WT.M      Tue Nov 05 21:30:07 2013                            Page 2
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Quantitation Report   (Not Reviewed)

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Data File : C:\MSDchem\1\data\110513\11M96670.D          Vial: 10
Acq On    :  5 Nov 2013  21:08                         Operator: FJB
Sample    : WG451178-10 200ug/L STD 8260               Inst    : hpms11
Misc      : 1,1 STD61183                               Multiplr: 1.00
MS Integration Params: rteint.p
Quant Time: Nov  5 21:30 2013              Quant Results File: 8260_WT.RES

Method       : C:\MSDCHEM\1\METHODS\8260_WT.M (RTE Integrator)
Title        : 8260B/624 (SOP: OVL MSV01) Water 11/05/13 HPMS11
Last Update  : Wed Oct 23 10:24:39 2013
Response via : Initial Calibration
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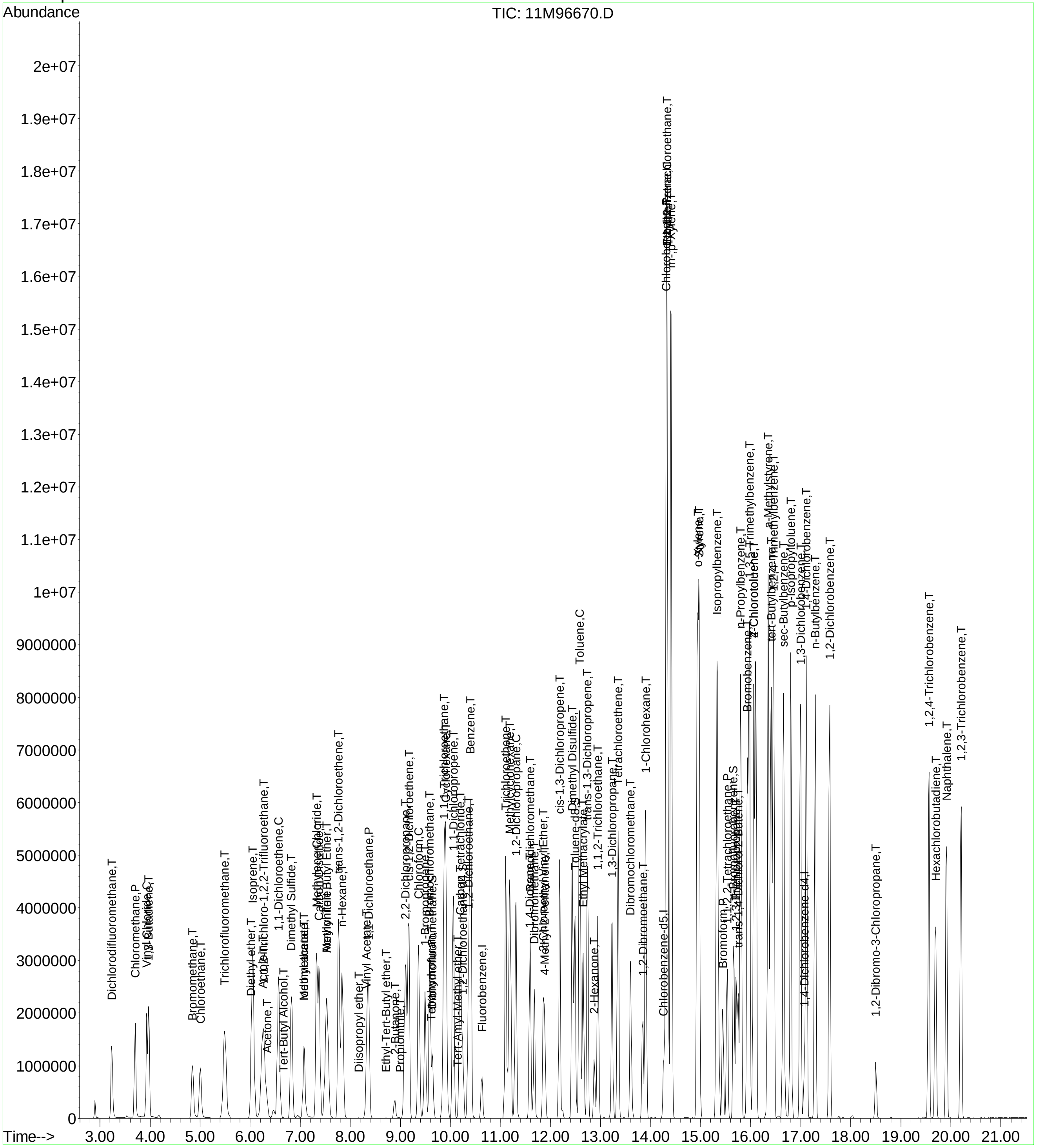

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                              Quantitation Report    (Not Reviewed)

Data File : C:\MSDchem\1\data\110513\11M96671.D          Vial: 11
Acq On    :  5 Nov 2013  21:39                       Operator: FJB
Sample    : WG451178-11 300ug/L STD 8260             Inst    : hpms11
Misc      : 1,1 STD61183                             Multiplr: 1.00
MS Integration Params: rteint.p
Quant Time: Nov 05 22:01:29 2013          Quant Results File: 8260_WT.RES

Quant Method : C:\MSDCHEM\1\METHODS\8260_WT.M (RTE Integrator)
Title        : 8260B/624 (SOP: OVL MSV01) Water 11/05/13 HPMS11
Last Update  : Wed Oct 23 10:24:39 2013
Response via : Initial Calibration
DataAcq Meth : 8260_WT

 Internal Standards                 R.T. QIon  Response  Conc Units Dev(Min)
 -------------------------------------------------------------------------
   1) Fluorobenzene               10.63   96   835552    25.00 ug/L    0.00
  56) Chlorobenzene-d5            14.26  117   686338    25.00 ug/L   -0.01
  76) 1,4-Dichlorobenzene-d4      17.08  152   365159    25.00 ug/L    0.00

 System Monitoring Compounds
  37) Dibromofluoromethane         9.64  111  1425100   166.2889 ug/L -0.01
   Spiked Amount     25.000   Range  86 - 118    Recovery   =  665.16%#
  43) 1,2-Dichloroethane-d4       10.25   65  1579307   201.2734 ug/L  0.00
   Spiked Amount     25.000   Range  80 - 120    Recovery   =  805.08%#
  57) Toluene-d8                  12.49   98  4644488   151.0607 ug/L  0.00
   Spiked Amount     25.000   Range  88 - 110    Recovery   =  604.24%#
  78) p-Bromofluorobenzene        15.65   95  2026991   159.0347 ug/L -0.01
   Spiked Amount     25.000   Range  86 - 115    Recovery   =  636.12%#

 Target Compounds                                                   Qvalue
   2) Dichlorodifluoromethane      3.24   85  2694267   450.4128 ug/L    97
   3) Chloromethane                3.70   50  3678630   703.4066 ug/L    99
   4) Vinyl Chloride               3.93   62  2722537   378.7440 ug/L    96
   5) 1,3-Butadiene                3.97   54  1501673   323.8177 ug/L    96
   6) Bromomethane                 4.84   94  1796230   501.2165 ug/L    99
   7) Chloroethane                 5.00   64  2010876   391.9033 ug/L    99
   8) Trichlorofluoromethane       5.49  101  4747511   412.6693 ug/L    99
   9) Diethyl ether                6.01   59  2072591   379.2054 ug/L    92
  10) Isoprene                     6.05   67  3929677   357.6283 ug/L    84
  11) Acrolein                     6.25   56    23566    92.9635 ug/L    99
  12) 1,1,2-Trichloro-1,2,2-Trif   6.26  101  2801075   386.1211 ug/L    90
  13) Acetone                      6.35   43   593624   364.9354 ug/L    83
  14) 1,1-Dichloroethene           6.57   61  4659374   438.7445 ug/L    92
  15) Tert-Butyl Alcohol           6.68   59   399425   779.9925 ug/L    97
  16) Dimethyl Sulfide             6.82   62  2730468   364.1099 ug/L    84
  17) Iodomethane                  7.07  142  2294492   271.7730 ug/L    93
  18) Methyl acetate               7.07   43  1717141   419.2317 ug/L    93
  19) Methylene Chloride           7.33   84  2809910   347.9721 ug/L    86
  20) Carbon Disulfide             7.37   76  7665631   307.5581 ug/L    95
  21) Acrylonitrile                7.51   53   440704   208.6356 ug/L    90
  22) Methyl Tert Butyl Ether      7.53   73  6866866   344.4647 ug/L    96
  23) trans-1,2-Dichloroethene     7.77   96  2895932   354.7464 ug/L    88
  24) n-Hexane                     7.84   57  3505041   423.7182 ug/L    97
  25) Diisopropyl ether            8.16   45  8785919   377.3217 ug/L    96
  26) Vinyl Acetate                8.32   43  3506029   323.0200 ug/L    97
  27) 1,1-Dichloroethane           8.36   63  5166892   388.5080 ug/L    94
  28) Ethyl-Tert-Butyl ether       8.72   59  8235952   380.2182 ug/L    92
  29) 2-Butanone                   8.89   43   874416   367.4731 ug/L    88
  30) Propionitrile                9.00   54   268285   363.6916 ug/L   100
  31) 2,2-Dichloropropane          9.10   77  4833298   416.1569 ug/L    98
  32) cis-1,2-Dichloroethene       9.17   96  3140165   346.7195 ug/L    95
  33) Chloroform                   9.37   83  4977155   357.6999 ug/L    96
  34) 1-Bromopropane               9.50  122   585564   314.8208 ug/L   100
  35) Bromochloromethane           9.59  130  1782343   327.6095 ug/L    98
  36) Tetrahydrofuran              9.61   42   556409   361.6684 ug/L    93
  38) 1,1,1-Trichloroethane        9.87   97  4751149   383.5134 ug/L    90
  39) Cyclohexane                  9.91   56  4865755   428.6720 ug/L    93
  40) 1,1-Dichloropropene         10.06   75  3994139   376.9285 ug/L    95
  41) Carbon Tetrachloride        10.20  117  4413170   380.5930 ug/L    97
  42) Tert-Amyl-Methyl ether      10.15   73  6864390   322.7926 ug/L    95
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 (#) = qualifier out of range (m) = manual integration
 11M96671.D  8260_WT.M      Tue Nov 05 22:01:30 2013                           Page 1
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                               Quantitation Report    (Not Reviewed)
Data File : C:\MSDchem\1\data\110513\11M96671.D          Vial: 11
Acq On    :  5 Nov 2013  21:39                       Operator: FJB
Sample    : WG451178-11 300ug/L STD 8260             Inst    : hpms11
Misc      : 1,1 STD61183                             Multiplr: 1.00
MS Integration Params: rteint.p
Quant Time: Nov 05 22:01:29 2013           Quant Results File: 8260_WT.RES

Quant Method : C:\MSDCHEM\1\METHODS\8260_WT.M (RTE Integrator)
Title        : 8260B/624 (SOP: OVL MSV01) Water 11/05/13 HPMS11
Last Update  : Wed Oct 23 10:24:39 2013
Response via : Initial Calibration
DataAcq Meth : 8260_WT


      Compound                     R.T. QIon  Response  Conc Unit   Qvalue
 --------------------------------------------------------------------------
  44) 1,2-Dichloroethane          10.36   62  3794853   396.0677 ug/L    92
  45) Benzene                     10.40   78  9033224   290.5186 ug/L    90
  46) Trichloroethene             11.10  130  3053533   339.9847 ug/L    99
  47) Methylcyclohexane           11.19   83  4146161   364.7450 ug/L    90
  48) 1,2-Dichloropropane         11.31   63  2950483   380.5671 ug/L    86
  49) 1,4-Dioxane                 11.58   88    43130   588.5219 ug/L   100
  50) Bromodichloromethane        11.59   83  4006096   383.5948 ug/L    97
  51) Dibromomethane              11.67   93  1636451   344.3087 ug/L    91
  52) 2-Chloroethyl Vinyl Ether   11.86   63  1402332   359.0135 ug/L    98
  53) 4-Methyl-2-Pentanone        11.89   58   772426   366.3254 ug/L    99
  54) cis-1,3-Dichloropropene     12.18   75  4572567   354.6061 ug/L    95
  55) Dimethyl Disulfide          12.44   79  2731465   354.1040 ug/L    98
  58) Toluene                     12.58   91  8956746   259.2816 ug/L    84
  59) Ethyl Methacrylate          12.66   69  2946701   295.2330 ug/L    88
  60) trans-1,3-Dichloropropene   12.74   75  4121023   338.6023 ug/L    91
  61) 1,1,2-Trichloroethane       12.95   97  2152785   308.3623 ug/L    94
  62) 2-Hexanone                  12.87   43  1360481   371.7698 ug/L    86
  63) 1,3-Dichloropropane         13.23   76  3731965   312.1685 ug/L    93
  64) Tetrachloroethene           13.35  164  2396669   293.2641 ug/L    99
  65) Dibromochloromethane        13.60  129  2909654   326.7587 ug/L    98
  66) 1,2-Dibromoethane           13.84  107  2224374   315.5248 ug/L   100
  67) 1-Chlorohexane              13.91   91  3782019   333.6834 ug/L    86
  68) Chlorobenzene               14.31  112  7073978   282.3056 ug/L    89
  69) 1,1,1,2-Tetrachloroethane   14.33  131  3079939   316.7387 ug/L   100
  70) Ethylbenzene                14.33  106  4559810   360.4717 ug/L    50
  71) m-,p-Xylene                 14.41  106  8582027   579.8787 ug/L    52
  72) o-Xylene                    14.94  106  5172858   342.6911 ug/L    63
  73) Styrene                     14.97  104  7642163   309.2569 ug/L    98
  74) Bromoform                   15.45  173  1788353   254.2290 ug/L   100
  75) Isopropylbenzene            15.32  105  9673857   277.2382 ug/L #  77
  77) 1,1,2,2-Tetrachloroethane   15.53   83  2527143   303.9649 ug/L    96
  79) 1,2,3-Trichloropropane      15.72  110   759391   306.3963 ug/L #  38
  80) trans-1,4-Dichloro-2-Buten  15.75   53   928163   390.8789 ug/L #   1
  81) n-Propylbenzene             15.80   91 10289739   248.2223 ug/L #  74
  82) Bromobenzene                15.93  156  3256314   285.5453 ug/L    60
  83) 1,3,5-Trimethylbenzene      15.97  105  8600266   291.9033 ug/L    77
  84) 2-Chlorotoluene             16.06   91  7210965   239.1212 ug/L    79
  85) 4-Chlorotoluene             16.06   91  7210965   285.3540 ug/L #  55
  86) a-Methylstyrene             16.35  118  5550219   323.5681 ug/L    96
  87) tert-Butylbenzene           16.41  134  2313428   337.5150 ug/L    65
  88) 1,2,4-Trimethylbenzene      16.46  105  8602545   284.9409 ug/L    74
  89) sec-Butylbenzene            16.66  105  9474098   279.3944 ug/L    84
  90) p-Isopropyltoluene          16.80  119  8453531   283.6463 ug/L    82
  91) 1,3-Dichlorobenzene         17.00  146  5595828   278.8173 ug/L    91
  92) 1,4-Dichlorobenzene         17.11  146  5578784   268.6504 ug/L    90
  93) n-Butylbenzene              17.29   91  7546840   286.1943 ug/L    86
  94) 1,2-Dichlorobenzene         17.58  146  5278608   270.4939 ug/L    91
  95) 1,2-Dibromo-3-Chloropropan  18.50   75   537030   364.6710 ug/L    99
  96) 1,2,4-Trichlorobenzene      19.56  180  3862731   275.3303 ug/L    95
  97) Hexachlorobutadiene         19.70  225  1476150   277.5030 ug/L    96
  98) Naphthalene                 19.91  128  6923635   257.1025 ug/L #  94
  99) 1,2,3-Trichlorobenzene      20.20  180  3474915   268.2058 ug/L    98


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 (#) = qualifier out of range (m) = manual integration
 11M96671.D  8260_WT.M      Tue Nov 05 22:01:30 2013                        Page 2
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                              Quantitation Report    (Not Reviewed)

  Data File : C:\MSDchem\1\data\110513\11M96671.D          Vial: 11
  Acq On    :  5 Nov 2013  21:39                       Operator: FJB
  Sample    : WG451178-11 300ug/L STD 8260             Inst    : hpms11
  Misc      : 1,1 STD61183                             Multiplr: 1.00
  MS Integration Params: rteint.p
  Quant Time: Nov  5 22:01 2013            Quant Results File: 8260_WT.RES

  Method       : C:\MSDCHEM\1\METHODS\8260_WT.M (RTE Integrator)
  Title        : 8260B/624 (SOP: OVL MSV01) Water 11/05/13 HPMS11
  Last Update  : Wed Oct 23 10:24:39 2013
  Response via : Initial Calibration
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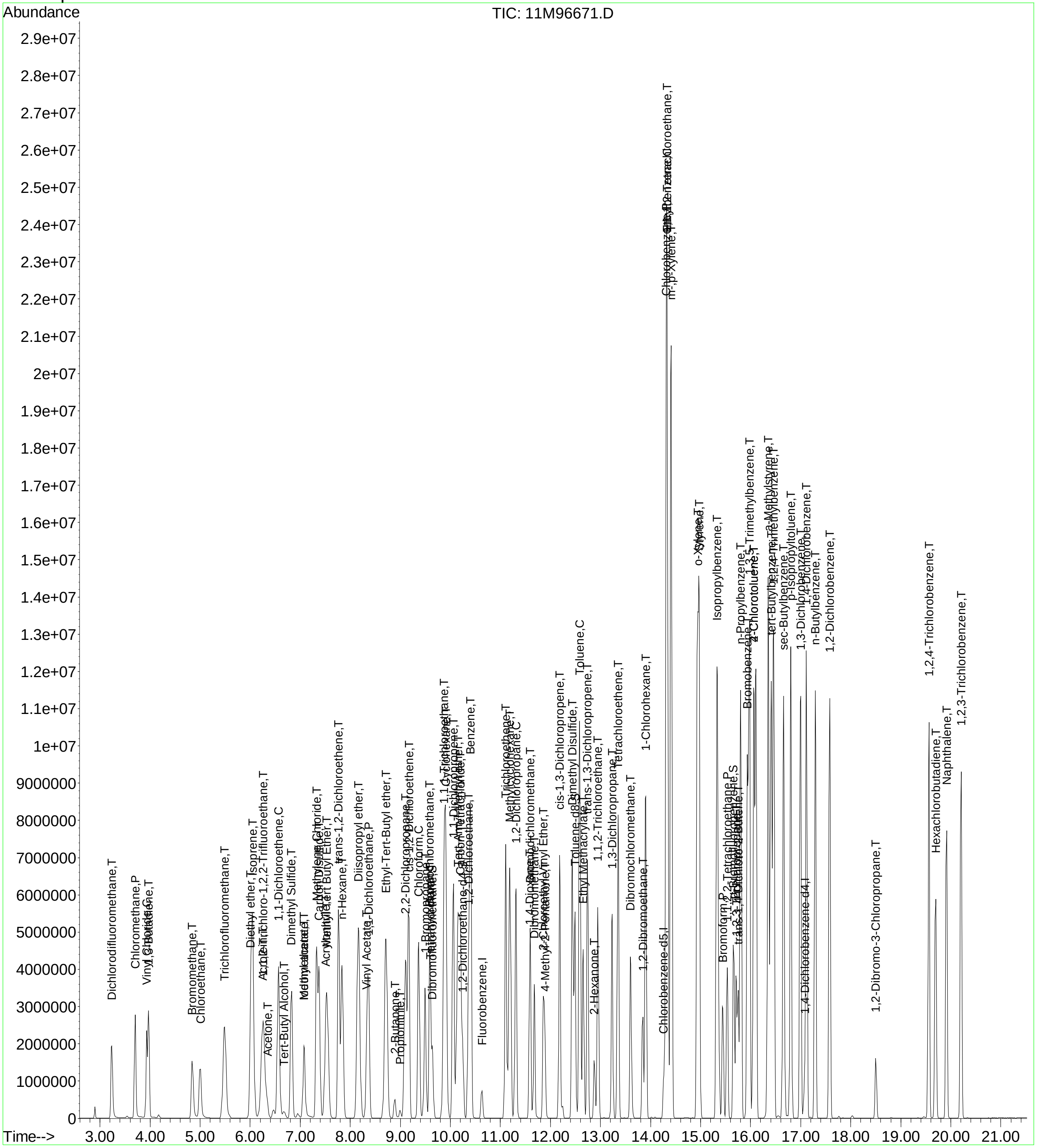

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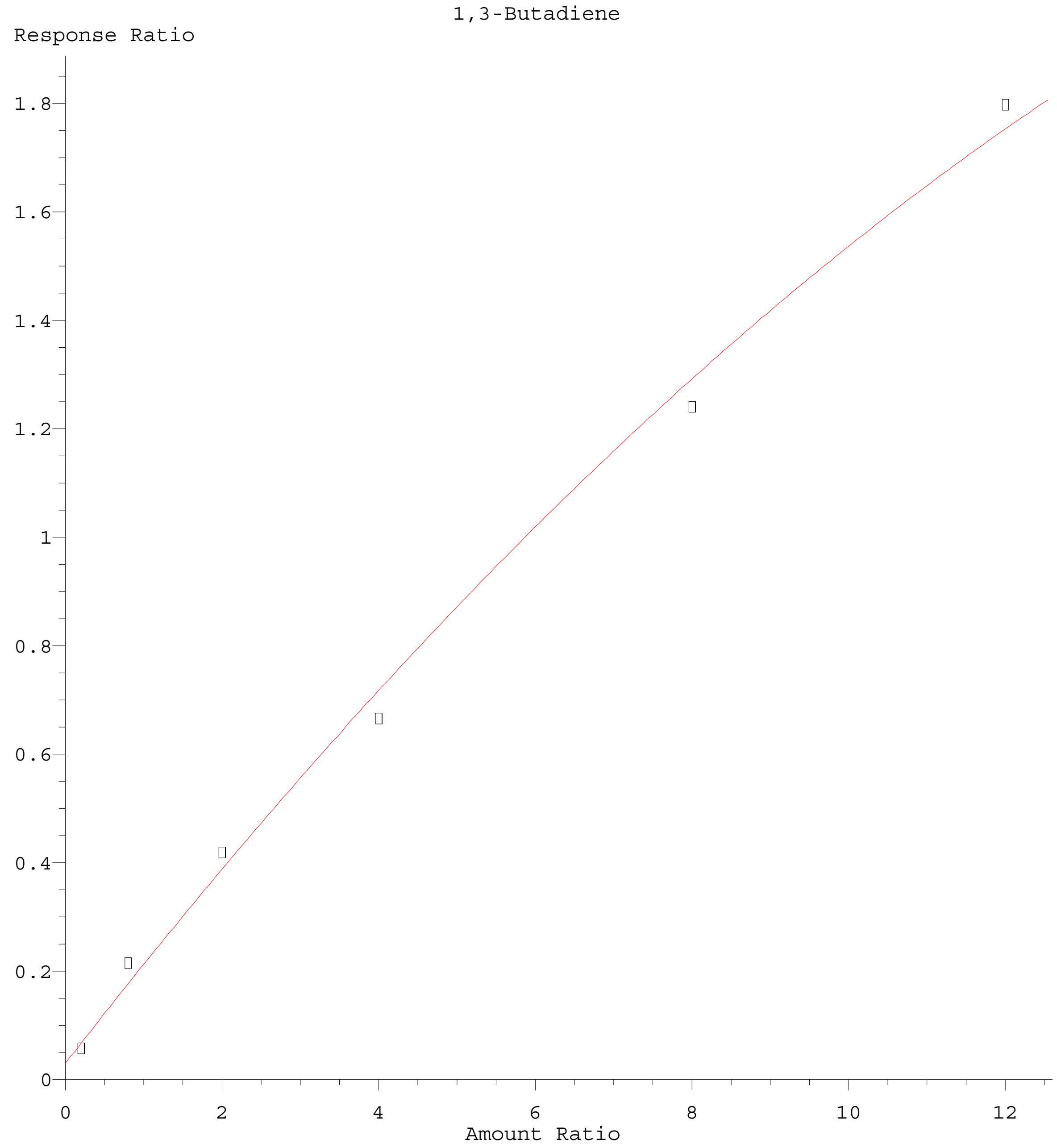
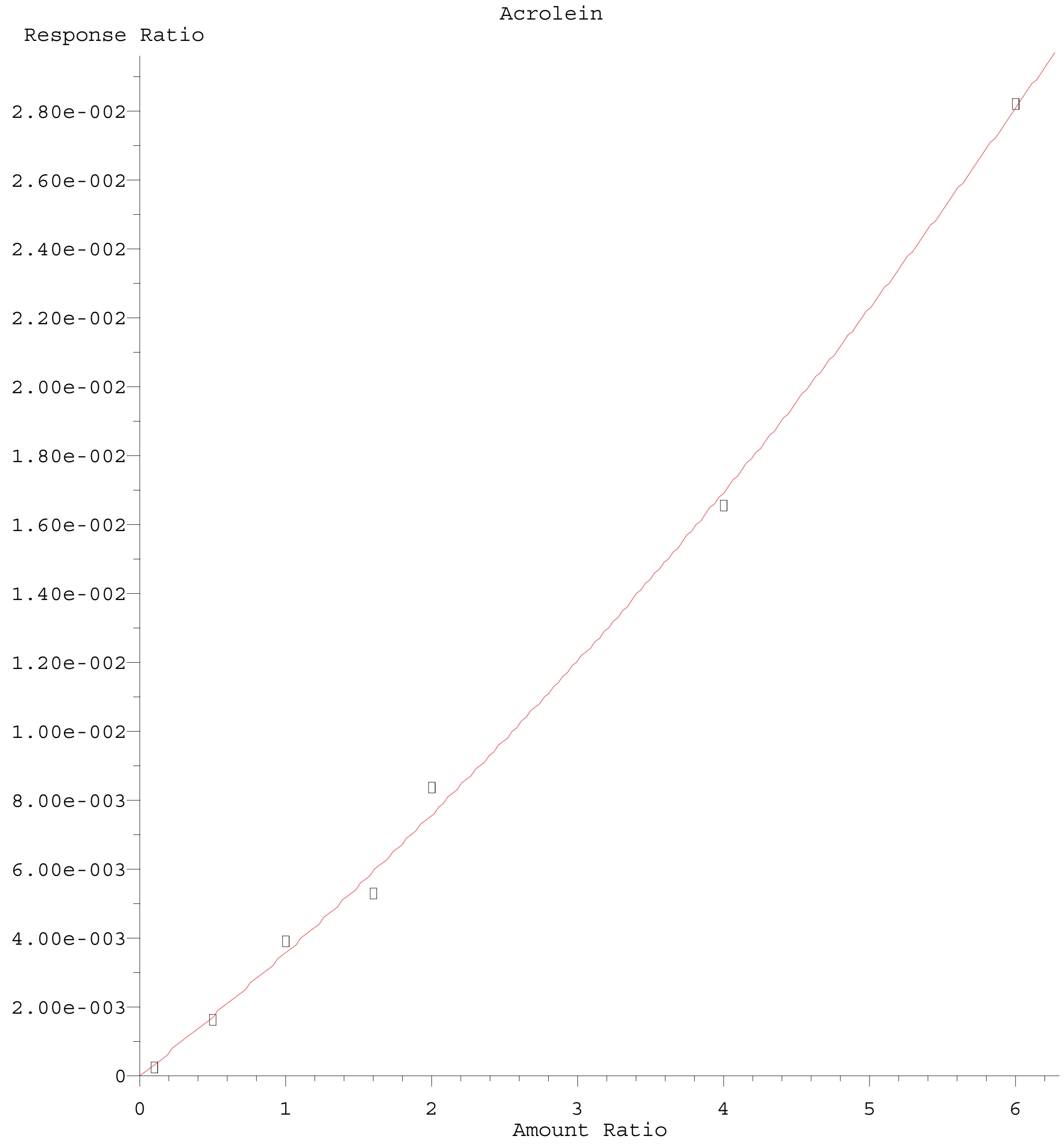
11M96671.D  8260_WT.M       Tue Nov 05 22:01:30 2013                     Page 3
```



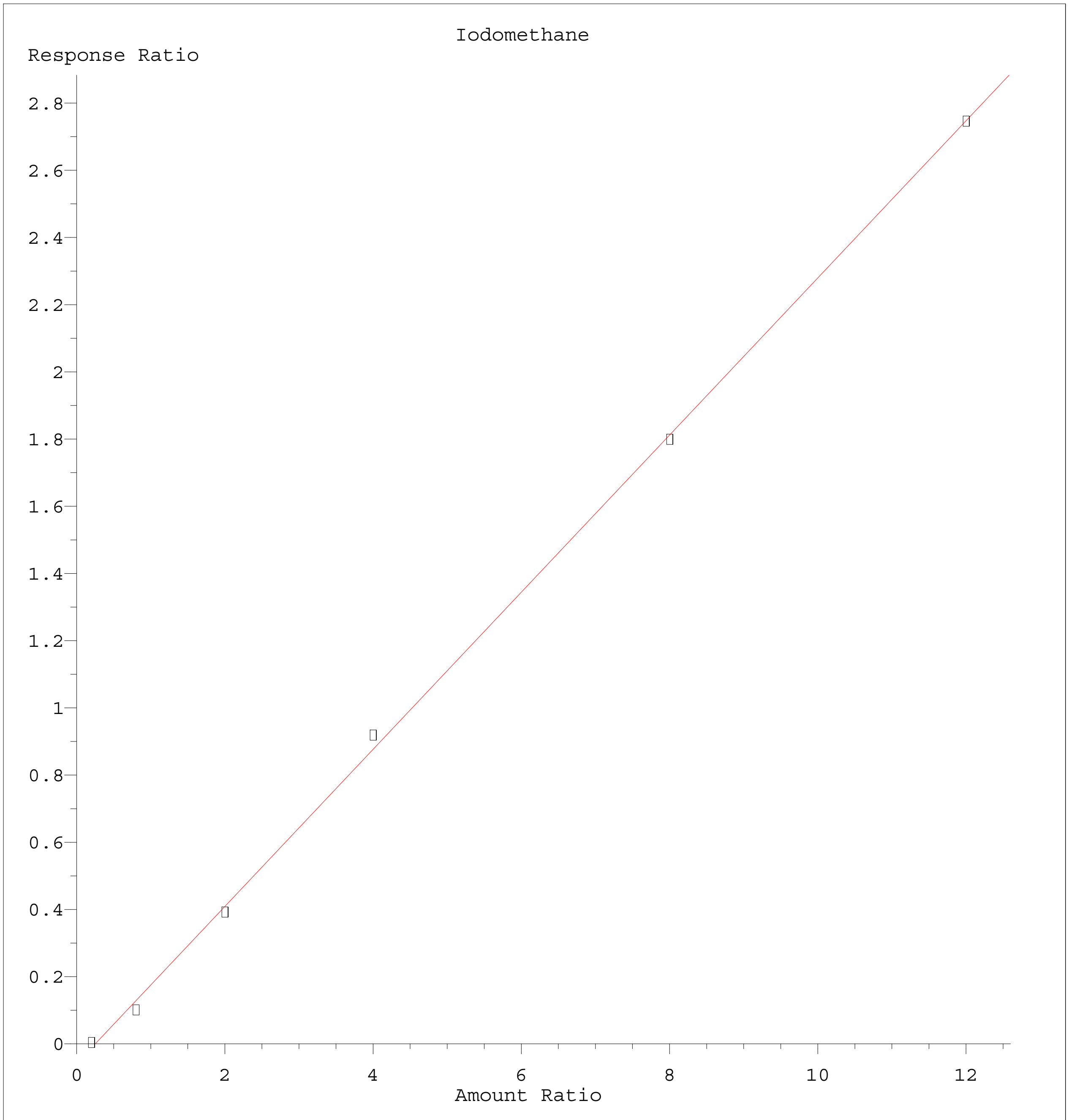
R = -3.54e-003 A*A + 1.86e-001 A + 2.99e-002
Coef of Det (r^2)=0.999   Curve Fit: Quadratic w(1/a)

Method Name: C:\MSDCHEM\1\METHODS\8260_WT.M
Calibration Table Last Updated: Wed Nov 06 14:52:21 2013



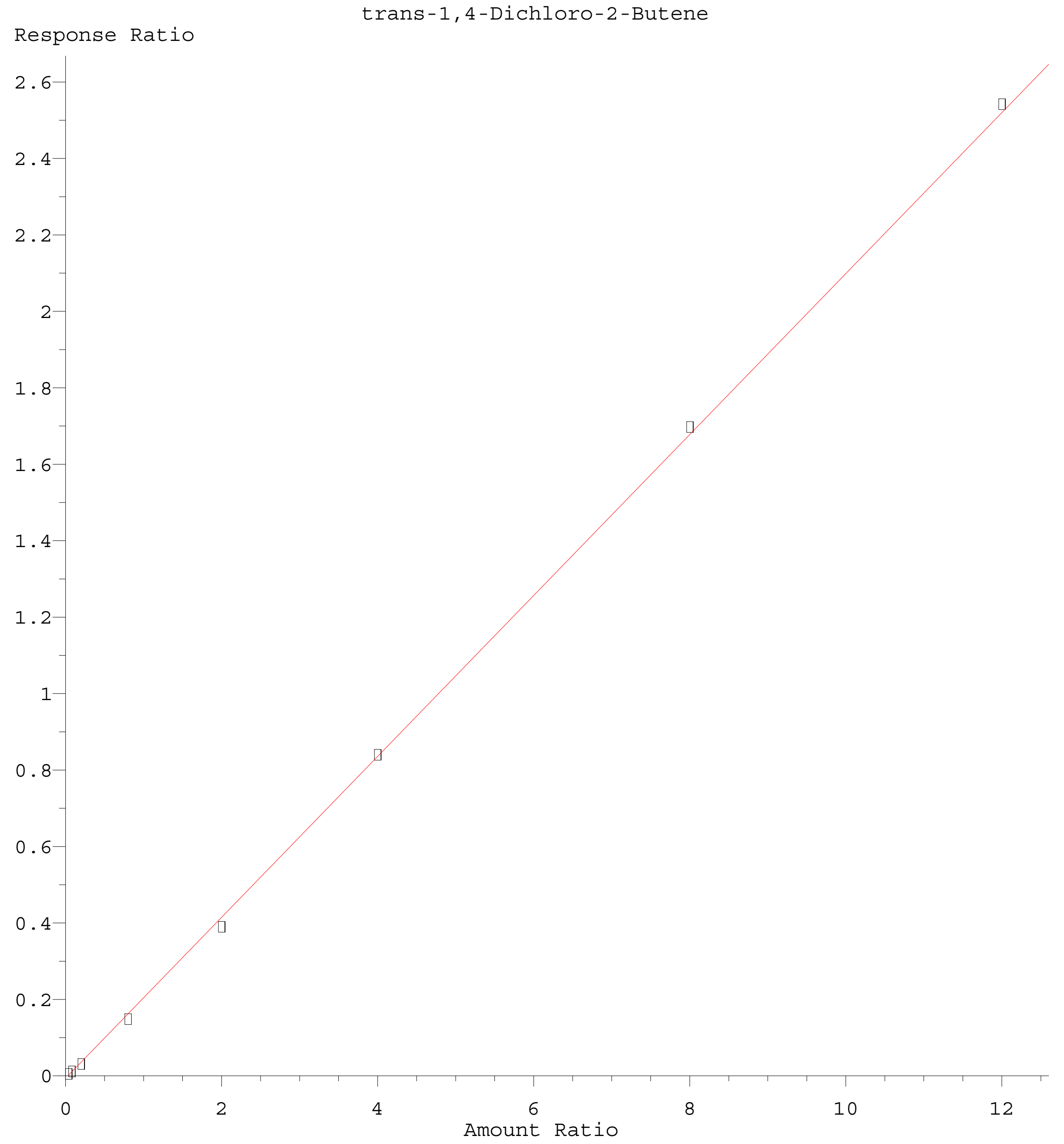
R = 2.23e-004 A*A + 3.34e-003 A + 9.05e-006
Coef of Det (r^2)=0.998   Curve Fit: Quadratic

Method Name: C:\MSDCHEM\1\METHODS\8260_WT.M
Calibration Table Last Updated: Wed Nov 06 14:52:21 2013



Resp Ratio = 2.34e-001 * Amt - 5.87e-002
Coef of Det (r^2) = 0.999   Curve Fit: Linear

Method Name: C:\MSDCHEM\1\METHODS\8260_WT.M
Calibration Table Last Updated: Wed Nov 06 14:52:21 2013



Resp Ratio = 2.10e-001 * Amt - 5.39e-003
Coef of Det (r^2) = 0.999   Curve Fit: wlr(1/a)

Method Name: C:\MSDCHEM\1\METHODS\8260_WT.M
Calibration Table Last Updated: Wed Nov 06 14:52:21 2013

```
                               Quantitation Report    (Not Reviewed)

Data File : C:\MSDCHEM\1\DATA\110513\11M96673.D          Vial: 13
Acq On    :  5 Nov 2013  22:42                       Operator: FJB
Sample    : WG451178-12 20ug/L ALT SRC 8260          Inst    : hpms11
Misc      : 1,1 STD61121                             Multiplr: 1.00
MS Integration Params: rteint.p
Quant Time: Nov 06 14:52:47 2013           Quant Results File: 8260_WT.RES

Quant Method : C:\MSDCHEM\1\METHODS\8260_WT.M (RTE Integrator)
Title        : 8260B/624 (SOP: OVL MSV01) Water 11/05/13 HPMS11
Last Update  : Wed Nov 06 14:52:21 2013
Response via : Initial Calibration
DataAcq Meth : 8260_WT

 Internal Standards                R.T. QIon  Response  Conc Units Dev(Min)
 -------------------------------------------------------------------------
   1) Fluorobenzene               10.63   96   853018    25.00 ug/L    0.00
  56) Chlorobenzene-d5            14.26  117   672477    25.00 ug/L    0.00
  76) 1,4-Dichlorobenzene-d4      17.07  152   366330    25.00 ug/L    0.00

 System Monitoring Compounds
  37) Dibromofluoromethane         9.64  111   100687     9.7575 ug/L  0.00
   Spiked Amount     25.000   Range  86 - 118    Recovery   =   39.04%#
  43) 1,2-Dichloroethane-d4       10.25   65   111589     9.5754 ug/L  0.00
   Spiked Amount     25.000   Range  80 - 120    Recovery   =   38.32%#
  57) Toluene-d8                  12.49   98   351398    10.4046 ug/L  0.00
   Spiked Amount     25.000   Range  88 - 110    Recovery   =   41.60%#
  78) p-Bromofluorobenzene        15.65   95   146143     9.9335 ug/L  0.00
   Spiked Amount     25.000   Range  86 - 115    Recovery   =   39.72%#

 Target Compounds                                                   Qvalue
   2) Dichlorodifluoromethane      3.24   85   260003    30.9006 ug/L    98
   3) Chloromethane                3.70   50   275386    23.1880 ug/L    98
   4) Vinyl Chloride               3.93   62   267431    23.7626 ug/L    99
   5) 1,3-Butadiene                3.97   54    74973     7.8349 ug/L    93
   6) Bromomethane                 4.84   94    99057    20.5139 ug/L    99
   7) Chloroethane                 5.00   64   137587    21.0128 ug/L    99
   8) Trichlorofluoromethane       5.49  101   362854    23.1575 ug/L   100
   9) Diethyl ether                6.01   59   618428    94.0690 ug/L    92
  10) Isoprene                     6.05   67   283516    21.9865 ug/L    82
  11) Acrolein                     6.25   56    40298   221.9320 ug/L    98
  12) 1,1,2-Trichloro-1,2,2-Trif   6.26  101   208982    22.8509 ug/L    85
  13) Acetone                      6.35   43    47103    23.7704 ug/L    95
  14) 1,1-Dichloroethene           6.57   61   304155    19.6499 ug/L    94
  15) Tert-Butyl Alcohol           6.67   59   116078   188.5514 ug/L    98
  16) Dimethyl Sulfide             6.82   62   221630    25.2361 ug/L    84
  17) Iodomethane                  7.08  142    40933    11.4083 ug/L #  66
  18) Methyl acetate               7.08   43   121895    21.2297 ug/L    97
  19) Methylene Chloride           7.33   84   193475    19.5472 ug/L    89
  20) Carbon Disulfide             7.37   76   606784    21.5339 ug/L   100
  21) Acrylonitrile                7.51   53    53390    22.0796 ug/L    98
  22) Methyl Tert Butyl Ether      7.54   73   516303    22.3614 ug/L    99
  23) trans-1,2-Dichloroethene     7.77   96   195673    20.0158 ug/L    88
  24) n-Hexane                     7.84   57   231868    19.1797 ug/L    98
  25) Diisopropyl ether            8.16   45  2730664    88.2745 ug/L    97
  26) Vinyl Acetate                8.32   43   307409    26.4727 ug/L    98
  27) 1,1-Dichloroethane           8.36   63   368673    20.7599 ug/L    98
  28) Ethyl-Tert-Butyl ether       8.72   59  2516568    88.4852 ug/L    96
  29) 2-Butanone                   8.89   43    60860    21.1322 ug/L    93
  30) Propionitrile                9.00   54    75478    94.0922 ug/L    99
  31) 2,2-Dichloropropane          9.10   77   320901    18.9195 ug/L   100
  32) cis-1,2-Dichloroethene       9.17   96   214157    20.5335 ug/L    96
  33) Chloroform                   9.37   83   370643    20.7805 ug/L    99
  34) 1-Bromopropane               9.50  122    41831    22.4735 ug/L    99
  35) Bromochloromethane           9.58  130   125985    21.6728 ug/L    98
  36) Tetrahydrofuran              9.61   42   155127    90.7443 ug/L    91
  38) 1,1,1-Trichloroethane        9.87   97   339816    21.1626 ug/L    92
  39) Cyclohexane                  9.91   56   333179    19.8263 ug/L    93
  40) 1,1-Dichloropropene         10.06   75   276762    20.5059 ug/L    99
  41) Carbon Tetrachloride        10.19  117   312052    21.1330 ug/L    98
  42) Tert-Amyl-Methyl ether      10.15   73  2116734    90.3591 ug/L    91
 -------------------------------------------------------------------------
 (#) = qualifier out of range (m) = manual integration
 11M96673.D  8260_WT.M      Wed Nov 06 14:52:48 2013                                  Page 1
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                        Quantitation Report    (Not Reviewed)

  Data File : C:\MSDCHEM\1\DATA\110513\11M96673.D         Vial: 13
  Acq On    :  5 Nov 2013  22:42                      Operator: FJB
  Sample    : WG451178-12 20ug/L ALT SRC 8260         Inst    : hpms11
  Misc      : 1,1 STD61121                            Multiplr: 1.00
  MS Integration Params: rteint.p
  Quant Time: Nov 06 14:52:47 2013         Quant Results File: 8260_WT.RES

  Quant Method : C:\MSDCHEM\1\METHODS\8260_WT.M (RTE Integrator)
  Title        : 8260B/624 (SOP: OVL MSV01) Water 11/05/13 HPMS11
  Last Update  : Wed Nov 06 14:52:21 2013
  Response via : Initial Calibration
  DataAcq Meth : 8260_WT


        Compound                     R.T. QIon  Response  Conc Unit   Qvalue
   ---------------------------------------------------------------------------
    44) 1,2-Dichloroethane          10.36   62   266481    20.6675 ug/L    96
    45) Benzene                     10.40   78   766848    20.6009 ug/L    98
    46) Trichloroethene             11.10  130   209514    20.5025 ug/L    97
    47) Methylcyclohexane           11.19   83   295669    20.9102 ug/L    89
    48) 1,2-Dichloropropane         11.31   63   198039    20.4525 ug/L    85
    49) 1,4-Dioxane                 11.58   88    10866   171.6745 ug/L    88
    50) Bromodichloromethane        11.59   83   271858    20.2049 ug/L    98
    51) Dibromomethane              11.67   93   113250    21.3803 ug/L    91
    52) 2-Chloroethyl Vinyl Ether   11.86   63    96562    21.4498 ug/L    98
    53) 4-Methyl-2-Pentanone        11.89   58    52464    22.3688 ug/L    99
    54) cis-1,3-Dichloropropene     12.18   75   328819    21.2932 ug/L   100
    55) Dimethyl Disulfide          12.44   79   184671    21.7517 ug/L    90
    58) Toluene                     12.58   91   802122    21.4422 ug/L   100
    59) Ethyl Methacrylate          12.66   69   212460    23.0578 ug/L    88
    60) trans-1,3-Dichloropropene   12.74   75   271735    20.1677 ug/L    95
    61) 1,1,2-Trichloroethane       12.95   97   142526    21.0026 ug/L    97
    62) 2-Hexanone                  12.87   43    96157    22.5574 ug/L    82
    63) 1,3-Dichloropropane         13.23   76   257007    20.7241 ug/L    92
    64) Tetrachloroethene           13.35  164   160890    20.3642 ug/L    99
    65) Dibromochloromethane        13.60  129   190794    20.9817 ug/L    99
    66) 1,2-Dibromoethane           13.84  107   146418    21.1213 ug/L    99
    67) 1-Chlorohexane              13.91   91   274489    21.7372 ug/L    85
    68) Chlorobenzene               14.31  112   562617    21.3292 ug/L   100
    69) 1,1,1,2-Tetrachloroethane   14.33  131   200016    20.3351 ug/L    98
    70) Ethylbenzene                14.33  106   294821    20.1851 ug/L    95
    71) m-,p-Xylene                 14.41  106   734255    43.3541 ug/L    92
    72) o-Xylene                    14.94  106   367894    21.2558 ug/L    88
    73) Styrene                     14.97  104   595444    21.6105 ug/L    91
    74) Bromoform                   15.45  173   115032    21.6997 ug/L    96
    75) Isopropylbenzene            15.32  105   899855    22.5367 ug/L    96
    77) 1,1,2,2-Tetrachloroethane   15.53   83   169139    20.6199 ug/L    97
    79) 1,2,3-Trichloropropane      15.72  110    50038    20.5066 ug/L #  56
    80) trans-1,4-Dichloro-2-Buten  15.75   53    40258    13.6946 ug/L #   1
    81) n-Propylbenzene             15.80   91  1066280    21.3479 ug/L    99
    82) Bromobenzene                15.93  156   227334    20.6400 ug/L    55
    83) 1,3,5-Trimethylbenzene      15.97  105   756510    21.4092 ug/L    93
    84) 2-Chlorotoluene             16.06   91   693399    21.2573 ug/L    91
    85) 4-Chlorotoluene             16.10   91   695478    20.8441 ug/L   100
    86) a-Methylstyrene             16.35  118   438144    23.1797 ug/L    88
    87) tert-Butylbenzene           16.41  134   160529    21.4416 ug/L    82
    88) 1,2,4-Trimethylbenzene      16.45  105   760133    21.1907 ug/L    93
    89) sec-Butylbenzene            16.66  105   897942    22.1684 ug/L   100
    90) p-Isopropyltoluene          16.80  119   746085    21.5540 ug/L    98
    91) 1,3-Dichlorobenzene         17.00  146   440175    21.3720 ug/L    99
    92) 1,4-Dichlorobenzene         17.11  146   433926    20.0544 ug/L    98
    93) n-Butylbenzene              17.29   91   662897    21.5001 ug/L    99
    94) 1,2-Dichlorobenzene         17.58  146   421672    21.7611 ug/L   100
    95) 1,2-Dibromo-3-Chloropropan  18.50   75    33521    22.1062 ug/L    99
    96) 1,2,4-Trichlorobenzene      19.56  180   275602    21.0381 ug/L    99
    97) Hexachlorobutadiene         19.70  225   102819    20.3172 ug/L    97
    98) Naphthalene                 19.91  128   568263    22.4353 ug/L    97
    99) 1,2,3-Trichlorobenzene      20.20  180   251794    20.8748 ug/L    98


   ---------------------------------------------------------------------------
   (#) = qualifier out of range (m) = manual integration
   11M96673.D  8260_WT.M      Wed Nov 06 14:52:48 2013                          Page 2
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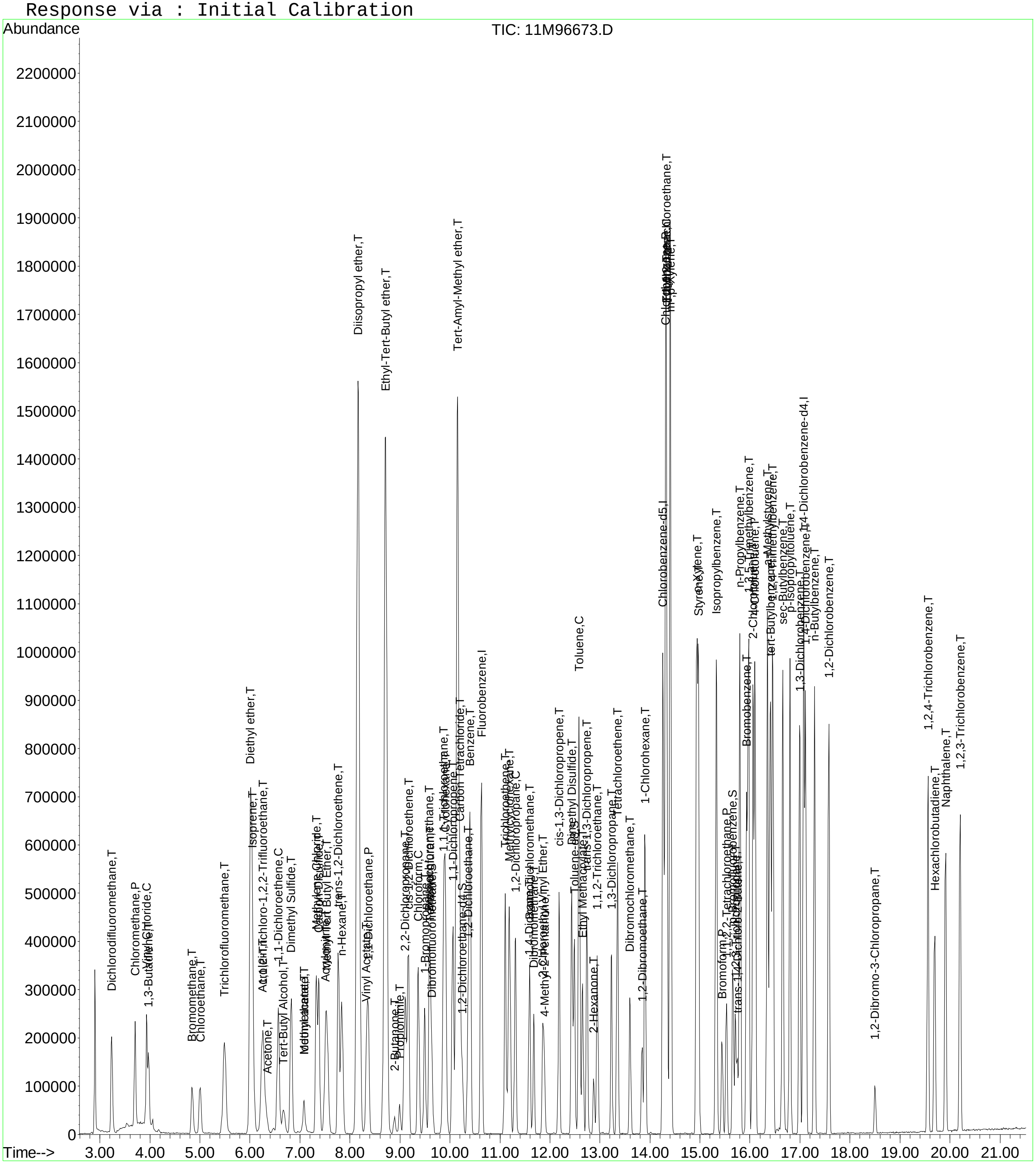
Quantitation Report   (Not Reviewed)

```
Data File : C:\MSDCHEM\1\DATA\110513\11M96673.D          Vial: 13
Acq On    :  5 Nov 2013  22:42                          Operator: FJB
Sample    : WG451178-12 20ug/L ALT SRC 8260             Inst    : hpms11
Misc      : 1,1 STD61121                                Multiplr: 1.00
MS Integration Params: rteint.p
Quant Time: Nov  6 14:52 2013            Quant Results File: 8260_WT.RES

Method       : C:\MSDCHEM\1\METHODS\8260_WT.M (RTE Integrator)
Title        : 8260B/624 (SOP: OVL MSV01) Water 11/05/13 HPMS11
Last Update  : Wed Nov 06 14:52:21 2013
Response via : Initial Calibration
```



```
                         Evaluate Continuing Calibration Report

     Data File : C:\MSDCHEM\1\DATA\110513\11M96673.D        Vial: 13
     Acq On    :  5 Nov 2013  22:42                     Operator: FJB
     Sample    : WG451178-12 20ug/L ALT SRC 8260        Inst    : hpms11
     Misc      : 1,1 STD61121                           Multiplr: 1.00
     MS Integration Params: rteint.p

     Method       : C:\MSDCHEM\1\METHODS\8260_WT.M (RTE Integrator)
     Title        : 8260B/624 (SOP: OVL MSV01) Water 11/05/13 HPMS11
     Last Update  : Wed Nov 06 14:52:21 2013
     Response via : Multiple Level Calibration

     Min. RRF     :   0.000  Min. Rel. Area :  50%  Max. R.T. Dev  0.50min
     Max. RRF Dev :  25%     Max. Rel. Area : 150%

          Compound                       Amount  Calc.      %Dev Area% Dev(min)
    -------------------------------------------------------------------------
   1 I    Fluorobenzene                 25.0000  25.0000       0.0   96   0.00
   2 T    Dichlorodifluoromethane       20.0000  30.9006     -54.5# 136   0.00
   3 P    Chloromethane                 20.0000  23.1880     -15.9  109   0.00
   4 C    Vinyl Chloride                20.0000  23.7626     -18.8  107  -0.01
   5 T    1,3-Butadiene                 20.0000   7.8349      60.8#  39  -0.01
   6 T    Bromomethane                  20.0000  20.5140      -2.6  107  -0.01
   7 T    Chloroethane                  20.0000  21.0128      -5.1   99   0.00
   8 T    Trichlorofluoromethane        20.0000  23.1575     -15.8  109   0.00
   9 T    Diethyl ether                 80.0000  94.0690     -17.6  117   0.00
  10 T    Isoprene                      20.0000  21.9865      -9.9  105   0.00
  11 T    Acrolein                      40.0000 221.9320    -454.8# 861   0.00
  12 T    1,1,2-Trichloro-1,2,2-Trifl   20.0000  22.8509     -14.3  109  -0.01
  13 T    Acetone                       20.0000  23.7705     -18.9  136   0.01
  14 C    1,1-Dichloroethene            20.0000  19.6499       1.8   93   0.00
  15 T    Tert-Butyl Alcohol           160.0000 188.5514     -17.8  124   0.00
  16 T    Dimethyl Sulfide              20.0000  25.2361     -26.2# 118   0.00
  17 T    Iodomethane                   20.0000  11.4083      43.0#  46   0.01
  18 T    Methyl acetate                20.0000  21.2297      -6.1  111   0.00
  19 T    Methylene Chloride            20.0000  19.5472       2.3   99   0.00
  20 T    Carbon Disulfide              20.0000  21.5339      -7.7   98  -0.01
  21 T    Acrylonitrile                 40.0000  22.0796      44.8#  56   0.01
  22 T    Methyl Tert Butyl Ether       20.0000  22.3614     -11.8  110   0.01
  23 T    trans-1,2-Dichloroethene      20.0000  20.0158      -0.1   96   0.00
  24 T    n-Hexane                      20.0000  19.1797       4.1   90   0.00
  25 T    Diisopropyl ether             80.0000  88.2745     -10.3  107   0.00
  26 T    Vinyl Acetate                 20.0000  26.4727     -32.4# 121   0.00
  27 P    1,1-Dichloroethane            20.0000  20.7599      -3.8   99   0.00
  28 T    Ethyl-Tert-Butyl ether        80.0000  88.4852     -10.6  109   0.01
  29 T    2-Butanone                    20.0000  21.1322      -5.7  119   0.00
  30 T    Propionitrile                 80.0000  94.0922     -17.6  119   0.00
  31 T    2,2-Dichloropropane           20.0000  18.9195       5.4   92  -0.01
  32 T    cis-1,2-Dichloroethene        20.0000  20.5335      -2.7   98   0.00
  33 C    Chloroform                    20.0000  20.7805      -3.9  101   0.00
  34 T    1-Bromopropane                20.0000  22.4735     -12.4  104   0.00
  35 T    Bromochloromethane            20.0000  21.6729      -8.4  100   0.00
  36 T    Tetrahydrofuran               80.0000  90.7443     -13.4  120   0.00
  37 S    Dibromofluoromethane          10.0000   9.7575       2.4   98   0.00
  38 T    1,1,1-Trichloroethane         20.0000  21.1626      -5.8  101   0.00
  39 T    Cyclohexane                   20.0000  19.8263       0.9   97   0.00
  40 T    1,1-Dichloropropene           20.0000  20.5059      -2.5   96   0.00
  41 T    Carbon Tetrachloride          20.0000  21.1330      -5.7  101   0.00
  42 T    Tert-Amyl-Methyl ether        80.0000  90.3591     -12.9  111   0.00
  43 S    1,2-Dichloroethane-d4         10.0000   9.5754       4.2   97   0.00
  44 T    1,2-Dichloroethane            20.0000  20.6675      -3.3   98   0.00
  45 T    Benzene                       20.0000  20.6009      -3.0   98   0.00
  46 T    Trichloroethene               20.0000  20.5025      -2.5   99   0.00
  47 T    Methylcyclohexane             20.0000  20.9102      -4.6   97   0.00
  48 C    1,2-Dichloropropane           20.0000  20.4525      -2.3   98   0.00
  49 T    1,4-Dioxane                  160.0000 171.6745      -7.3  115   0.00
  50 T    Bromodichloromethane          20.0000  20.2049      -1.0   97   0.00
  51 T    Dibromomethane                20.0000  21.3803      -6.9  104   0.00
  52 T    2-Chloroethyl Vinyl Ether     20.0000  21.4498      -7.2  103   0.00
  53 T    4-Methyl-2-Pentanone          20.0000  22.3688     -11.8  116   0.00
  54 T    cis-1,3-Dichloropropene       20.0000  21.2932      -6.5  100   0.00
  -------------------------------------------------------------------------
   (#) = Out of Range
   11M96673.D  8260_WT.M      Wed Nov 06 14:53:59 2013                          Page 1
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                          Evaluate Continuing Calibration Report

     Data File : C:\MSDCHEM\1\DATA\110513\11M96673.D          Vial: 13
     Acq On    :  5 Nov 2013  22:42                         Operator: FJB
     Sample    : WG451178-12 20ug/L ALT SRC 8260            Inst    : hpms11
     Misc      : 1,1 STD61121                               Multiplr: 1.00
     MS Integration Params: rteint.p

     Method       : C:\MSDCHEM\1\METHODS\8260_WT.M (RTE Integrator)
     Title        : 8260B/624 (SOP: OVL MSV01) Water 11/05/13 HPMS11
     Last Update  : Wed Nov 06 14:52:21 2013
     Response via : Multiple Level Calibration

     Min. RRF     :   0.000  Min. Rel. Area :  50%  Max. R.T. Dev  0.50min
     Max. RRF Dev :  25%     Max. Rel. Area : 150%

          Compound                       Amount  Calc.      %Dev Area% Dev(min)
    ------------------------------------------------------------------------------
  55 T    Dimethyl Disulfide            20.0000  21.7517      -8.8  103   0.00
  56 I    Chlorobenzene-d5              25.0000  25.0000       0.0   96   0.00
  57 S    Toluene-d8                    10.0000  10.4046      -4.0   99   0.00
  58 C    Toluene                       20.0000  21.4422      -7.2   98   0.00
  59 T    Ethyl Methacrylate            20.0000  23.0578     -15.3  113   0.00
  60 T    trans-1,3-Dichloropropene     20.0000  20.1677      -0.8   95   0.00
  61 T    1,1,2-Trichloroethane         20.0000  21.0026      -5.0  100   0.00
  62 T    2-Hexanone                    20.0000  22.5574     -12.8  120   0.00
  63 T    1,3-Dichloropropane           20.0000  20.7241      -3.6  100   0.00
  64 T    Tetrachloroethene             20.0000  20.3642      -1.8   97   0.00
  65 T    Dibromochloromethane          20.0000  20.9817      -4.9  101   0.00
  66 T    1,2-Dibromoethane             20.0000  21.1213      -5.6  101   0.00
  67 T    1-Chlorohexane                20.0000  21.7372      -8.7   99   0.00
  68 P    Chlorobenzene                 20.0000  21.3292      -6.6  101   0.00
  69 T    1,1,1,2-Tetrachloroethane     20.0000  20.3350      -1.7   99   0.00
  70 C    Ethylbenzene                  20.0000  20.1851      -0.9   97   0.00
  71 T    m-,p-Xylene                   40.0000  43.3541      -8.4  101   0.01
  72 T    o-Xylene                      20.0000  21.2558      -6.3  101   0.00
  73 T    Styrene                       20.0000  21.6105      -8.1  100   0.00
  74 P    Bromoform                     20.0000  21.6997      -8.5  106   0.01
  75 T    Isopropylbenzene              20.0000  22.5367     -12.7  102   0.00

  76 I    1,4-Dichlorobenzene-d4        25.0000  25.0000       0.0  100   0.00
  77 P    1,1,2,2-Tetrachloroethane     20.0000  20.6199      -3.1  101   0.00
  78 S    p-Bromofluorobenzene          10.0000   9.9335       0.7   99   0.00
  79 T    1,2,3-Trichloropropane        20.0000  20.5066      -2.5  105   0.01
  80 T    trans-1,4-Dichloro-2-Butene   20.0000  13.6946      31.5#  74   0.00
  81 T    n-Propylbenzene               20.0000  21.3479      -6.7  100   0.00
  82 T    Bromobenzene                  20.0000  20.6400      -3.2  102   0.00
  83 T    1,3,5-Trimethylbenzene        20.0000  21.4093      -7.0  101   0.00
  84 T    2-Chlorotoluene               20.0000  21.2573      -6.3  106   0.00
  85 T    4-Chlorotoluene               20.0000  20.8441      -4.2  101   0.00
  86 T    a-Methylstyrene               20.0000  23.1797     -15.9  107   0.00
  87 T    tert-Butylbenzene             20.0000  21.4416      -7.2  105   0.00
  88 T    1,2,4-Trimethylbenzene        20.0000  21.1907      -6.0   99   0.00
  89 T    sec-Butylbenzene              20.0000  22.1684     -10.8  103   0.00
  90 T    p-Isopropyltoluene            20.0000  21.5540      -7.8   99   0.00
  91 T    1,3-Dichlorobenzene           20.0000  21.3720      -6.9  103   0.00
  92 T    1,4-Dichlorobenzene           20.0000  20.0544      -0.3  100   0.00
  93 T    n-Butylbenzene                20.0000  21.5001      -7.5   99   0.00
  94 T    1,2-Dichlorobenzene           20.0000  21.7611      -8.8  106   0.00
  95 T    1,2-Dibromo-3-Chloropropane   20.0000  22.1062     -10.5  114   0.00
  96 T    1,2,4-Trichlorobenzene        20.0000  21.0381      -5.2  102   0.00
  97 T    Hexachlorobutadiene           20.0000  20.3172      -1.6   98   0.00
  98 T    Naphthalene                   20.0000  22.4353     -12.2  108   0.00
  99 T    1,2,3-Trichlorobenzene        20.0000  20.8747      -4.4  105   0.00

  --------------------------------------------------------------------------
   (#) = Out of Range              SPCC's out = 0  CCC's out = 0
   11M96673.D  8260_WT.M       Wed Nov 06 14:53:59 2013                        Page 2
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                         Quantitation Report    (Not Reviewed)

Data File : C:\MSDCHEM\1\DATA\120413\11M97410.D         Vial: 3
Acq On    :  4 Dec 2013  16:06                       Operator: FJB
Sample    : WG455130-02 5ug/L STD A9FOO              Inst    : hpms11
Misc      : 1,1 STD61356                             Multiplr: 1.00
MS Integration Params: rteint.p
Quant Time: Dec 18 14:24:48 2013          Quant Results File: A9WTR.RES

Quant Method : C:\MSDCHEM\1\METHODS\A9WTR.M (RTE Integrator)
Title        : Appendix IX (SOP:OVL MSV01) Water 09/11/13 HPMS11
Last Update  : Wed Dec 18 14:24:41 2013
Response via : Initial Calibration
DataAcq Meth : 8260_WT

 Internal Standards                R.T. QIon  Response  Conc Units Dev(Min)
 ------------------------------------------------------------------------
   1) Fluorobenzene               10.63   96  1015273    25.00 ug/L    0.00
  12) Chlorobenzene-d5            14.26  117   744134    25.00 ug/L    0.00
  13) 1,4-Dichlorobenzene-d4      17.07  152   339002    25.00 ug/L    0.00

 Target Compounds                                                  Qvalue
   2) Acetonitrile                 6.79   41     7380     6.1273 ug/L    96
   3) 3-Chloro-1-propene           7.16   41    97016     4.9218 ug/L    92
   4) 2-Chloro-1,3-butadiene       8.50   53    92907     4.5683 ug/L    89
   5) Methacrylonitrile            9.25   41    39802     5.4732 ug/L    84
   6) Isobutyl Alcohol             9.24   43     5282    14.0774 ug/L    87
   7) 1-Butanol                   10.13   56      746    17.3202 ug/L #  51
   8) Cyclohexanone               15.44   55     8875    Below Cal     93
   9) 2-Nitropropane              11.61   43    14809     4.4591 ug/L    84
  10) Ethyl Acetate                9.09   43    49960     5.2522 ug/L    98
  11) Methyl methacrylate         11.29   41    47778     4.9682 ug/L    91

 ------------------------------------------------------------------------
 (#) = qualifier out of range (m) = manual integration
 11M97410.D  A9WTR.M      Wed Dec 18 14:51:22 2013                            Page 1
```
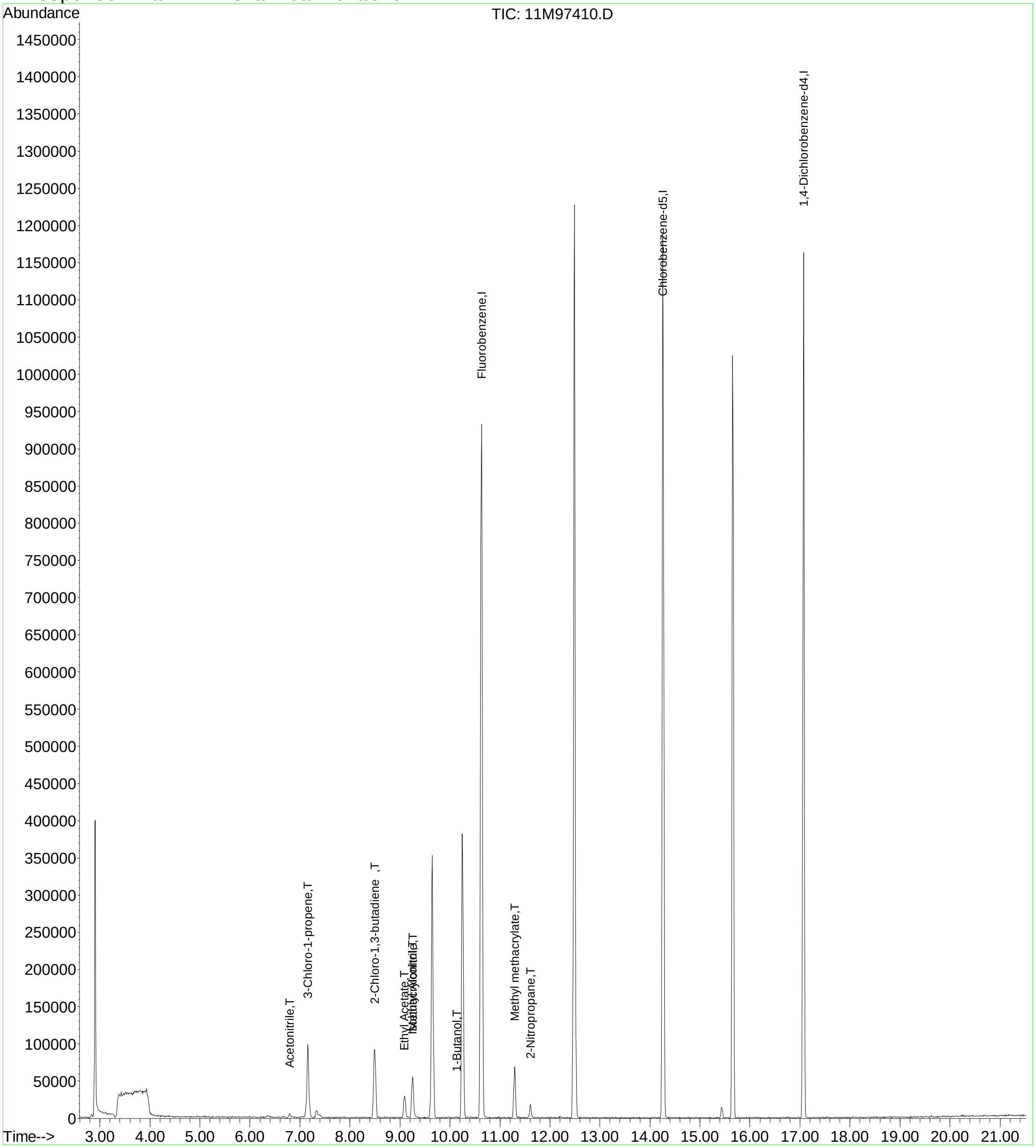

```
                         Quantitation Report    (Not Reviewed)
  Data File : C:\MSDCHEM\1\DATA\120413\11M97410.D         Vial: 3
  Acq On    :  4 Dec 2013  16:06                       Operator: FJB
  Sample    : WG455130-02 5ug/L STD A9FOO              Inst    : hpms11
  Misc      : 1,1 STD61356                             Multiplr: 1.00
  MS Integration Params: rteint.p
  Quant Time: Dec 18 14:24 2013            Quant Results File: A9WTR.RES

  Method       : C:\MSDCHEM\1\METHODS\A9WTR.M (RTE Integrator)
  Title        : Appendix IX (SOP:OVL MSV01) Water 12/04/13 HPMS11
  Last Update  : Wed Dec 18 14:24:41 2013
  Response via : Initial Calibration
```



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11M97410.D  A9WTR.M      Wed Dec 18 14:51:22 2013                     Page 2
```

```
                              Quantitation Report    (Not Reviewed)

Data File : C:\MSDCHEM\1\DATA\120413\11M97411.D          Vial: 4
Acq On    :  4 Dec 2013  16:38                       Operator: FJB
Sample    : WG455130-03 20ug/L STD A9FOO             Inst    : hpms11
Misc      : 1,1 STD61356                             Multiplr: 1.00
MS Integration Params: rteint.p
Quant Time: Dec 18 14:25:11 2013          Quant Results File: A9WTR.RES

Quant Method : C:\MSDCHEM\1\METHODS\A9WTR.M (RTE Integrator)
Title        : Appendix IX (SOP:OVL MSV01) Water 09/11/13 HPMS11
Last Update  : Wed Dec 18 14:24:41 2013
Response via : Initial Calibration
DataAcq Meth : 8260_WT

 Internal Standards                 R.T. QIon  Response  Conc Units Dev(Min)
 -------------------------------------------------------------------------
   1) Fluorobenzene                10.63   96  1003605    25.00 ug/L    0.00
  12) Chlorobenzene-d5             14.26  117   728788    25.00 ug/L    0.00
  13) 1,4-Dichlorobenzene-d4       17.07  152   329987    25.00 ug/L    0.00

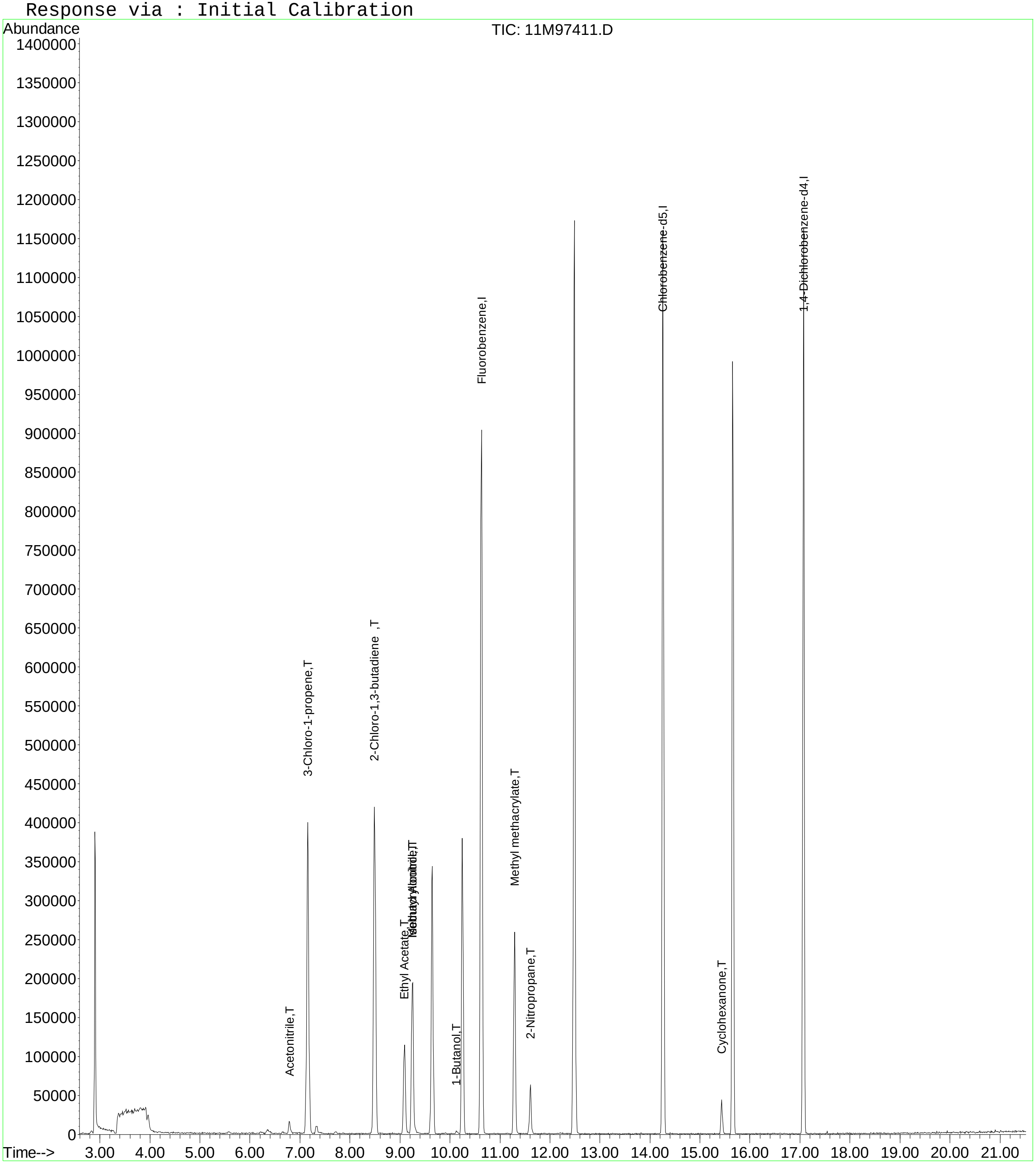
 Target Compounds                                                   Qvalue
   2) Acetonitrile                  6.79   41    22406    18.8189 ug/L    92
   3) 3-Chloro-1-propene            7.16   41   399253    20.4904 ug/L    94
   4) 2-Chloro-1,3-butadiene        8.49   53   403129    20.0527 ug/L    94
   5) Methacrylonitrile             9.24   41   142627    19.8409 ug/L    91
   6) Isobutyl Alcohol              9.24   43    15458    41.6772 ug/L    75
   7) 1-Butanol                    10.12   56     2376    26.2341 ug/L #  77
   8) Cyclohexanone                15.44   55    22478    19.9644 ug/L    93
   9) 2-Nitropropane               11.61   43    56939    17.3441 ug/L    92
  10) Ethyl Acetate                 9.09   43   189706    20.1753 ug/L    99
  11) Methyl methacrylate          11.29   41   175887    18.5022 ug/L    91

 -------------------------------------------------------------------------
 (#) = qualifier out of range (m) = manual integration
 11M97411.D  A9WTR.M      Wed Dec 18 14:51:23 2013                  Page 1
```

Quantitation Report   (Not Reviewed)

```
Data File : C:\MSDCHEM\1\DATA\120413\11M97411.D          Vial: 4
Acq On    :  4 Dec 2013  16:38                       Operator: FJB
Sample    : WG455130-03 20ug/L STD A9FOO             Inst    : hpms11
Misc      : 1,1 STD61356                             Multiplr: 1.00
MS Integration Params: rteint.p
Quant Time: Dec 18 14:25 2013            Quant Results File: A9WTR.RES

Method       : C:\MSDCHEM\1\METHODS\A9WTR.M (RTE Integrator)
Title        : Appendix IX (SOP:OVL MSV01) Water 12/04/13 HPMS11
Last Update  : Wed Dec 18 14:24:41 2013
Response via : Initial Calibration
```



11M97411.D A9WTR.M   Wed Dec 18 14:51:23 2013   Page 2

```
                              Quantitation Report    (Not Reviewed)

Data File : C:\MSDCHEM\1\DATA\120413\11M97412.D          Vial: 5
Acq On    :  4 Dec 2013  17:10                       Operator: FJB
Sample    : WG455130-04 50ug/L STD A9FOO             Inst    : hpms11
Misc      : 1,1 STD61356                             Multiplr: 1.00
MS Integration Params: rteint.p
Quant Time: Dec 18 14:25:33 2013           Quant Results File: A9WTR.RES

Quant Method : C:\MSDCHEM\1\METHODS\A9WTR.M (RTE Integrator)
Title        : Appendix IX (SOP:OVL MSV01) Water 09/11/13 HPMS11
Last Update  : Wed Dec 18 14:24:41 2013
Response via : Initial Calibration
DataAcq Meth : 8260_WT

 Internal Standards                R.T. QIon  Response  Conc Units Dev(Min)
 -------------------------------------------------------------------------
   1) Fluorobenzene               10.63   96   994696    25.00 ug/L    0.00
  12) Chlorobenzene-d5            14.26  117   723608    25.00 ug/L    0.00
  13) 1,4-Dichlorobenzene-d4      17.07  152   327750    25.00 ug/L    0.00

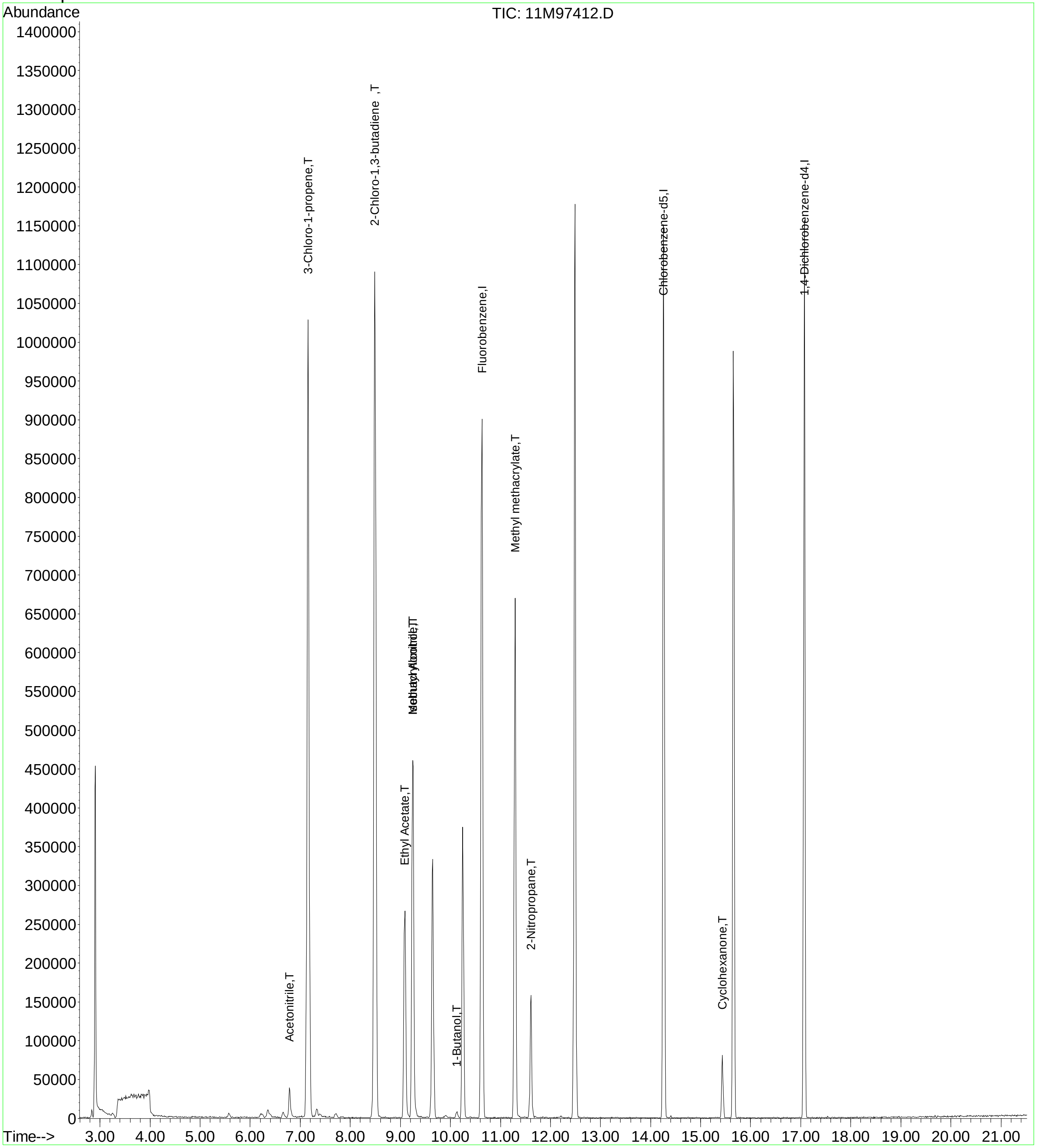
 Target Compounds                                                   Qvalue
   2) Acetonitrile                 6.78   41    52946    44.8679 ug/L    93
   3) 3-Chloro-1-propene           7.16   41  1024766    53.0638 ug/L    93
   4) 2-Chloro-1,3-butadiene       8.49   53  1044277    52.4105 ug/L    93
   5) Methacrylonitrile            9.24   41   333698    46.8367 ug/L    90
   6) Isobutyl Alcohol             9.24   43    31085    84.5608 ug/L    91
   7) 1-Butanol                   10.12   56     5344    42.6407 ug/L #  90
   8) Cyclohexanone               15.44   55    41078    52.0175 ug/L    94
   9) 2-Nitropropane              11.61   43   146743    45.0996 ug/L    96
  10) Ethyl Acetate                9.09   43   445242    47.7758 ug/L    99
  11) Methyl methacrylate         11.29   41   444001    47.1244 ug/L    91

 -------------------------------------------------------------------------
 (#) = qualifier out of range (m) = manual integration
 11M97412.D  A9WTR.M      Wed Dec 18 14:51:24 2013                          Page 1
```

```
                         Quantitation Report    (Not Reviewed)

  Data File : C:\MSDCHEM\1\DATA\120413\11M97412.D          Vial: 5
  Acq On    :  4 Dec 2013  17:10                       Operator: FJB
  Sample    : WG455130-04 50ug/L STD A9FOO             Inst    : hpms11
  Misc      : 1,1 STD61356                             Multiplr: 1.00
  MS Integration Params: rteint.p
  Quant Time: Dec 18 14:25 2013             Quant Results File: A9WTR.RES

  Method       : C:\MSDCHEM\1\METHODS\A9WTR.M (RTE Integrator)
  Title        : Appendix IX (SOP:OVL MSV01) Water 12/04/13 HPMS11
  Last Update  : Wed Dec 18 14:24:41 2013
  Response via : Initial Calibration
```



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11M97412.D  A9WTR.M      Wed Dec 18 14:51:24 2013                               Page 2
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                                Quantitation Report    (Not Reviewed)

Data File : C:\MSDCHEM\1\DATA\120413\11M97413.D          Vial: 6
Acq On    :  4 Dec 2013  17:41                       Operator: FJB
Sample    : WG455130-05 100ug/L STD A9FOO            Inst    : hpms11
Misc      : 1,1 STD61356                             Multiplr: 1.00
MS Integration Params: rteint.p
Quant Time: Dec 18 14:12:22 2013          Quant Results File: A9WTR.RES

Quant Method : C:\MSDCHEM\1\METHODS\A9WTR.M (RTE Integrator)
Title        : Appendix IX (SOP:OVL MSV01) Water 09/11/13 HPMS11
Last Update  : Wed Dec 04 15:12:01 2013
Response via : Initial Calibration
DataAcq Meth : 8260_WT

 Internal Standards                R.T. QIon  Response  Conc Units Dev(Min)
 ------------------------------------------------------------------------
   1) Fluorobenzene               10.63   96    992538    25.00 ug/L    0.00
  12) Chlorobenzene-d5            14.26  117    731142    25.00 ug/L    0.00
  13) 1,4-Dichlorobenzene-d4      17.07  152    335229    25.00 ug/L    0.00

 Target Compounds                                                   Qvalue
   2) Acetonitrile                 6.78   41    115266   135.6734 ug/L    96
   3) 3-Chloro-1-propene           7.16   41   1991273   120.7010 ug/L    95
   4) 2-Chloro-1,3-butadiene       8.49   53   2078232   118.9967 ug/L    94
   5) Methacrylonitrile            9.24   41    699121   132.9800 ug/L    91
   6) Isobutyl Alcohol             9.24   43     71429   349.3734 ug/L    88
   7) 1-Butanol                   10.13   56     14832   232.5307 ug/L    91
   8) Cyclohexanone               15.44   55     84641    66.1657 ug/L    93
   9) 2-Nitropropane              11.61   43    326350   139.3861 ug/L   100
  10) Ethyl Acetate                9.09   43    937224   140.6538 ug/L    98
  11) Methyl methacrylate         11.29   41    964144   136.2275 ug/L    90

 ------------------------------------------------------------------------
 (#) = qualifier out of range (m) = manual integration
 11M97413.D  A9WTR.M      Wed Dec 18 14:51:25 2013                          Page 1
```
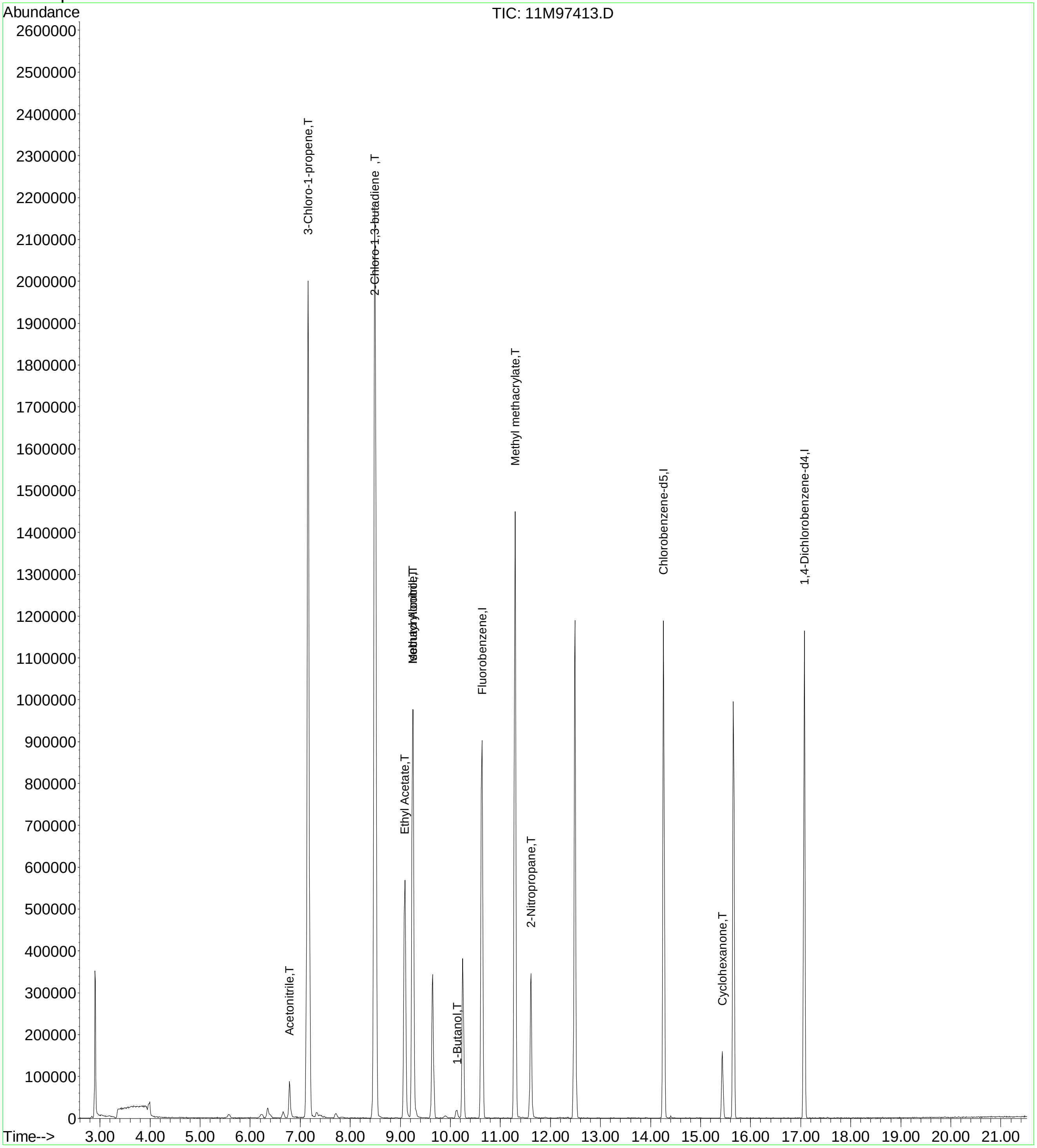

```
                           Quantitation Report    (Not Reviewed)

  Data File : C:\MSDCHEM\1\DATA\120413\11M97413.D         Vial: 6
  Acq On    :  4 Dec 2013  17:41                       Operator: FJB
  Sample    : WG455130-05 100ug/L STD A9FOO            Inst    : hpms11
  Misc      : 1,1 STD61356                             Multiplr: 1.00
  MS Integration Params: rteint.p
  Quant Time: Dec 18 14:12 2013            Quant Results File: A9WTR.RES

  Method       : C:\MSDCHEM\1\METHODS\A9WTR.M (RTE Integrator)
  Title        : Appendix IX (SOP:OVL MSV01) Water 12/04/13 HPMS11
  Last Update  : Wed Dec 18 14:24:41 2013
  Response via : Initial Calibration
```



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                          Quantitation Report    (Not Reviewed)

Data File : C:\MSDCHEM\1\DATA\120413\11M97414.D          Vial: 7
Acq On    :  4 Dec 2013  18:13                       Operator: FJB
Sample    : WG455130-06 200ug/L STD A9FOO            Inst    : hpms11
Misc      : 1,1 STD61356                             Multiplr: 1.00
MS Integration Params: rteint.p
Quant Time: Dec 18 14:12:23 2013           Quant Results File: A9WTR.RES

Quant Method : C:\MSDCHEM\1\METHODS\A9WTR.M (RTE Integrator)
Title        : Appendix IX (SOP:OVL MSV01) Water 09/11/13 HPMS11
Last Update  : Wed Dec 04 15:12:01 2013
Response via : Initial Calibration
DataAcq Meth : 8260_WT

 Internal Standards                R.T. QIon  Response  Conc Units Dev(Min)
 -------------------------------------------------------------------------
   1) Fluorobenzene               10.63   96   988807    25.00 ug/L    0.00
  12) Chlorobenzene-d5            14.26  117   731619    25.00 ug/L    0.00
  13) 1,4-Dichlorobenzene-d4      17.07  152   334379    25.00 ug/L    0.00

 Target Compounds                                                    Qvalue
   2) Acetonitrile                 6.78   41   232790   275.0384 ug/L    94
   3) 3-Chloro-1-propene           7.15   41  3995107   243.0771 ug/L    96
   4) 2-Chloro-1,3-butadiene       8.49   53  4217979   242.4270 ug/L    96
   5) Methacrylonitrile            9.24   41  1449357   276.7229 ug/L    90
   6) Isobutyl Alcohol             9.25   43   147277   723.0792 ug/L    93
   7) 1-Butanol                   10.12   56    32681   514.2940 ug/L    94
   8) Cyclohexanone               15.44   55   142369   111.7129 ug/L    95
   9) 2-Nitropropane              11.61   43   691892   296.6263 ug/L   100
  10) Ethyl Acetate                9.09   43  1915002   288.4782 ug/L   100
  11) Methyl methacrylate         11.29   41  1981916   281.0888 ug/L    92

 -------------------------------------------------------------------------
 (#) = qualifier out of range (m) = manual integration
 11M97414.D  A9WTR.M      Wed Dec 18 14:51:26 2013                           Page 1
```

Quantitation Report   (Not Reviewed)

```
Data File : C:\MSDCHEM\1\DATA\120413\11M97414.D         Vial: 7
Acq On    :  4 Dec 2013  18:13                        Operator: FJB
Sample    : WG455130-06 200ug/L STD A9FOO             Inst    : hpms11
Misc      : 1,1 STD61356                              Multiplr: 1.00
MS Integration Params: rteint.p
Quant Time: Dec 18 14:12 2013            Quant Results File: A9WTR.RES

Method       : C:\MSDCHEM\1\METHODS\A9WTR.M (RTE Integrator)
Title        : Appendix IX (SOP:OVL MSV01) Water 12/04/13 HPMS11
Last Update  : Wed Dec 18 14:24:41 2013
Response via : Initial Calibration
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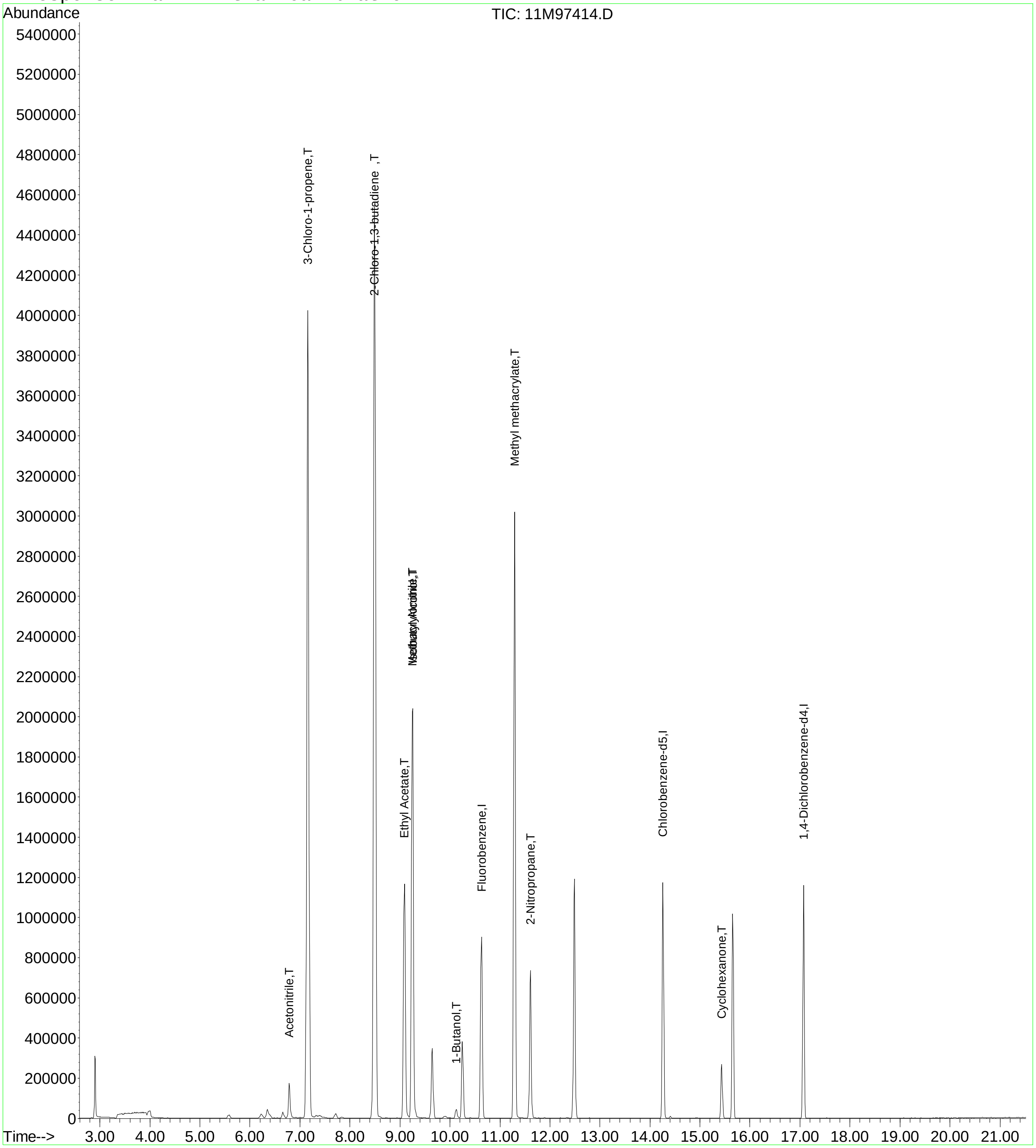

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                           Quantitation Report    (Not Reviewed)

Data File : C:\MSDCHEM\1\DATA\120413\11M97415.D          Vial: 8
Acq On    :  4 Dec 2013  18:44                       Operator: FJB
Sample    : WG455130-07 300ug/L STD A9FOO            Inst    : hpms11
Misc      : 1,1 STD61356                             Multiplr: 1.00
MS Integration Params: rteint.p
Quant Time: Dec 18 14:12:25 2013           Quant Results File: A9WTR.RES

Quant Method : C:\MSDCHEM\1\METHODS\A9WTR.M (RTE Integrator)
Title        : Appendix IX (SOP:OVL MSV01) Water 09/11/13 HPMS11
Last Update  : Wed Dec 04 15:12:01 2013
Response via : Initial Calibration
DataAcq Meth : 8260_WT

 Internal Standards                 R.T. QIon  Response  Conc Units Dev(Min)
 -------------------------------------------------------------------------
   1) Fluorobenzene                10.63   96  1005971    25.00 ug/L    0.00
  12) Chlorobenzene-d5             14.26  117   746913    25.00 ug/L    0.00
  13) 1,4-Dichlorobenzene-d4       17.07  152   350321    25.00 ug/L    0.00

 Target Compounds                                                    Qvalue
   2) Acetonitrile                  6.78   41   366399   425.5096 ug/L    95
   3) 3-Chloro-1-propene            7.16   41  5950898   355.8968 ug/L    98
   4) 2-Chloro-1,3-butadiene        8.49   53  6283126   354.9591 ug/L    98
   5) Methacrylonitrile             9.25   41  2223559   417.2962 ug/L    92
   6) Isobutyl Alcohol              9.25   43   239192  1154.3132 ug/L    91
   7) 1-Butanol                    10.12   56    54835   848.2035 ug/L    94
   8) Cyclohexanone                15.44   55   430971   332.4007 ug/L    96
   9) 2-Nitropropane               11.61   43  1097748   462.5941 ug/L    99
  10) Ethyl Acetate                 9.09   43  2909827   430.8608 ug/L   100
  11) Methyl methacrylate          11.29   41  3028050   422.1312 ug/L    93

 -------------------------------------------------------------------------
 (#) = qualifier out of range (m) = manual integration
 11M97415.D  A9WTR.M      Wed Dec 18 14:51:27 2013                            Page 1
```

```
                         Quantitation Report    (Not Reviewed)

Data File : C:\MSDCHEM\1\DATA\120413\11M97415.D         Vial: 8
Acq On    :  4 Dec 2013  18:44                      Operator: FJB
Sample    : WG455130-07 300ug/L STD A9FOO           Inst    : hpms11
Misc      : 1,1 STD61356                            Multiplr: 1.00
MS Integration Params: rteint.p
Quant Time: Dec 18 14:12 2013            Quant Results File: A9WTR.RES

Method       : C:\MSDCHEM\1\METHODS\A9WTR.M (RTE Integrator)
Title        : Appendix IX (SOP:OVL MSV01) Water 12/04/13 HPMS11
Last Update  : Wed Dec 18 14:24:41 2013
Response via : Initial Calibration
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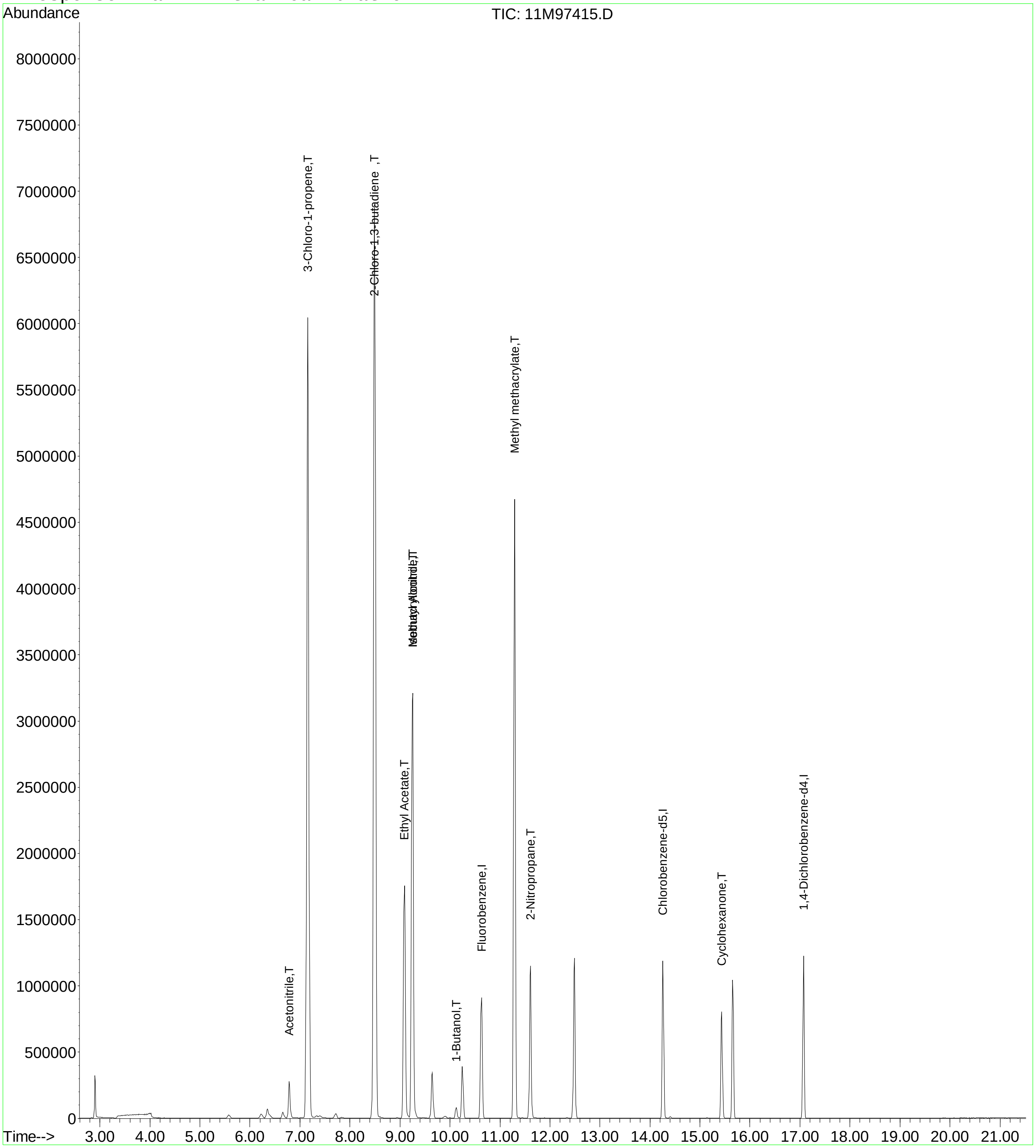

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                              Quantitation Report    (Not Reviewed)

Data File : C:\MSDCHEM\1\DATA\120413\11M97416.D          Vial: 9
Acq On    :  4 Dec 2013  19:15                       Operator: FJB
Sample    : WG455130-08 400ug/L STD A9FOO            Inst    : hpms11
Misc      : 1,1 STD61356                             Multiplr: 1.00
MS Integration Params: rteint.p
Quant Time: Dec 18 14:12:27 2013          Quant Results File: A9WTR.RES

Quant Method : C:\MSDCHEM\1\METHODS\A9WTR.M (RTE Integrator)
Title        : Appendix IX (SOP:OVL MSV01) Water 09/11/13 HPMS11
Last Update  : Wed Dec 04 15:12:01 2013
Response via : Initial Calibration
DataAcq Meth : 8260_WT

 Internal Standards                 R.T. QIon  Response  Conc Units Dev(Min)
------------------------------------------------------------------------
  1) Fluorobenzene                 10.63   96  1041152    25.00 ug/L    0.00
 12) Chlorobenzene-d5              14.26  117   772014    25.00 ug/L    0.00
 13) 1,4-Dichlorobenzene-d4        17.07  152   363960    25.00 ug/L    0.00

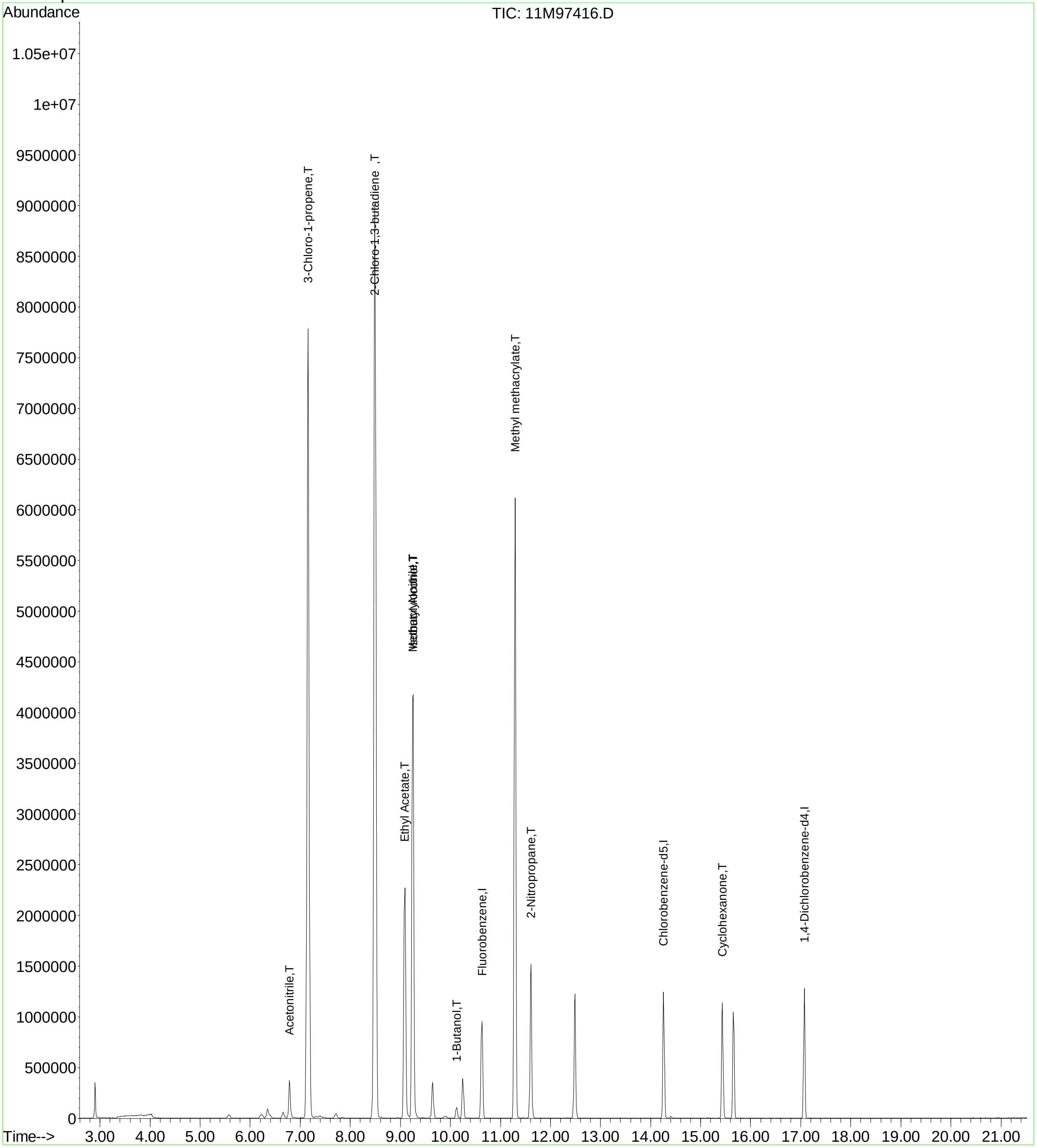
 Target Compounds                                                    Qvalue
  2) Acetonitrile                   6.78   41   483561   542.5974 ug/L    97
  3) 3-Chloro-1-propene             7.15   41  7560842   436.9011 ug/L    99
  4) 2-Chloro-1,3-butadiene         8.49   53  7997132   436.5240 ug/L    99
  5) Methacrylonitrile              9.24   41  2900753   525.9905 ug/L    92
  6) Isobutyl Alcohol               9.25   43   315186  1469.6545 ug/L    90
  7) 1-Butanol                     10.12   56    77653  1160.5712 ug/L    95
  8) Cyclohexanone                 15.44   55   600146   447.2416 ug/L    96
  9) 2-Nitropropane                11.61   43  1468309   597.8417 ug/L    97
 10) Ethyl Acetate                  9.09   43  3750892   536.6309 ug/L   100
 11) Methyl methacrylate           11.29   41  3948233   531.8125 ug/L    93

------------------------------------------------------------------------
 (#) = qualifier out of range (m) = manual integration
 11M97416.D  A9WTR.M      Wed Dec 18 14:51:28 2013                          Page 1
```

Quantitation Report   (Not Reviewed)

```
Data File : C:\MSDCHEM\1\DATA\120413\11M97416.D          Vial: 9
Acq On    :  4 Dec 2013  19:15                       Operator: FJB
Sample    : WG455130-08 400ug/L STD A9FOO            Inst    : hpms11
Misc      : 1,1 STD61356                             Multiplr: 1.00
MS Integration Params: rteint.p
Quant Time: Dec 18 14:12 2013            Quant Results File: A9WTR.RES

Method       : C:\MSDCHEM\1\METHODS\A9WTR.M (RTE Integrator)
Title        : Appendix IX (SOP:OVL MSV01) Water 12/04/13 HPMS11
Last Update  : Wed Dec 18 14:24:41 2013
Response via : Initial Calibration
```



```
                              Quantitation Report    (Not Reviewed)

Data File : C:\MSDCHEM\1\DATA\120413\11M97417.D          Vial: 10
Acq On    :  4 Dec 2013  19:47                       Operator: FJB
Sample    : WG455130-09 500ug/L STD A9FOO            Inst    : hpms11
Misc      : 1,1 STD61356                             Multiplr: 1.00
MS Integration Params: rteint.p
Quant Time: Dec 18 14:12:29 2013          Quant Results File: A9WTR.RES

Quant Method : C:\MSDCHEM\1\METHODS\A9WTR.M (RTE Integrator)
Title        : Appendix IX (SOP:OVL MSV01) Water 09/11/13 HPMS11
Last Update  : Wed Dec 04 15:12:01 2013
Response via : Initial Calibration
DataAcq Meth : 8260_WT

 Internal Standards                 R.T. QIon  Response  Conc Units Dev(Min)
 -------------------------------------------------------------------------
   1) Fluorobenzene                10.63   96  1021128    25.00 ug/L    0.00
  12) Chlorobenzene-d5             14.26  117   757413    25.00 ug/L    0.00
  13) 1,4-Dichlorobenzene-d4       17.07  152   366136    25.00 ug/L    0.00

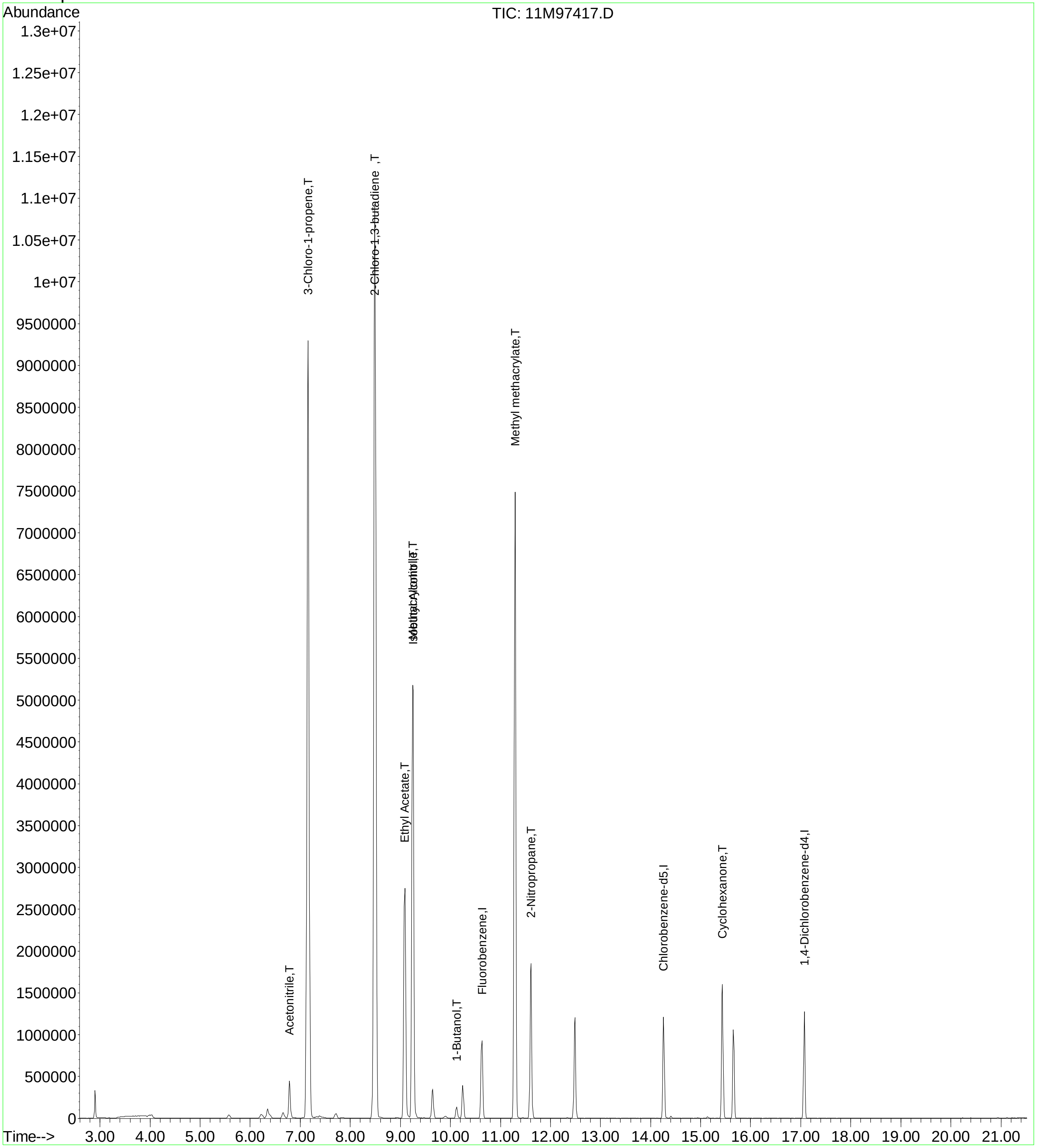
 Target Compounds                                                   Qvalue
   2) Acetonitrile                  6.78   41   583255   667.2965 ug/L    96
   3) 3-Chloro-1-propene            7.16   41  8973136   528.6779 ug/L    96
   4) 2-Chloro-1,3-butadiene        8.49   53  9485105   527.8980 ug/L    96
   5) Methacrylonitrile             9.24   41  3543333   655.1082 ug/L    93
   6) Isobutyl Alcohol              9.25   43   390584  1856.9351 ug/L    88
   7) 1-Butanol                    10.12   56    87481  1333.0955 ug/L    95
   8) Cyclohexanone                15.44   55   850844   646.5009 ug/L    96
   9) 2-Nitropropane               11.61   43  1794414   744.9469 ug/L    98
  10) Ethyl Acetate                 9.09   43  4560891   665.3111 ug/L    99
  11) Methyl methacrylate          11.29   41  4812232   660.9007 ug/L    94

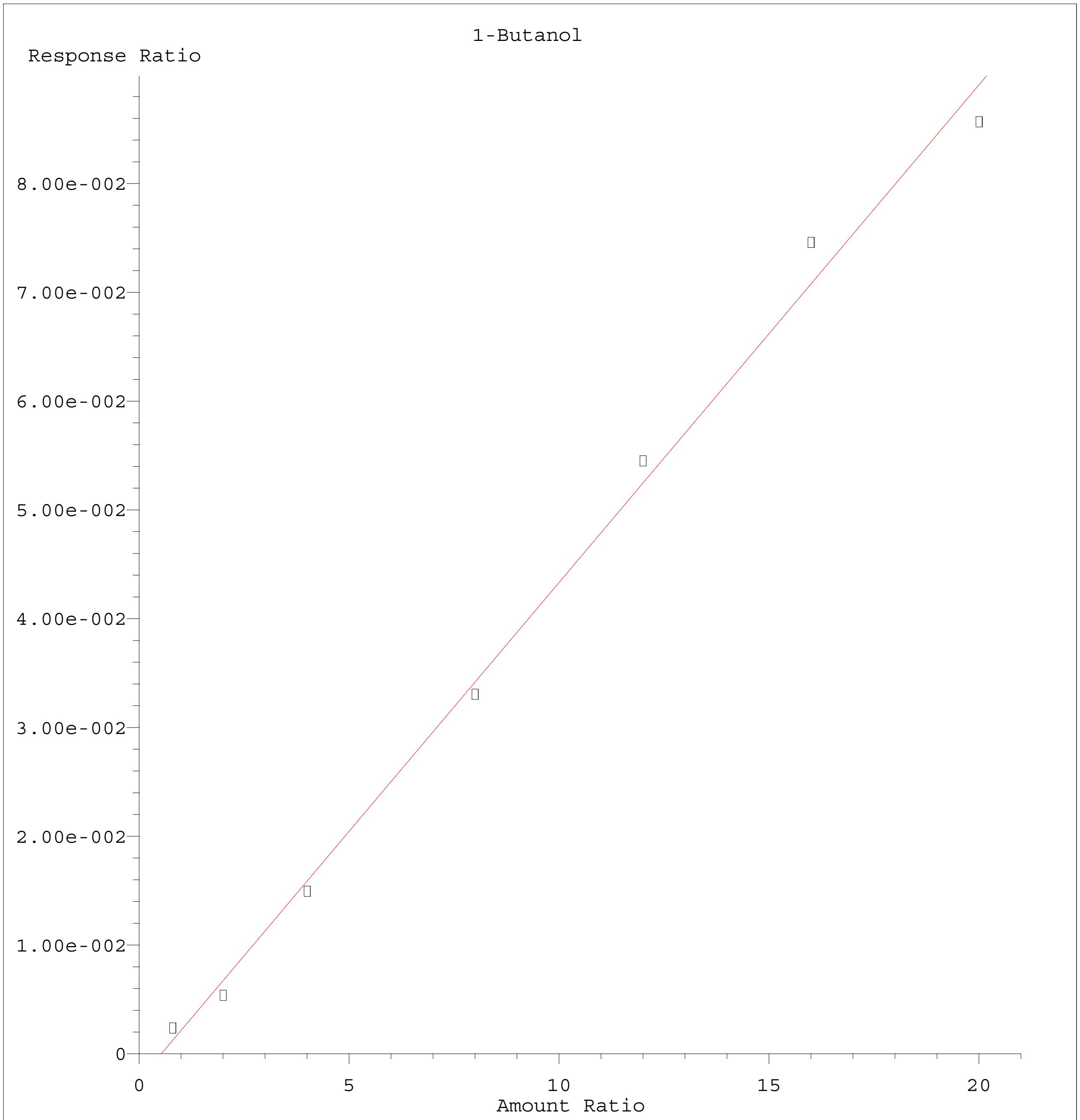
 -------------------------------------------------------------------------
 (#) = qualifier out of range (m) = manual integration
 11M97417.D  A9WTR.M      Wed Dec 18 14:51:28 2013                         Page 1
```

Quantitation Report (Not Reviewed)

```
Data File : C:\MSDCHEM\1\DATA\120413\11M97417.D          Vial: 10
Acq On    :  4 Dec 2013  19:47                       Operator: FJB
Sample    : WG455130-09 500ug/L STD A9FOO            Inst    : hpms11
Misc      : 1,1 STD61356                             Multiplr: 1.00
MS Integration Params: rteint.p
Quant Time: Dec 18 14:12 2013            Quant Results File: A9WTR.RES

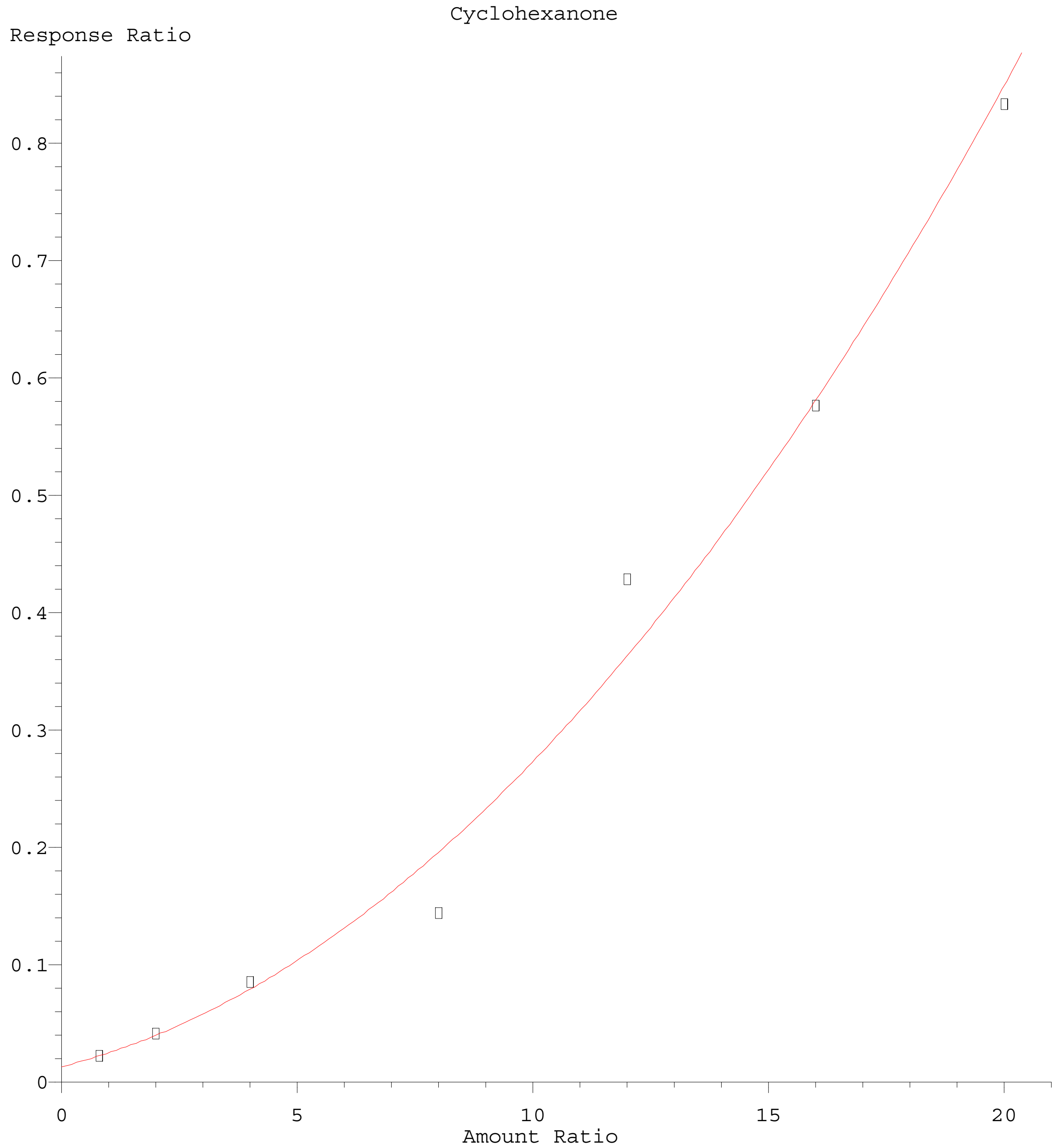
Method       : C:\MSDCHEM\1\METHODS\A9WTR.M (RTE Integrator)
Title        : Appendix IX (SOP:OVL MSV01) Water 12/04/13 HPMS11
Last Update  : Wed Dec 18 14:24:41 2013
Response via : Initial Calibration
```





Resp Ratio = 4.58e-003 * Amt - 2.44e-003
Coef of Det (r^2) = 0.995 Curve Fit: Linear

Method Name: C:\MSDCHEM\1\METHODS\A9WTR.M
Calibration Table Last Updated: Wed Dec 18 14:24:41 2013



R = 1.58e-003 A*A + 1.02e-002 A + 1.33e-002
Coef of Det (r^2) = 0.991   Curve Fit: Quadratic w(1/a)

Method Name: C:\MSDCHEM\1\METHODS\A9WTR.M
Calibration Table Last Updated: Wed Dec 18 14:24:41 2013

```
                              Quantitation Report    (Not Reviewed)

Data File : C:\MSDCHEM\1\DATA\120413\11M97419.D          Vial: 12
Acq On    :  4 Dec 2013  20:50                       Operator: FJB
Sample    : WG455130-10 100ug/L ALT SRC A9FOO        Inst    : hpms11
Misc      : 1,1 STD61663                             Multiplr: 1.00
MS Integration Params: rteint.p
Quant Time: Dec 18 14:25:51 2013           Quant Results File: A9WTR.RES

Quant Method : C:\MSDCHEM\1\METHODS\A9WTR.M (RTE Integrator)
Title        : Appendix IX (SOP:OVL MSV01) Water 09/11/13 HPMS11
Last Update  : Wed Dec 18 14:24:41 2013
Response via : Initial Calibration
DataAcq Meth : 8260_WT

 Internal Standards                 R.T. QIon  Response  Conc Units Dev(Min)
 ------------------------------------------------------------------------
   1) Fluorobenzene                10.63   96  1010748    25.00 ug/L    0.00
  12) Chlorobenzene-d5             14.26  117   728819    25.00 ug/L    0.00
  13) 1,4-Dichlorobenzene-d4       17.07  152   337646    25.00 ug/L    0.00

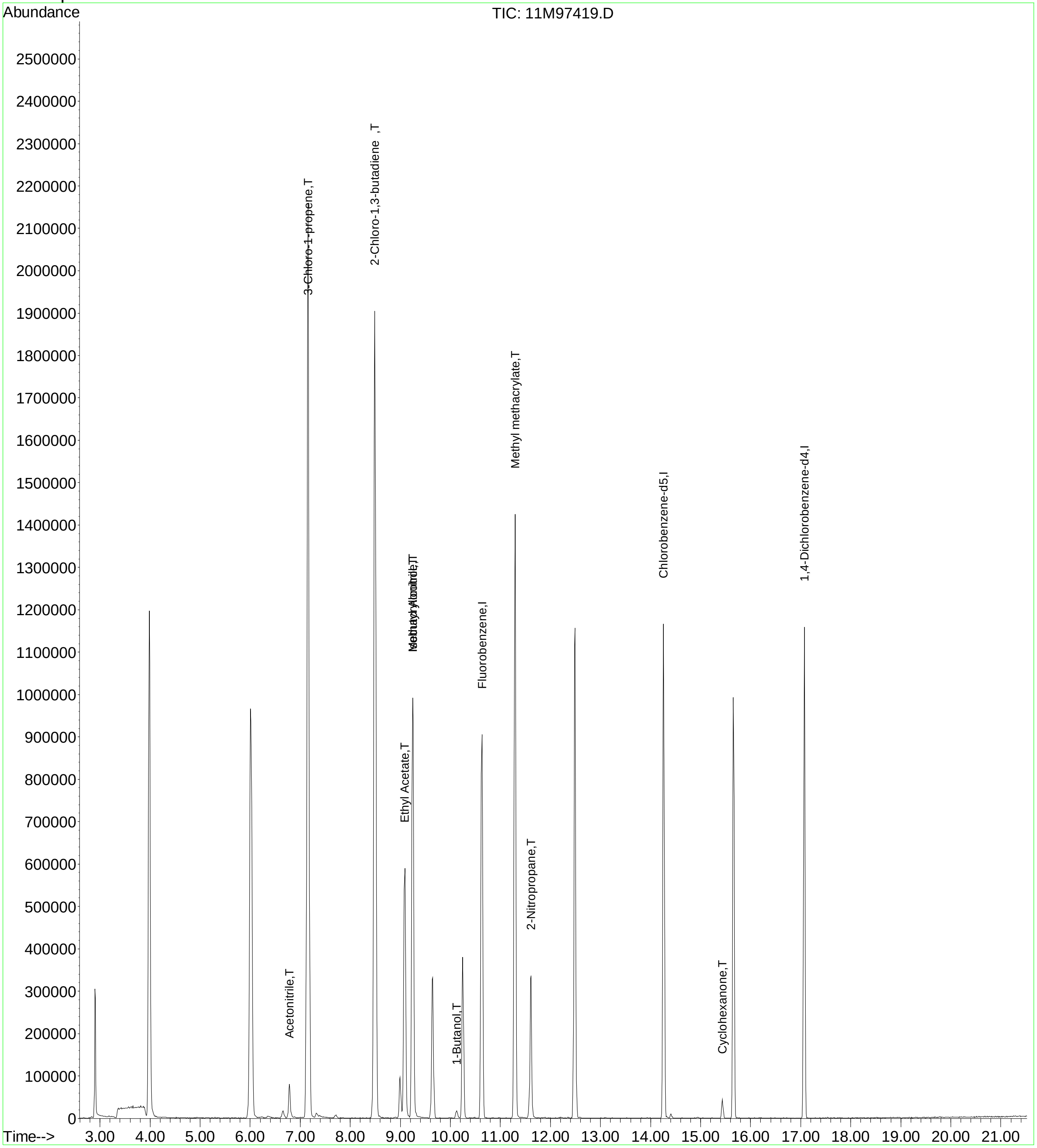
 Target Compounds                                                    Qvalue
   2) Acetonitrile                  6.78   41   112063    93.4572 ug/L    95
   3) 3-Chloro-1-propene            7.16   41  2129126   108.4982 ug/L    95
   4) 2-Chloro-1,3-butadiene        8.49   53  1772195    87.5309 ug/L    94
   5) Methacrylonitrile             9.24   41   693783    95.8304 ug/L    92
   6) Isobutyl Alcohol              9.24   43    65597   175.6101 ug/L    93
   7) 1-Butanol                    10.12   56    11451    75.1627 ug/L #  84
   8) Cyclohexanone                15.44   55    23296    21.2365 ug/L    93
   9) 2-Nitropropane               11.61   43   320485    96.9327 ug/L    99
  10) Ethyl Acetate                 9.09   43   982423   103.7427 ug/L    99
  11) Methyl methacrylate          11.29   41   942345    98.4282 ug/L    92
```

```
 ------------------------------------------------------------------------
 (#) = qualifier out of range (m) = manual integration
 11M97419.D  A9WTR.M      Wed Dec 18 14:51:29 2013                          Page 1
```

```
                         Quantitation Report    (Not Reviewed)

  Data File : C:\MSDCHEM\1\DATA\120413\11M97419.D         Vial: 12
  Acq On    :  4 Dec 2013  20:50                       Operator: FJB
  Sample    : WG455130-10 100ug/L ALT SRC A9FOO        Inst    : hpms11
  Misc      : 1,1 STD61663                             Multiplr: 1.00
  MS Integration Params: rteint.p
  Quant Time: Dec 18 14:25 2013             Quant Results File: A9WTR.RES

  Method       : C:\MSDCHEM\1\METHODS\A9WTR.M (RTE Integrator)
  Title        : Appendix IX (SOP:OVL MSV01) Water 12/04/13 HPMS11
  Last Update  : Wed Dec 18 14:24:41 2013
  Response via : Initial Calibration
```



```
                          Evaluate Continuing Calibration Report

   Data File : C:\MSDCHEM\1\DATA\120413\11M97419.D          Vial: 12
   Acq On    :  4 Dec 2013  20:50                       Operator: FJB
   Sample    : WG455130-10 100ug/L ALT SRC A9FOO        Inst    : hpms11
   Misc      : 1,1 STD61663                             Multiplr: 1.00
   MS Integration Params: rteint.p

   Method       : C:\MSDCHEM\1\METHODS\A9WTR.M (RTE Integrator)
   Title        : Appendix IX (SOP:OVL MSV01) Water 09/11/13 HPMS11
   Last Update  : Wed Dec 18 14:24:41 2013
   Response via : Multiple Level Calibration

   Min. RRF     :   0.000  Min. Rel. Area :   1%  Max. R.T. Dev  0.50min
   Max. RRF Dev :  75%     Max. Rel. Area : 200%

        Compound                       Amount  Calc.      %Dev Area% Dev(min)
  --------------------------------------------------------------------------
 1 I    Fluorobenzene                 25.0000  25.0000       0.0  102   0.00
 2 T    Acetonitrile                 100.0000  93.4572       6.5   97   0.00
 3 T    3-Chloro-1-propene           100.0000 108.4982      -8.5  107   0.00
 4 T    2-Chloro-1,3-butadiene       100.0000  87.5309      12.5   85   0.00
 5 T    Methacrylonitrile            100.0000  95.8304       4.2   99   0.00
 6 T    Isobutyl Alcohol             200.0000 175.6101      12.2   92   0.00
 7 T    1-Butanol                    100.0000  75.1627      24.8   77  -0.01
 8 T    Cyclohexanone                100.0000  21.2365      78.8#  28   0.00
 9 T    2-Nitropropane               100.0000  96.9327       3.1   98   0.00
10 T    Ethyl Acetate                100.0000 103.7427      -3.7  105   0.00
11 T    Methyl methacrylate          100.0000  98.4282       1.6   98   0.00

12 I    Chlorobenzene-d5              25.0000  25.0000       0.0  100   0.00

13 I    1,4-Dichlorobenzene-d4        25.0000  25.0000       0.0  101   0.00
```

```
 -------------------------------------------------------------------------
  (#) = Out of Range            SPCC's out = 0  CCC's out = 0
  11M97419.D  A9WTR.M      Wed Dec 18 14:25:58 2013                             Page 1
```

```
                          Quantitation Report    (Not Reviewed)

  Data File : C:\MSDchem\1\data\011914\11M98463.D          Vial: 2
  Acq On    : 19 Jan 2014  14:35                       Operator: adc
  Sample    : WG459902-02 50ug/L CCV 8260              Inst    : hpms11
  Misc      : 1,1 STD62280                             Multiplr: 1.00
  MS Integration Params: rteint.p
  Quant Time: Jan 19 14:57:42 2014          Quant Results File: 8260_WT.RES

  Quant Method : C:\MSDCHEM\1\METHODS\8260_WT.M (RTE Integrator)
  Title        : 8260B/624 (SOP: OVL MSV01) Water 11/05/13 HPMS11
  Last Update  : Mon Dec 16 17:06:06 2013
  Response via : Initial Calibration
  DataAcq Meth : 8260_WT

   Internal Standards                R.T. QIon  Response  Conc Units Dev(Min)
   --------------------------------------------------------------------------
     1) Fluorobenzene              10.61   96   855886    25.00 ug/L   -0.02
    56) Chlorobenzene-d5           14.24  117   710389    25.00 ug/L   -0.02
    76) 1,4-Dichlorobenzene-d4     17.05  152   402663    25.00 ug/L   -0.02

   System Monitoring Compounds
    37) Dibromofluoromethane        9.62  111   259321    25.0464 ug/L -0.02
     Spiked Amount     25.000   Range  86 - 118    Recovery   =  100.20%
    43) 1,2-Dichloroethane-d4      10.23   65   273985    23.4317 ug/L -0.02
     Spiked Amount     25.000   Range  80 - 120    Recovery   =   93.72%
    57) Toluene-d8                 12.47   98   970272    27.1958 ug/L -0.02
     Spiked Amount     25.000   Range  88 - 110    Recovery   =  108.80%
    78) p-Bromofluorobenzene       15.63   95   394956    24.4233 ug/L -0.02
     Spiked Amount     25.000   Range  86 - 115    Recovery   =   97.68%

   Target Compounds                                                    Qvalue
     2) Dichlorodifluoromethane     3.23   85   448370    53.1089 ug/L    99
     3) Chloromethane               3.69   50   609153    51.1199 ug/L    96
     4) Vinyl Chloride              3.92   62   633987    56.1441 ug/L    99
     5) 1,3-Butadiene               3.96   54   435049    67.7601 ug/L    97
     6) Bromomethane                4.83   94   329025    67.9102 ug/L   100
     7) Chloroethane                4.98   64   378587    57.6253 ug/L    99
     8) Trichlorofluoromethane      5.47  101   813149    51.7216 ug/L   100
     9) Diethyl ether               5.99   59   727668   110.3146 ug/L    95
    10) Isoprene                    6.03   67   682002    52.7117 ug/L    85
    11) Acrolein                    6.22   56    44338   237.2659 ug/L    97
    12) 1,1,2-Trichloro-1,2,2-Trif  6.25  101   498735    54.3508 ug/L    90
    13) Acetone                     6.32   43    98863    49.7239 ug/L    85
    14) 1,1-Dichloroethene          6.55   61   839719    54.0682 ug/L    96
    15) Tert-Butyl Alcohol          6.64   59   110466   178.8343 ug/L    98
    16) Dimethyl Sulfide            6.80   62   452861    51.3926 ug/L    88
    17) Iodomethane                 7.05  142   406499    57.0555 ug/L    90
    18) Methyl acetate              7.05   43   314409    54.5752 ug/L    95
    19) Methylene Chloride          7.31   84   505140    50.8643 ug/L    96
    20) Carbon Disulfide            7.36   76  1562055    55.2493 ug/L    99
    21) Acrylonitrile               7.49   53   142722    58.8255 ug/L    97
    22) Methyl Tert Butyl Ether     7.51   73  1208099    52.1483 ug/L    96
    23) trans-1,2-Dichloroethene    7.74   96   507913    51.7814 ug/L    95
    24) n-Hexane                    7.82   57   723063    59.6100 ug/L    99
    25) Diisopropyl ether           8.14   45  3492447   112.5224 ug/L    97
    26) Vinyl Acetate               8.30   43   670450    57.5427 ug/L    97
    27) 1,1-Dichloroethane          8.34   63   964144    54.1087 ug/L    97
    28) Ethyl-Tert-Butyl ether      8.69   59  2996685   105.0136 ug/L    94
    29) 2-Butanone                  8.87   43   151570    52.4529 ug/L    94
    30) Propionitrile               8.98   54    93509   116.1793 ug/L    99
    31) 2,2-Dichloropropane         9.09   77   853323    50.1413 ug/L   100
    32) cis-1,2-Dichloroethene      9.15   96   563372    53.8355 ug/L    98
    33) Chloroform                  9.35   83   911350    50.9247 ug/L    99
    34) 1-Bromopropane              9.48  122   104379    55.8892 ug/L    98
    35) Bromochloromethane          9.56  130   330398    56.6470 ug/L    96
    36) Tetrahydrofuran             9.59   42   193684   112.9192 ug/L    99
    38) 1,1,1-Trichloroethane       9.85   97   831662    51.6195 ug/L    92
    39) Cyclohexane                 9.88   56   959412    56.8999 ug/L   100
    40) 1,1-Dichloropropene        10.04   75   722502    53.3524 ug/L    97
    41) Carbon Tetrachloride       10.17  117   771293    52.0590 ug/L    98
    42) Tert-Amyl-Methyl ether     10.13   73  2440868   103.8466 ug/L    95
   --------------------------------------------------------------------------
   (#) = qualifier out of range (m) = manual integration
   11M98463.D  8260_WT.M      Sun Jan 19 14:57:43 2014                                  Page 1
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                         Quantitation Report    (Not Reviewed)

Data File : C:\MSDchem\1\data\011914\11M98463.D         Vial: 2
Acq On    : 19 Jan 2014  14:35                       Operator: adc
Sample    : WG459902-02 50ug/L CCV 8260              Inst    : hpms11
Misc      : 1,1 STD62280                             Multiplr: 1.00
MS Integration Params: rteint.p
Quant Time: Jan 19 14:57:42 2014          Quant Results File: 8260_WT.RES

Quant Method : C:\MSDCHEM\1\METHODS\8260_WT.M (RTE Integrator)
Title        : 8260B/624 (SOP: OVL MSV01) Water 11/05/13 HPMS11
Last Update  : Mon Dec 16 17:06:06 2013
Response via : Initial Calibration
DataAcq Meth : 8260_WT

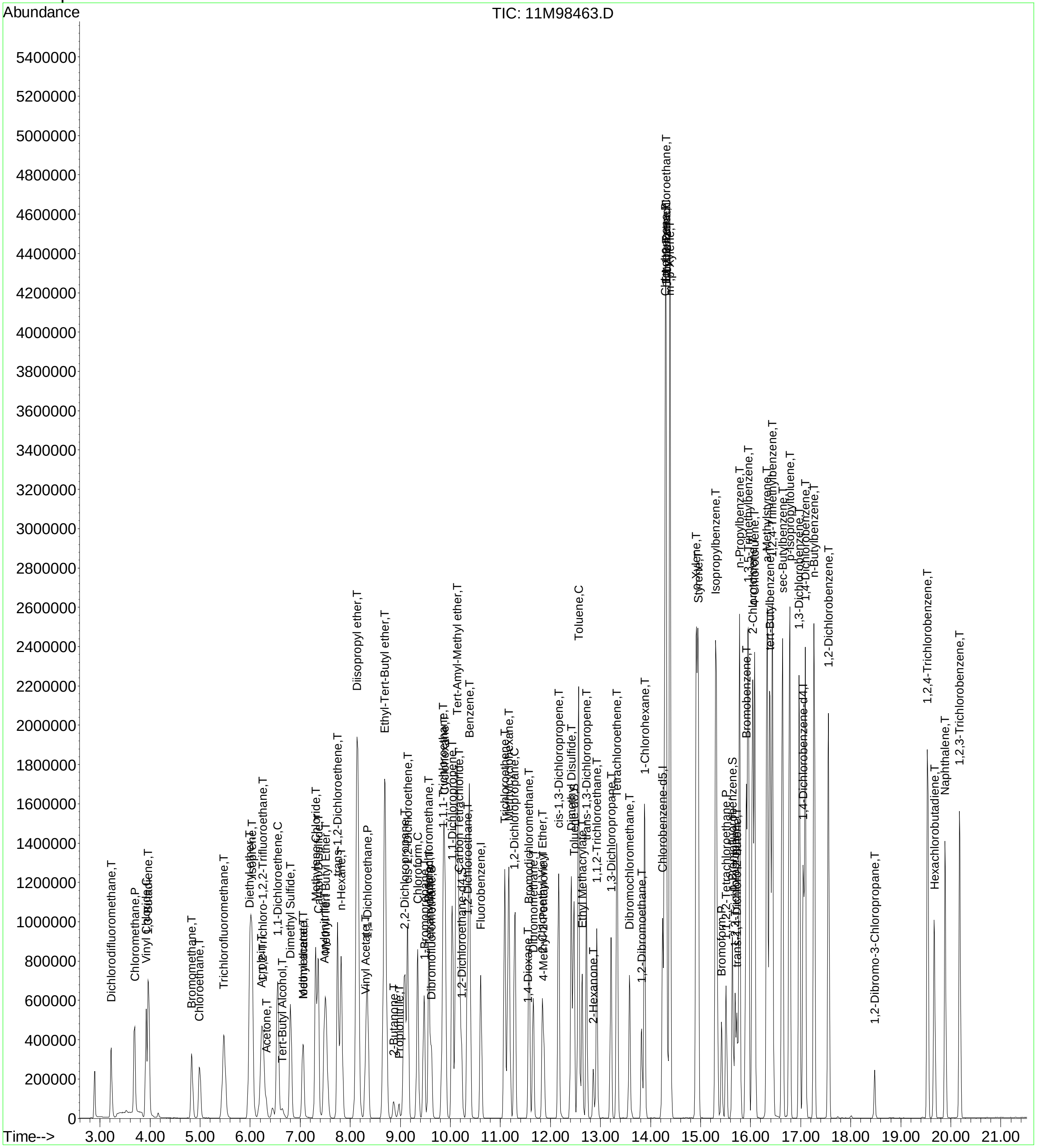

      Compound                      R.T. QIon  Response  Conc Unit   Qvalue
 -------------------------------------------------------------------------
  44) 1,2-Dichloroethane           10.34   62   668682    51.6872 ug/L    93
  45) Benzene                      10.38   78  1964876    52.6084 ug/L    99
  46) Trichloroethene              11.08  130   544094    53.0652 ug/L    99
  47) Methylcyclohexane            11.17   83   815179    57.4576 ug/L    90
  48) 1,2-Dichloropropane          11.28   63   542370    55.8255 ug/L    80
  49) 1,4-Dioxane                  11.55   88    11899   187.3651 ug/L    94
  50) Bromodichloromethane         11.57   83   690876    51.1749 ug/L    99
  51) Dibromomethane               11.65   93   281061    52.8832 ug/L    94
  52) 2-Chloroethyl Vinyl Ether    11.84   63   265619    58.8056 ug/L    98
  53) 4-Methyl-2-Pentanone         11.86   58   130474    55.4431 ug/L    98
  54) cis-1,3-Dichloropropene      12.16   75   847228    54.6797 ug/L   100
  55) Dimethyl Disulfide           12.42   79   457447    53.7004 ug/L    88
  58) Toluene                      12.56   91  2039686    51.6147 ug/L    98
  59) Ethyl Methacrylate           12.64   69   488094    50.1448 ug/L    89
  60) trans-1,3-Dichloropropene    12.72   75   739904    51.9838 ug/L    94
  61) 1,1,2-Trichloroethane        12.92   97   377485    52.6576 ug/L    97
  62) 2-Hexanone                   12.85   43   227726    50.5711 ug/L    83
  63) 1,3-Dichloropropane          13.21   76   680066    51.9115 ug/L    89
  64) Tetrachloroethene            13.33  164   424082    50.8123 ug/L   100
  65) Dibromochloromethane         13.58  129   503026    52.3657 ug/L   100
  66) 1,2-Dibromoethane            13.82  107   384205    52.4651 ug/L    99
  67) 1-Chlorohexane               13.89   91   690820    51.7874 ug/L    87
  68) Chlorobenzene                14.29  112  1408301    50.5403 ug/L   100
  69) 1,1,1,2-Tetrachloroethane    14.31  131   517063    49.7628 ug/L    99
  70) Ethylbenzene                 14.31  106   765640    49.6226 ug/L    91
  71) m-,p-Xylene                  14.38  106  1839819   102.8346 ug/L    87
  72) o-Xylene                     14.91  106   922169    50.4366 ug/L    86
  73) Styrene                      14.95  104  1480246    50.8557 ug/L    90
  74) Bromoform                    15.42  173   288068    51.4413 ug/L    98
  75) Isopropylbenzene             15.30  105  2251107    53.3697 ug/L    96
  77) 1,1,2,2-Tetrachloroethane    15.51   83   432955    48.0193 ug/L    98
  79) 1,2,3-Trichloropropane       15.69  110   127099    47.3879 ug/L #  39
  80) trans-1,4-Dichloro-2-Buten   15.73   53   145571    43.5840 ug/L #   1
  81) n-Propylbenzene              15.78   91  2672995    48.6870 ug/L    97
  82) Bromobenzene                 15.91  156   581321    48.0167 ug/L    61
  83) 1,3,5-Trimethylbenzene       15.95  105  1935013    49.8197 ug/L    94
  84) 2-Chlorotoluene              16.04   91  1681907    46.9092 ug/L    92
  85) 4-Chlorotoluene              16.08   91  1640543    44.7320 ug/L    85
  86) a-Methylstyrene              16.33  118  1016379    48.9190 ug/L    91
  87) tert-Butylbenzene            16.39  134   396313    48.1585 ug/L    83
  88) 1,2,4-Trimethylbenzene       16.43  105  1940892    49.2252 ug/L    94
  89) sec-Butylbenzene             16.64  105  2424796    54.4618 ug/L    99
  90) p-Isopropyltoluene           16.78  119  2067991    54.3524 ug/L    99
  91) 1,3-Dichlorobenzene          16.97  146  1159911    51.2360 ug/L    99
  92) 1,4-Dichlorobenzene          17.09  146  1166198    49.0340 ug/L    99
  93) n-Butylbenzene               17.27   91  1810935    53.4354 ug/L    99
  94) 1,2-Dichlorobenzene          17.56  146  1073586    50.4050 ug/L    99
  95) 1,2-Dibromo-3-Chloropropan   18.48   75    79333    47.5971 ug/L    99
  96) 1,2,4-Trichlorobenzene       19.53  180   711581    49.4174 ug/L    99
  97) Hexachlorobutadiene          19.68  225   261757    47.0564 ug/L    97
  98) Naphthalene                  19.88  128  1383258    49.6839 ug/L    98
  99) 1,2,3-Trichlorobenzene       20.17  180   626133    47.2251 ug/L    99


 -------------------------------------------------------------------------
 (#) = qualifier out of range (m) = manual integration
 11M98463.D  8260_WT.M      Sun Jan 19 14:57:43 2014                            Page 2
```

Quantitation Report   (Not Reviewed)

```
Data File : C:\MSDchem\1\data\011914\11M98463.D         Vial: 2
Acq On    : 19 Jan 2014  14:35                        Operator: adc
Sample    : WG459902-02 50ug/L CCV 8260               Inst    : hpms11
Misc      : 1,1 STD62280                              Multiplr: 1.00
MS Integration Params: rteint.p
Quant Time: Jan 19 14:57 2014            Quant Results File: 8260_WT.RES

Method       : C:\MSDCHEM\1\METHODS\8260_WT.M (RTE Integrator)
Title        : 8260B/624 (SOP: OVL MSV01) Water 11/05/13 HPMS11
Last Update  : Mon Dec 16 17:06:06 2013
Response via : Initial Calibration
```



```
                          Evaluate Continuing Calibration Report

     Data File : C:\MSDCHEM\1\DATA\011914\11M98463.D         Vial: 2
     Acq On    : 19 Jan 2014  14:35                      Operator: adc
     Sample    : WG459902-02 50ug/L CCV 8260             Inst    : hpms11
     Misc      : 1,1 STD62280                            Multiplr: 1.00
     MS Integration Params: rteint.p

     Method       : C:\MSDCHEM\1\METHODS\8260_WT.M (RTE Integrator)
     Title        : 8260B/624 (SOP: OVL MSV01) Water 11/05/13 HPMS11
     Last Update  : Mon Dec 16 17:06:06 2013
     Response via : Multiple Level Calibration

     Min. RRF     :   0.000  Min. Rel. Area :  50%  Max. R.T. Dev  0.50min
     Max. RRF Dev :  25%     Max. Rel. Area : 150%

          Compound                      AvgRF   CCRF       %Dev Area% Dev(min)
    ---------------------------------------------------------------------------
   1 I    Fluorobenzene                 1.0000  1.0000      0.0   97  -0.02
   2 T    Dichlorodifluoromethane       0.2466  0.2619     -6.2   95  -0.01
   3 P    Chloromethane                 0.3481  0.3559     -2.2  104  -0.01
   4 C    Vinyl Chloride                0.3298  0.3704    -12.3  102  -0.02
   5 T    1,3-Butadiene                 0.2061  0.2541    -23.3  117  -0.02
   6 T    Bromomethane                  0.1415  0.1922    -35.8# 149  -0.02
   7 T    Chloroethane                  0.1919  0.2212    -15.3  109  -0.02
   8 T    Trichlorofluoromethane        0.4592  0.4750     -3.4   97  -0.02
   9 T    Diethyl ether                 0.1927  0.2125    -10.3  105  -0.02
  10 T    Isoprene                      0.3779  0.3984     -5.4  104  -0.02
  11 T    Acrolein                      0.0037  0.0259   -600.0# 598# -0.02
  12 T    1,1,2-Trichloro-1,2,2-Trifl   0.2680  0.2914     -8.7  104  -0.02
  13 T    Acetone                       0.0581  0.0578      0.6  105  -0.03
  14 C    1,1-Dichloroethene            0.4537  0.4906     -8.1  102  -0.02
  15 T    Tert-Butyl Alcohol            0.0180  0.0161     10.6   81  -0.03
  16 T    Dimethyl Sulfide              0.2574  0.2646     -2.8  100  -0.02
  17 T    Iodomethane                   0.1709  0.2375    -39.0# 117  -0.02
  18 T    Methyl acetate                0.1683  0.1837     -9.1  112  -0.03
  19 T    Methylene Chloride            0.2901  0.2951     -1.7  105  -0.02
  20 T    Carbon Disulfide              0.8258  0.9125    -10.5  107  -0.02
  21 T    Acrylonitrile                 0.0709  0.0834    -17.7  108  -0.01
  22 T    Methyl Tert Butyl Ether       0.6767  0.7058     -4.3   98  -0.02
  23 T    trans-1,2-Dichloroethene      0.2865  0.2967     -3.6  100  -0.02
  24 T    n-Hexane                      0.3543  0.4224    -19.2  117  -0.02
  25 T    Diisopropyl ether             0.9066  1.0201    -12.5  107  -0.02
  26 T    Vinyl Acetate                 0.3403  0.3917    -15.1  102  -0.02
  27 P    1,1-Dichloroethane            0.5205  0.5632     -8.2  103  -0.02
  28 T    Ethyl-Tert-Butyl ether        0.8335  0.8753     -5.0   99  -0.02
  29 T    2-Butanone                    0.0844  0.0886     -4.9  104  -0.02
  30 T    Propionitrile                 0.0235  0.0273    -16.2  105  -0.02
  31 T    2,2-Dichloropropane           0.4971  0.4985     -0.3   98  -0.02
  32 T    cis-1,2-Dichloroethene        0.3057  0.3291     -7.7  103  -0.02
  33 C    Chloroform                    0.5227  0.5324     -1.8  100  -0.02
  34 T    1-Bromopropane                0.0546  0.0610    -11.8  110  -0.02
  35 T    Bromochloromethane            0.1704  0.1930    -13.3  105  -0.02
  36 T    Tetrahydrofuran               0.0501  0.0566    -12.9  103  -0.02
  37 S    Dibromofluoromethane          0.3024  0.3030     -0.2  104  -0.02
  38 T    1,1,1-Trichloroethane         0.4706  0.4859     -3.2   98  -0.02
  39 T    Cyclohexane                   0.4925  0.5605    -13.8  116  -0.02
  40 T    1,1-Dichloropropene           0.3956  0.4221     -6.7  101  -0.02
  41 T    Carbon Tetrachloride          0.4328  0.4506     -4.1   97  -0.02
  42 T    Tert-Amyl-Methyl ether        0.6866  0.7130     -3.8   98  -0.02
  43 S    1,2-Dichloroethane-d4         0.3415  0.3201      6.3   98  -0.02
  44 T    1,2-Dichloroethane            0.3779  0.3906     -3.4   97  -0.02
  45 T    Benzene                       1.0910  1.1479     -5.2  103  -0.02
  46 T    Trichloroethene               0.2995  0.3179     -6.1  103  -0.02
  47 T    Methylcyclohexane             0.4144  0.4762    -14.9  113  -0.02
  48 C    1,2-Dichloropropane           0.2838  0.3169    -11.7  106  -0.03
  49 T    1,4-Dioxane                   0.0019  0.0017      6.5   84  -0.03
  50 T    Bromodichloromethane          0.3943  0.4036     -2.3   97  -0.02
  51 T    Dibromomethane                0.1552  0.1642     -5.8   99  -0.02
  52 T    2-Chloroethyl Vinyl Ether     0.1319  0.1552    -17.6  109  -0.02
  53 T    4-Methyl-2-Pentanone          0.0687  0.0762    -10.9  100  -0.03
  54 T    cis-1,3-Dichloropropene       0.4526  0.4949     -9.4  103  -0.02
  -------------------------------------------------------------------------
   (#) = Out of Range
   11M98463.D  8260_WT.M      Sun Jan 19 15:13:20 2014                             Page 1
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```
                                    Evaluate Continuing Calibration Report

           Data File : C:\MSDCHEM\1\DATA\011914\11M98463.D         Vial: 2
           Acq On    : 19 Jan 2014  14:35                       Operator: adc
           Sample    : WG459902-02 50ug/L CCV 8260              Inst    : hpms11
           Misc      : 1,1 STD62280                             Multiplr: 1.00
           MS Integration Params: rteint.p

           Method       : C:\MSDCHEM\1\METHODS\8260_WT.M (RTE Integrator)
           Title        : 8260B/624 (SOP: OVL MSV01) Water 11/05/13 HPMS11
           Last Update  : Mon Dec 16 17:06:06 2013
           Response via : Multiple Level Calibration

           Min. RRF     :   0.000  Min. Rel. Area :  50%  Max. R.T. Dev  0.50min
           Max. RRF Dev :  25%     Max. Rel. Area : 150%

                Compound                      AvgRF   CCRF       %Dev Area% Dev(min)
          ----------------------------------------------------------------------------
        55 T    Dimethyl Disulfide            0.2488   0.2672      -7.4  103  -0.02
        56 I    Chlorobenzene-d5              1.0000   1.0000       0.0  101  -0.02
        57 S    Toluene-d8                    1.2555   1.3658      -8.8  113  -0.02
        58 C    Toluene                       1.3907   1.4356      -3.2  101  -0.02
        59 T    Ethyl Methacrylate            0.3426   0.3435      -0.3   98  -0.02
        60 T    trans-1,3-Dichloropropene     0.5009   0.5208      -4.0  100  -0.02
        61 T    1,1,2-Trichloroethane         0.2523   0.2657      -5.3  102  -0.02
        62 T    2-Hexanone                    0.1585   0.1603      -1.1   96  -0.02
        63 T    1,3-Dichloropropane           0.4610   0.4787      -3.8  103  -0.02
        64 T    Tetrachloroethene             0.2937   0.2985      -1.6  104  -0.02
        65 T    Dibromochloromethane          0.3381   0.3540      -4.7  102  -0.02
        66 T    1,2-Dibromoethane             0.2577   0.2704      -4.9  101  -0.02
        67 T    1-Chlorohexane                0.4694   0.4862      -3.6  105  -0.02
        68 P    Chlorobenzene                 0.9806   0.9912      -1.1  102  -0.02
        69 T    1,1,1,2-Tetrachloroethane     0.3657   0.3639       0.5  100  -0.02
        70 C    Ethylbenzene                  0.5430   0.5389       0.8  100  -0.02
        71 T    m-,p-Xylene                   0.6296   0.6475      -2.8  100  -0.02
        72 T    o-Xylene                      0.6434   0.6491      -0.9  102  -0.03
        73 T    Styrene                       1.0243   1.0419      -1.7   98  -0.02
        74 P    Bromoform                     0.1971   0.2028      -2.9   97  -0.02
        75 T    Isopropylbenzene              1.4844   1.5844      -6.7  103  -0.02

        76 I    1,4-Dichlorobenzene-d4        1.0000   1.0000       0.0  105  -0.02
        77 P    1,1,2,2-Tetrachloroethane     0.5598   0.5376       4.0   96  -0.02
        78 S    p-Bromofluorobenzene          1.0040   0.9809       2.3  111  -0.02
        79 T    1,2,3-Trichloropropane        0.1665   0.1578       5.2   98  -0.02
        80 T    trans-1,4-Dichloro-2-Butene   0.1803   0.1808      -0.2   98  -0.02
        81 T    n-Propylbenzene               3.4087   3.3192       2.6  102  -0.02
        82 T    Bromobenzene                  0.7517   0.7218       4.0  104  -0.02
        83 T    1,3,5-Trimethylbenzene        2.4115   2.4028       0.4  104  -0.02
        84 T    2-Chlorotoluene               2.2261   2.0885       6.2  103  -0.02
        85 T    4-Chlorotoluene               2.2770   2.0371      10.5   98  -0.02
        86 T    a-Methylstyrene               1.2900   1.2621       2.2  100  -0.02
        87 T    tert-Butylbenzene             0.5109   0.4921       3.7  102  -0.02
        88 T    1,2,4-Trimethylbenzene        2.4480   2.4101       1.5  102  -0.02
        89 T    sec-Butylbenzene              2.7643   3.0109      -8.9  111  -0.02
        90 T    p-Isopropyltoluene            2.3623   2.5679      -8.7  111  -0.02
        91 T    1,3-Dichlorobenzene           1.4056   1.4403      -2.5  109  -0.03
        92 T    1,4-Dichlorobenzene           1.4766   1.4481       1.9  108  -0.02
        93 T    n-Butylbenzene                2.1041   2.2487      -6.9  109  -0.02
        94 T    1,2-Dichlorobenzene           1.3224   1.3331      -0.8  107  -0.02
        95 T    1,2-Dibromo-3-Chloropropane   0.1035   0.0985       4.8   90  -0.02
        96 T    1,2,4-Trichlorobenzene        0.8940   0.8836       1.2  104  -0.03
        97 T    Hexachlorobutadiene           0.3454   0.3250       5.9  102  -0.02
        98 T    Naphthalene                   1.7286   1.7176       0.6   98  -0.03
        99 T    1,2,3-Trichlorobenzene        0.8232   0.7775       5.5  102  -0.03




        --------------------------------------------------------------------------
         (#) = Out of Range            SPCC's out = 0  CCC's out = 0
         11M98463.D  8260_WT.M      Sun Jan 19 15:13:21 2014                             Page 2
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                           Evaluate Continuing Calibration Report

     Data File : C:\MSDCHEM\1\DATA\011914\11M98463.D          Vial: 2
     Acq On    : 19 Jan 2014  14:35                         Operator: adc
     Sample    : WG459902-02 50ug/L CCV 8260                Inst    : hpms11
     Misc      : 1,1 STD62280                               Multiplr: 1.00
     MS Integration Params: rteint.p

     Method       : C:\MSDCHEM\1\METHODS\8260_WT.M (RTE Integrator)
     Title        : 8260B/624 (SOP: OVL MSV01) Water 11/05/13 HPMS11
     Last Update  : Mon Dec 16 17:06:06 2013
     Response via : Multiple Level Calibration

     Min. RRF     :   0.000  Min. Rel. Area :  50%  Max. R.T. Dev  0.50min
     Max. RRF Dev :  25%     Max. Rel. Area : 150%

          Compound                        Amount  Calc.      %Dev Area% Dev(min)
    -------------------------------------------------------------------------
   1 I    Fluorobenzene                  25.0000  25.0000       0.0   97  -0.02
   2 T    Dichlorodifluoromethane        50.0000  53.1090      -6.2   95  -0.01
   3 P    Chloromethane                  50.0000  51.1199      -2.2  104  -0.01
   4 C    Vinyl Chloride                 50.0000  56.1441     -12.3  102  -0.02
   5 T    1,3-Butadiene                  50.0000  67.7601     -35.5# 117  -0.02
   6 T    Bromomethane                   50.0000  67.9102     -35.8# 149  -0.02
   7 T    Chloroethane                   50.0000  57.6253     -15.3  109  -0.02
   8 T    Trichlorofluoromethane         50.0000  51.7216      -3.4   97  -0.02
   9 T    Diethyl ether                 100.0000 110.3146     -10.3  105  -0.02
  10 T    Isoprene                       50.0000  52.7117      -5.4  104  -0.02
  11 T    Acrolein                       50.0000 237.2659     -374.5# 598  -0.02
  12 T    1,1,2-Trichloro-1,2,2-Trifl    50.0000  54.3508      -8.7  104  -0.02
  13 T    Acetone                        50.0000  49.7239       0.6  105  -0.03
  14 C    1,1-Dichloroethene             50.0000  54.0682      -8.1  102  -0.02
  15 T    Tert-Butyl Alcohol            200.0000 178.8343      10.6   81  -0.03
  16 T    Dimethyl Sulfide               50.0000  51.3926      -2.8  100  -0.02
  17 T    Iodomethane                    50.0000  57.0555     -14.1  117  -0.02
  18 T    Methyl acetate                 50.0000  54.5752      -9.2  112  -0.03
  19 T    Methylene Chloride             50.0000  50.8643      -1.7  105  -0.02
  20 T    Carbon Disulfide               50.0000  55.2493     -10.5  107  -0.02
  21 T    Acrylonitrile                  50.0000  58.8255     -17.7  108  -0.01
  22 T    Methyl Tert Butyl Ether        50.0000  52.1483      -4.3   98  -0.02
  23 T    trans-1,2-Dichloroethene       50.0000  51.7814      -3.6  100  -0.02
  24 T    n-Hexane                       50.0000  59.6100     -19.2  117  -0.02
  25 T    Diisopropyl ether             100.0000 112.5224     -12.5  107  -0.02
  26 T    Vinyl Acetate                  50.0000  57.5427     -15.1  102  -0.02
  27 P    1,1-Dichloroethane             50.0000  54.1087      -8.2  103  -0.02
  28 T    Ethyl-Tert-Butyl ether        100.0000 105.0136      -5.0   99  -0.02
  29 T    2-Butanone                     50.0000  52.4529      -4.9  104  -0.02
  30 T    Propionitrile                 100.0000 116.1793     -16.2  105  -0.02
  31 T    2,2-Dichloropropane            50.0000  50.1413      -0.3   98  -0.02
  32 T    cis-1,2-Dichloroethene         50.0000  53.8355      -7.7  103  -0.02
  33 C    Chloroform                     50.0000  50.9247      -1.8  100  -0.02
  34 T    1-Bromopropane                 50.0000  55.8892     -11.8  110  -0.02
  35 T    Bromochloromethane             50.0000  56.6470     -13.3  105  -0.02
  36 T    Tetrahydrofuran               100.0000 112.9192     -12.9  103  -0.02
  37 S    Dibromofluoromethane           25.0000  25.0464      -0.2  104  -0.02
  38 T    1,1,1-Trichloroethane          50.0000  51.6195      -3.2   98  -0.02
  39 T    Cyclohexane                    50.0000  56.8999     -13.8  116  -0.02
  40 T    1,1-Dichloropropene            50.0000  53.3524      -6.7  101  -0.02
  41 T    Carbon Tetrachloride           50.0000  52.0590      -4.1   97  -0.02
  42 T    Tert-Amyl-Methyl ether        100.0000 103.8466      -3.8   98  -0.02
  43 S    1,2-Dichloroethane-d4          25.0000  23.4317       6.3   98  -0.02
  44 T    1,2-Dichloroethane             50.0000  51.6872      -3.4   97  -0.02
  45 T    Benzene                        50.0000  52.6084      -5.2  103  -0.02
  46 T    Trichloroethene                50.0000  53.0652      -6.1  103  -0.02
  47 T    Methylcyclohexane              50.0000  57.4576     -14.9  113  -0.02
  48 C    1,2-Dichloropropane            50.0000  55.8255     -11.7  106  -0.03
  49 T    1,4-Dioxane                   200.0000 187.3651       6.3   84  -0.03
  50 T    Bromodichloromethane           50.0000  51.1749      -2.3   97  -0.02
  51 T    Dibromomethane                 50.0000  52.8832      -5.8   99  -0.02
  52 T    2-Chloroethyl Vinyl Ether      50.0000  58.8055     -17.6  109  -0.02
  53 T    4-Methyl-2-Pentanone           50.0000  55.4431     -10.9  100  -0.03
  54 T    cis-1,3-Dichloropropene        50.0000  54.6797      -9.4  103  -0.02
  -------------------------------------------------------------------------
   (#) = Out of Range
   11M98463.D  8260_WT.M      Sun Jan 19 15:13:26 2014                          Page 1
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                          Evaluate Continuing Calibration Report

     Data File : C:\MSDCHEM\1\DATA\011914\11M98463.D          Vial: 2
     Acq On    : 19 Jan 2014  14:35                        Operator: adc
     Sample    : WG459902-02 50ug/L CCV 8260               Inst    : hpms11
     Misc      : 1,1 STD62280                              Multiplr: 1.00
     MS Integration Params: rteint.p

     Method       : C:\MSDCHEM\1\METHODS\8260_WT.M (RTE Integrator)
     Title        : 8260B/624 (SOP: OVL MSV01) Water 11/05/13 HPMS11
     Last Update  : Mon Dec 16 17:06:06 2013
     Response via : Multiple Level Calibration

     Min. RRF     :   0.000  Min. Rel. Area :  50%  Max. R.T. Dev  0.50min
     Max. RRF Dev :  25%     Max. Rel. Area : 150%

          Compound                      Amount  Calc.      %Dev Area% Dev(min)
    -----------------------------------------------------------------------
   55 T   Dimethyl Disulfide           50.0000  53.7004      -7.4  103  -0.02
   56 I   Chlorobenzene-d5             25.0000  25.0000       0.0  101  -0.02
   57 S   Toluene-d8                   25.0000  27.1958      -8.8  113  -0.02
   58 C   Toluene                      50.0000  51.6147      -3.2  101  -0.02
   59 T   Ethyl Methacrylate           50.0000  50.1448      -0.3   98  -0.02
   60 T   trans-1,3-Dichloropropene    50.0000  51.9838      -4.0  100  -0.02
   61 T   1,1,2-Trichloroethane        50.0000  52.6576      -5.3  102  -0.02
   62 T   2-Hexanone                   50.0000  50.5711      -1.1   96  -0.02
   63 T   1,3-Dichloropropane          50.0000  51.9115      -3.8  103  -0.02
   64 T   Tetrachloroethene            50.0000  50.8123      -1.6  104  -0.02
   65 T   Dibromochloromethane         50.0000  52.3657      -4.7  102  -0.02
   66 T   1,2-Dibromoethane            50.0000  52.4651      -4.9  101  -0.02
   67 T   1-Chlorohexane               50.0000  51.7874      -3.6  105  -0.02
   68 P   Chlorobenzene                50.0000  50.5403      -1.1  102  -0.02
   69 T   1,1,1,2-Tetrachloroethane    50.0000  49.7628       0.5  100  -0.02
   70 C   Ethylbenzene                 50.0000  49.6226       0.8  100  -0.02
   71 T   m-,p-Xylene                 100.0000 102.8347      -2.8  100  -0.02
   72 T   o-Xylene                     50.0000  50.4366      -0.9  102  -0.03
   73 T   Styrene                      50.0000  50.8557      -1.7   98  -0.02
   74 P   Bromoform                    50.0000  51.4413      -2.9   97  -0.02
   75 T   Isopropylbenzene             50.0000  53.3697      -6.7  103  -0.02

   76 I   1,4-Dichlorobenzene-d4       25.0000  25.0000       0.0  105  -0.02
   77 P   1,1,2,2-Tetrachloroethane    50.0000  48.0193       4.0   96  -0.02
   78 S   p-Bromofluorobenzene         25.0000  24.4233       2.3  111  -0.02
   79 T   1,2,3-Trichloropropane       50.0000  47.3879       5.2   98  -0.02
   80 T   trans-1,4-Dichloro-2-Butene  50.0000  43.5840      12.8   98  -0.02
   81 T   n-Propylbenzene              50.0000  48.6870       2.6  102  -0.02
   82 T   Bromobenzene                 50.0000  48.0167       4.0  104  -0.02
   83 T   1,3,5-Trimethylbenzene       50.0000  49.8197       0.4  104  -0.02
   84 T   2-Chlorotoluene              50.0000  46.9092       6.2  103  -0.02
   85 T   4-Chlorotoluene              50.0000  44.7320      10.5   98  -0.02
   86 T   a-Methylstyrene              50.0000  48.9190       2.2  100  -0.02
   87 T   tert-Butylbenzene            50.0000  48.1585       3.7  102  -0.02
   88 T   1,2,4-Trimethylbenzene       50.0000  49.2252       1.5  102  -0.02
   89 T   sec-Butylbenzene             50.0000  54.4618      -8.9  111  -0.02
   90 T   p-Isopropyltoluene           50.0000  54.3524      -8.7  111  -0.02
   91 T   1,3-Dichlorobenzene          50.0000  51.2360      -2.5  109  -0.03
   92 T   1,4-Dichlorobenzene          50.0000  49.0340       1.9  108  -0.02
   93 T   n-Butylbenzene               50.0000  53.4354      -6.9  109  -0.02
   94 T   1,2-Dichlorobenzene          50.0000  50.4051      -0.8  107  -0.02
   95 T   1,2-Dibromo-3-Chloropropane  50.0000  47.5971       4.8   90  -0.02
   96 T   1,2,4-Trichlorobenzene       50.0000  49.4174       1.2  104  -0.03
   97 T   Hexachlorobutadiene          50.0000  47.0564       5.9  102  -0.02
   98 T   Naphthalene                  50.0000  49.6839       0.6   98  -0.03
   99 T   1,2,3-Trichlorobenzene       50.0000  47.2251       5.5  102  -0.03

   ---------------------------------------------------------------------------
    (#) = Out of Range             SPCC's out = 0  CCC's out = 0
    11M98463.D  8260_WT.M      Sun Jan 19 15:13:26 2014                            Page 2
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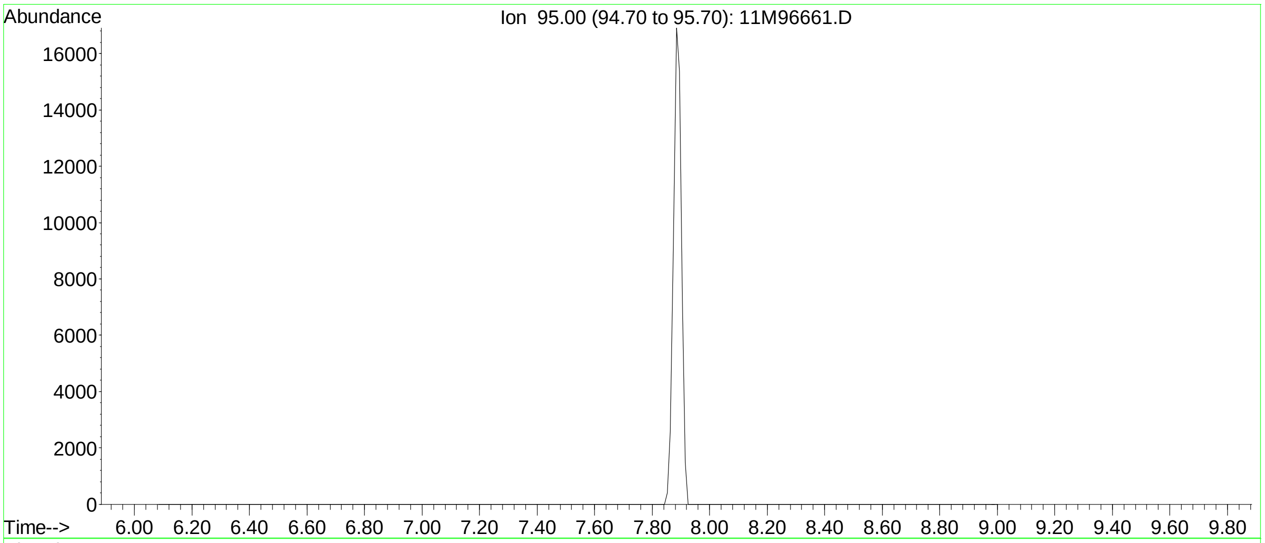
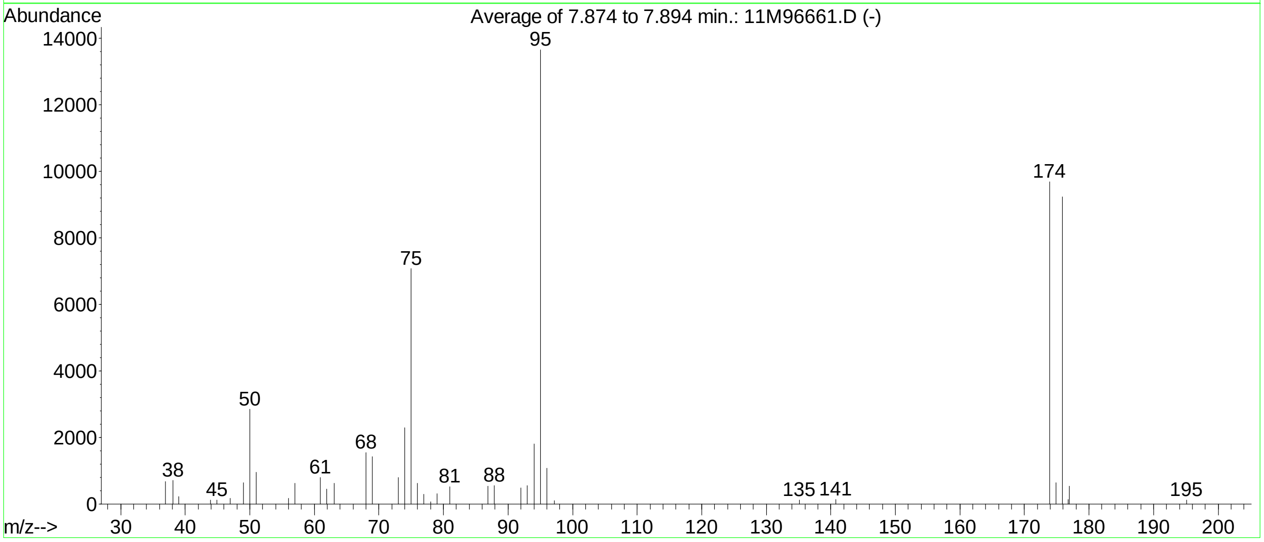
2.1.1.5 Raw QC Data

```
Data File : C:\MSDCHEM\1\DATA\110513\11M96661.D          Vial: 1
Acq On    :  5 Nov 2013  15:54                       Operator: FJB
Sample    : WG451178-01 BFB 50ng 8260                Inst    : hpms11
Misc      : 1,1 STD61161                             Multiplr: 1.00
MS Integration Params: rteint.p
Method   : C:\MSDCHEM\1\METHODS\BFB.M (RTE Integrator)
Title    : SOP: OVL MSV01
```





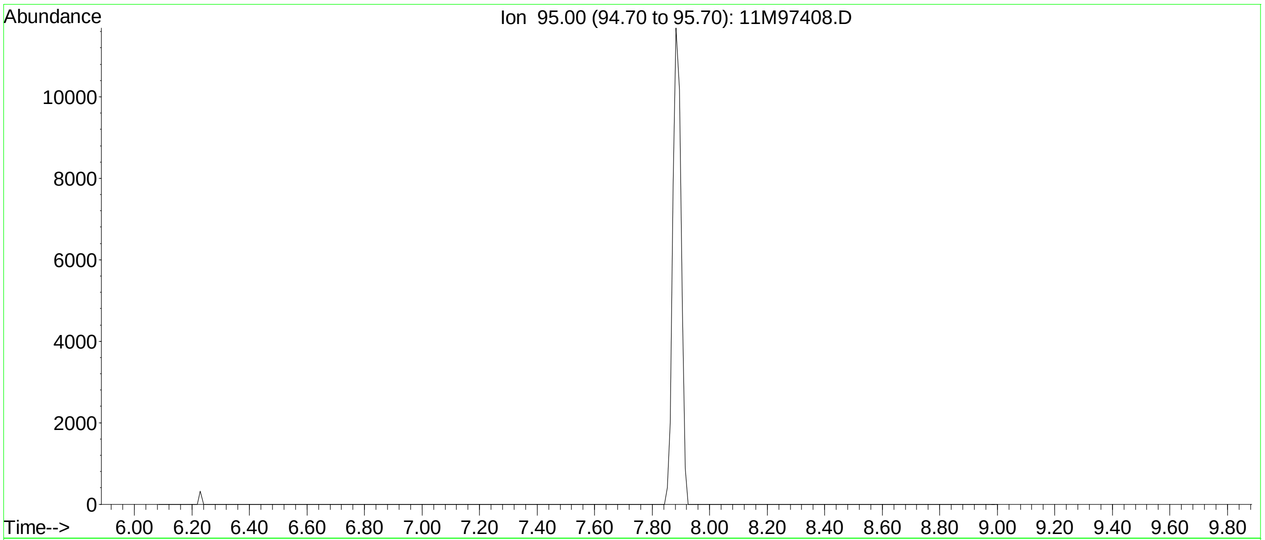
```
AutoFind: Scans 174, 175, 176; Background Corrected with Scan 169

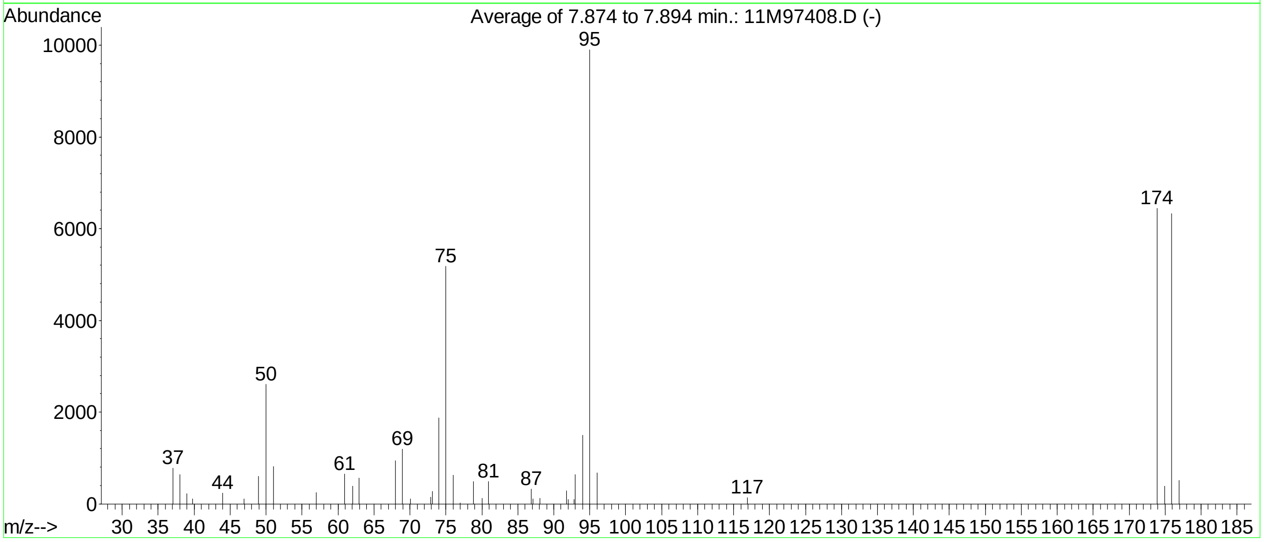
| Target | Rel. to | Lower  | Upper  |  Rel.  |    Raw    |   Result  |
|  Mass  |  Mass   | Limit% | Limit% |  Abn%  |    Abn    | Pass/Fail |
----------------------------------------------------------------------
|   50   |    95   |    15  |    40  |  20.8  |     2847 |   PASS    |
|   75   |    95   |    30  |    60  |  51.7  |     7067 |   PASS    |
|   95   |    95   |   100  |   100  | 100.0  |    13657 |   PASS    |
|   96   |    95   |     5  |     9  |   7.9  |     1078 |   PASS    |
|  173   |   174   |  0.00  |     2  |   0.0  |        0 |   PASS    |
|  174   |    95   |    50  |   100  |  70.9  |     9677 |   PASS    |
|  175   |   174   |     5  |     9  |   6.6  |      640 |   PASS    |
|  176   |   174   |    95  |   101  |  95.5  |     9240 |   PASS    |
|  177   |   176   |     5  |     9  |   5.8  |      534 |   PASS    |
----------------------------------------------------------------------

11M96661.D  BFB.M     Wed Nov 06 15:33:17 2013
```

BFB

```
Data File : C:\MSDCHEM\1\DATA\120413\11M97408.D          Vial: 1
Acq On    :  4 Dec 2013  15:09                       Operator: FJB
Sample    : WG455130-01 BFB 50ng A9FOO               Inst    : hpms11
Misc      : 1,1 STD61161                             Multiplr: 1.00
MS Integration Params: rteint.p
Method   : C:\MSDCHEM\1\METHODS\BFB.M (RTE Integrator)
Title    : SOP: OVL MSV01
```





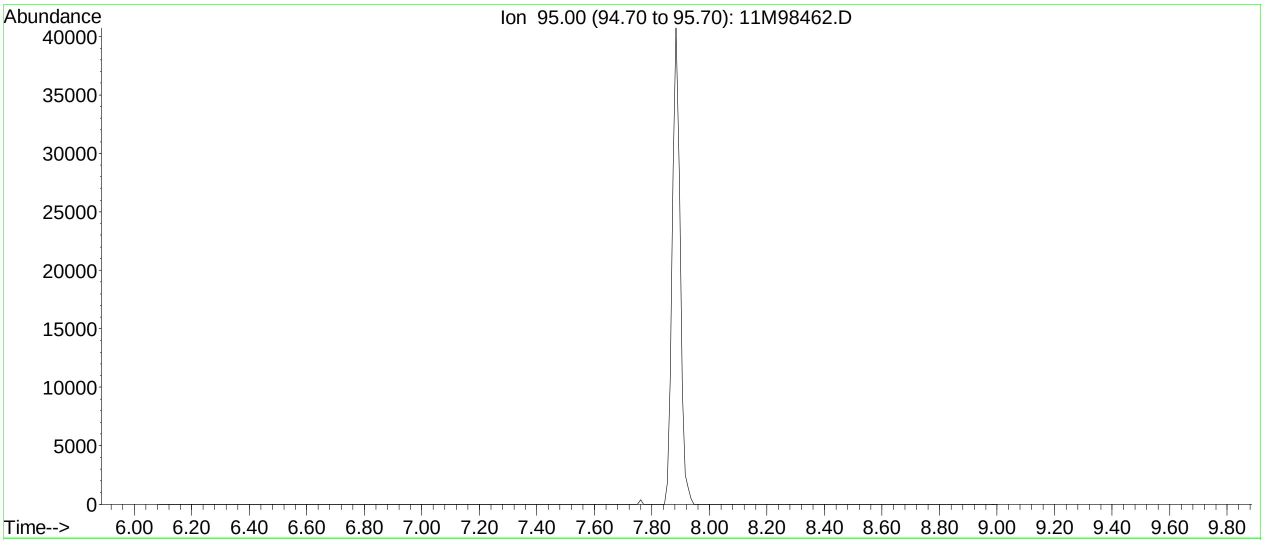
```
AutoFind: Scans 174, 175, 176; Background Corrected with Scan 169

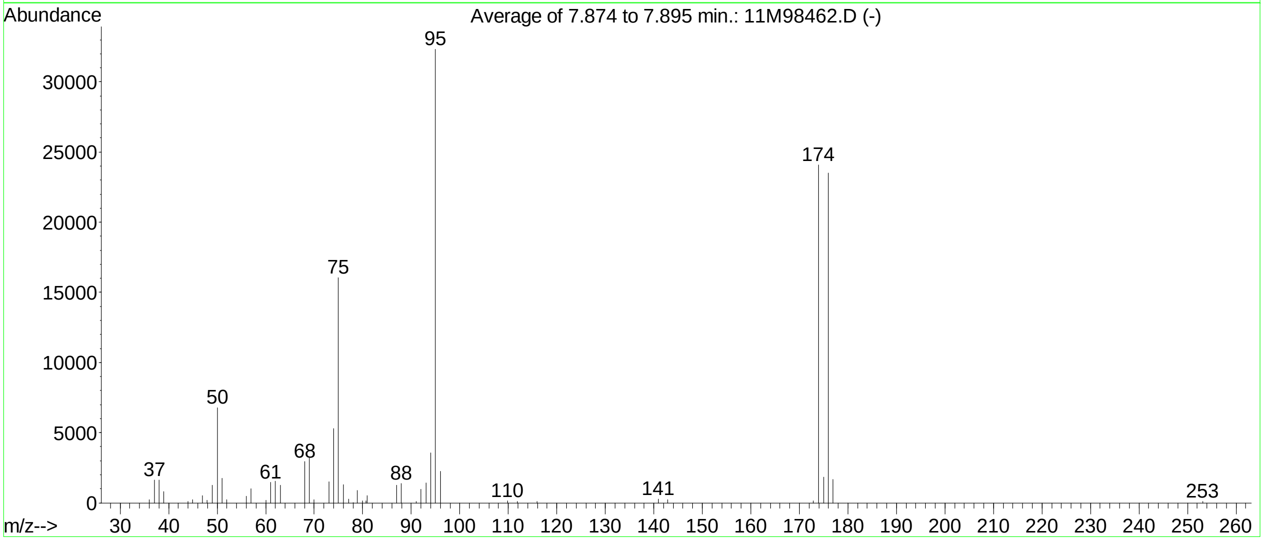
| Target | Rel. to | Lower  | Upper  |  Rel.  |     Raw    |   Result  |
|  Mass  |  Mass   | Limit% | Limit% |  Abn%  |     Abn    | Pass/Fail |
-----------------------------------------------------------------------
|   50   |    95   |    15  |    40  |  26.3  |      2601  |   PASS    |
|   75   |    95   |    30  |    60  |  52.3  |      5177  |   PASS    |
|   95   |    95   |   100  |   100  | 100.0  |      9902  |   PASS    |
|   96   |    95   |     5  |     9  |   6.8  |       675  |   PASS    |
|  173   |   174   |  0.00  |     2  |   0.0  |         0  |   PASS    |
|  174   |    95   |    50  |   100  |  65.0  |      6441  |   PASS    |
|  175   |   174   |     5  |     9  |   6.0  |       384  |   PASS    |
|  176   |   174   |    95  |   101  |  98.2  |      6328  |   PASS    |
|  177   |   176   |     5  |     9  |   8.1  |       514  |   PASS    |
-----------------------------------------------------------------------

11M97408.D  BFB.M     Wed Dec 18 14:07:30 2013
```

BFB

```
Data File : C:\MSDCHEM\1\DATA\011914\11M98462.D         Vial: 3
Acq On    : 19 Jan 2014  14:06                      Operator: adc
Sample    : WG459902-01 BFB 50ng 8260               Inst    : hpms11
Misc      : 1,1 STD62146                            Multiplr: 1.00
MS Integration Params: rteint.p
Method    : C:\MSDCHEM\1\METHODS\8260_WT.M (RTE Integrator)
Title     : 8260B/624 (SOP: OVL MSV01) Water 11/05/13 HPMS11
```





```
AutoFind: Scans 174, 175, 176; Background Corrected with Scan 169

| Target | Rel. to | Lower  | Upper  |  Rel.  |     Raw    |   Result  |
|  Mass  |  Mass   | Limit% | Limit% |  Abn%  |     Abn    | Pass/Fail |
----------------------------------------------------------------------
|   50   |    95   |    15  |    40  |  21.0  |      6775  |   PASS    |
|   75   |    95   |    30  |    60  |  49.7  |     16066  |   PASS    |
|   95   |    95   |   100  |   100  | 100.0  |     32333  |   PASS    |
|   96   |    95   |     5  |     9  |   6.9  |      2235  |   PASS    |
|  173   |   174   |  0.00  |     2  |   0.5  |       127  |   PASS    |
|  174   |    95   |    50  |   100  |  74.5  |     24080  |   PASS    |
|  175   |   174   |     5  |     9  |   7.6  |      1820  |   PASS    |
|  176   |   174   |    95  |   101  |  97.7  |     23520  |   PASS    |
|  177   |   176   |     5  |     9  |   7.0  |      1651  |   PASS    |
----------------------------------------------------------------------

11M98462.D  8260_WT.M     Sun Jan 19 15:13:39 2014
```

```
                          Quantitation Report    (Not Reviewed)

Data File : C:\MSDCHEM\1\DATA\011914\11M98465.D          Vial: 4
Acq On    : 19 Jan 2014  15:38                       Operator: adc
Sample    : WG459903-01 VBLK0119 BLANK 8260          Inst    : hpms11
Misc      : 1,1                                      Multiplr: 1.00
MS Integration Params: rteint.p
Quant Time: Jan 20 13:43:13 2014          Quant Results File: 8260_WT.RES

Quant Method : C:\MSDCHEM\1\METHODS\8260_WT.M (RTE Integrator)
Title        : 8260B/624 (SOP: OVL MSV01) Water 11/05/13 HPMS11
Last Update  : Mon Dec 16 17:06:06 2013
Response via : Initial Calibration
DataAcq Meth : 8260_WT

 Internal Standards                 R.T. QIon  Response  Conc Units Dev(Min)
 -------------------------------------------------------------------------
   1) Fluorobenzene                10.61   96   807878    25.00 ug/L   -0.02
  56) Chlorobenzene-d5             14.24  117   655317    25.00 ug/L   -0.02
  76) 1,4-Dichlorobenzene-d4       17.05  152   359174    25.00 ug/L   -0.02

 System Monitoring Compounds
  37) Dibromofluoromethane          9.62  111   242104    24.7731 ug/L -0.02
   Spiked Amount     25.000   Range  86 - 118    Recovery   =   99.08%
  43) 1,2-Dichloroethane-d4        10.23   65   272477    24.6875 ug/L -0.02
   Spiked Amount     25.000   Range  80 - 120    Recovery   =   98.76%
  57) Toluene-d8                   12.47   98   897465    27.2691 ug/L -0.02
   Spiked Amount     25.000   Range  88 - 110    Recovery   =  109.08%
  78) p-Bromofluorobenzene         15.63   95   368026    25.5136 ug/L -0.02
   Spiked Amount     25.000   Range  86 - 115    Recovery   =  102.04%

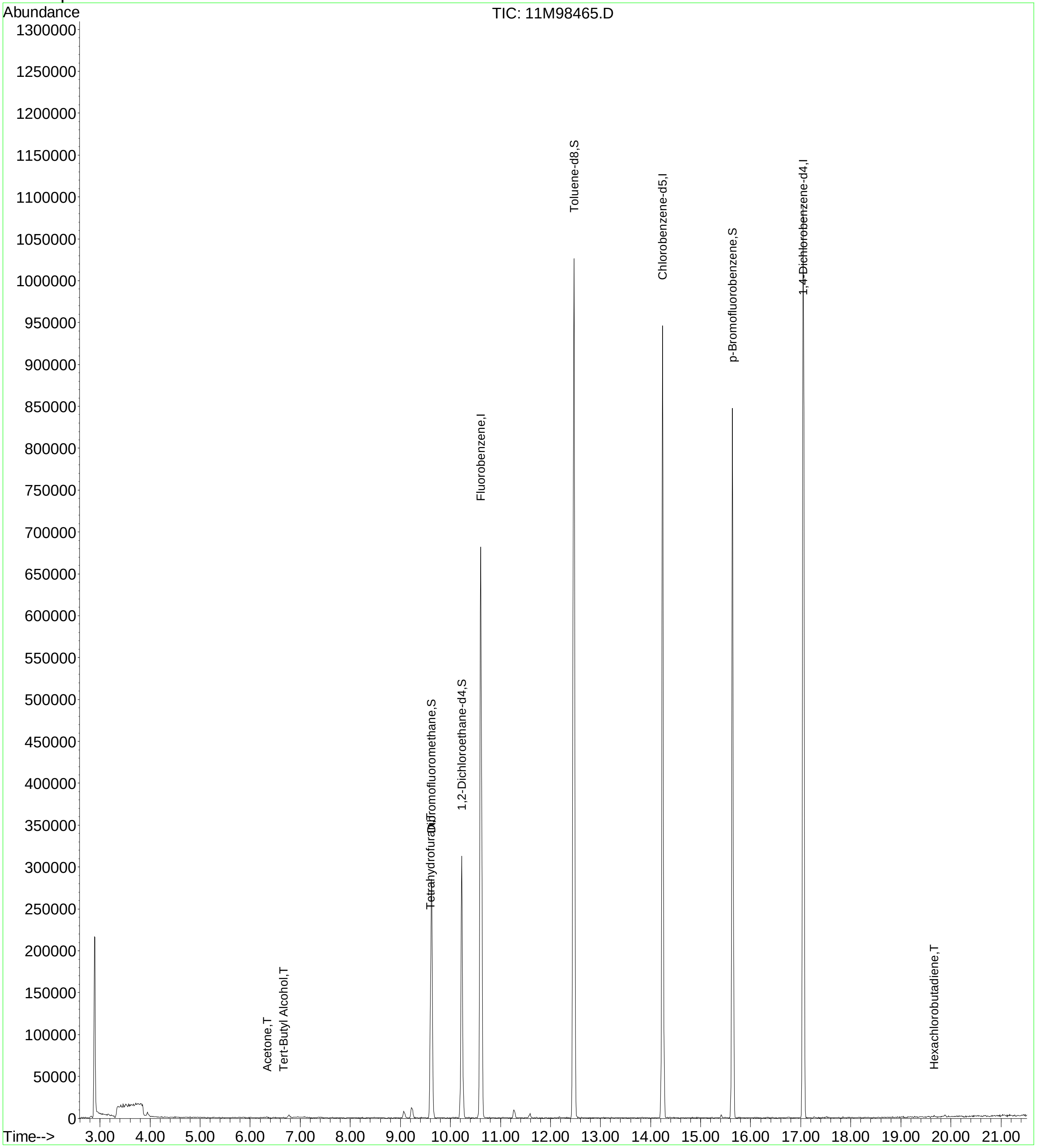
 Target Compounds                                                    Qvalue
  13) Acetone                       6.34   43     1020     0.5435 ug/L    90
  15) Tert-Butyl Alcohol            6.67   59      190     0.3259 ug/L #  58
  36) Tetrahydrofuran               9.61   42      201     0.1241 ug/L #  39
  97) Hexachlorobutadiene          19.67  225     1282     0.2584 ug/L #  37

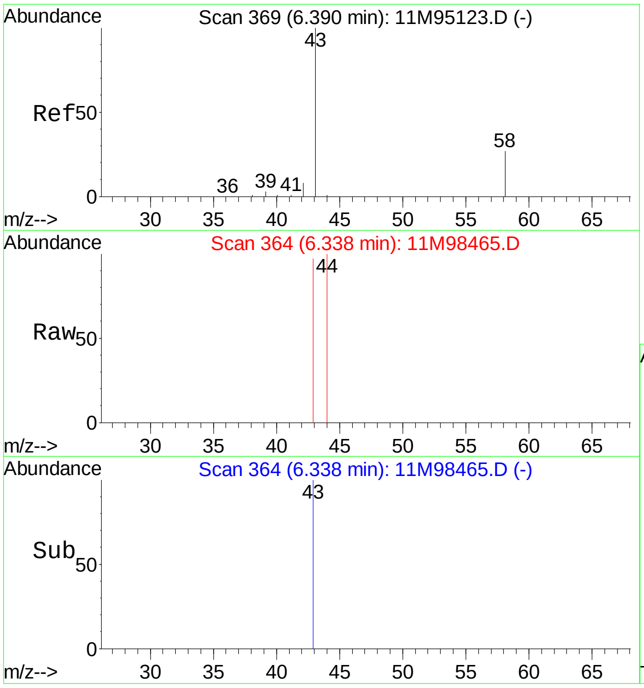
 -------------------------------------------------------------------------
 (#) = qualifier out of range (m) = manual integration
 11M98465.D  8260_WT.M      Mon Jan 20 13:43:14 2014                        Page 1
```

Quantitation Report (Not Reviewed)

```
Data File : C:\MSDCHEM\1\DATA\011914\11M98465.D          Vial: 4
Acq On    : 19 Jan 2014  15:38                       Operator: adc
Sample    : WG459903-01 VBLK0119 BLANK 8260          Inst    : hpms11
Misc      : 1,1                                      Multiplr: 1.00
MS Integration Params: rteint.p
Quant Time: Jan 20 13:43 2014            Quant Results File: 8260_WT.RES

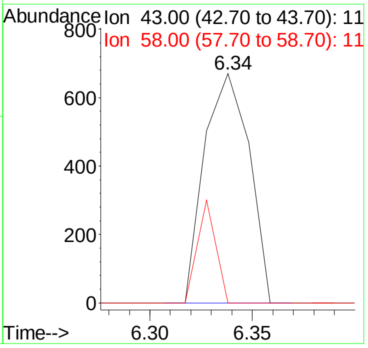
Method       : C:\MSDCHEM\1\METHODS\8260_WT.M (RTE Integrator)
Title        : 8260B/624 (SOP: OVL MSV01) Water 11/05/13 HPMS11
Last Update  : Mon Dec 16 17:06:06 2013
Response via : Initial Calibration
```

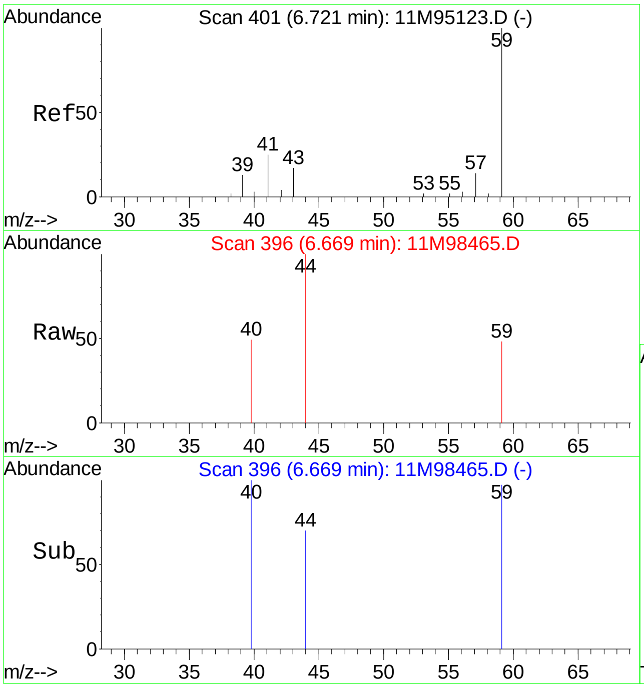




```
#13
Acetone
Concen:     0.54 ug/L
RT: 6.34 min   Scan# 364
Delta R.T.    -0.01 min
Lab File:    11M98465.D
Acq: 19 Jan 2014  15:38

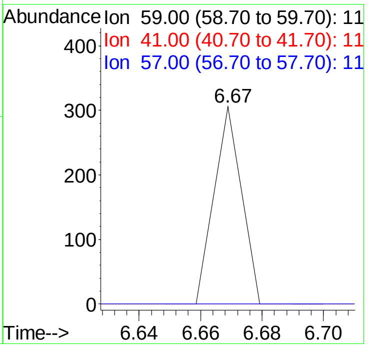
Tgt Ion: 43 Resp:     1020
Ion  Ratio  Lower   Upper
 43  100
 58   18.3   13.9    32.3
```

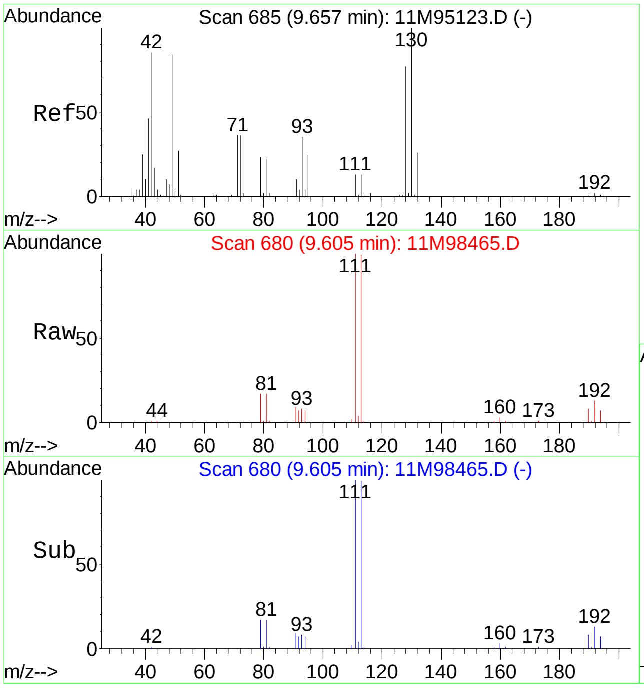




```
#15
Tert-Butyl Alcohol
Concen:     0.33 ug/L
RT: 6.67 min   Scan# 396
Delta R.T.    -0.00 min
Lab File:    11M98465.D
Acq: 19 Jan 2014  15:38

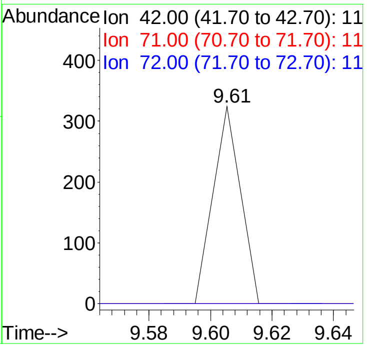
Tgt Ion: 59 Resp:      190
Ion  Ratio  Lower   Upper
 59  100
 41    0.0   14.0    32.6#
 57    0.0    7.2    16.8#
```

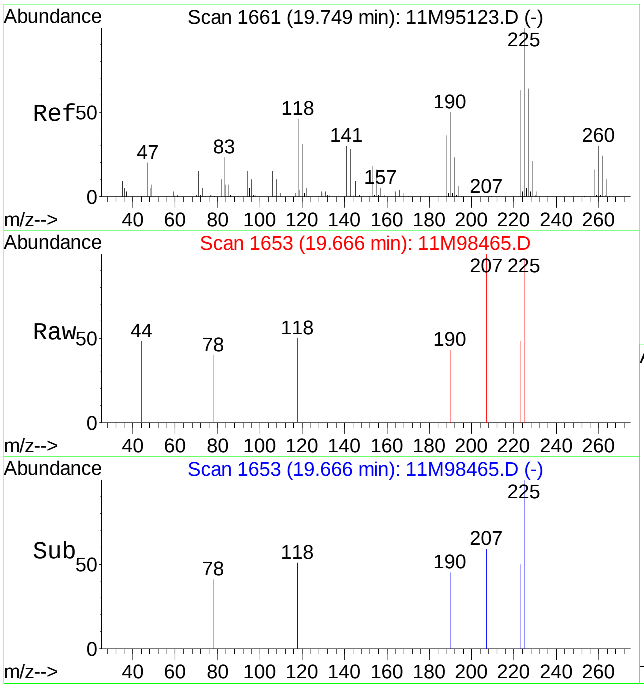




```
#36
Tetrahydrofuran
Concen:    0.12 ug/L
RT: 9.61 min   Scan# 680
Delta R.T.    -0.00 min
Lab File:   11M98465.D
Acq: 19 Jan 2014  15:38

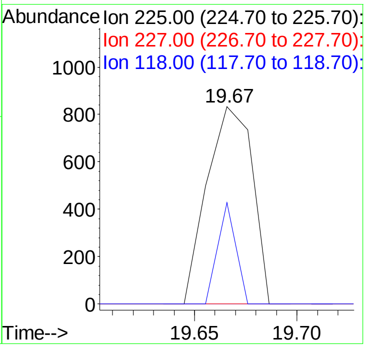
Tgt Ion: 42 Resp:      201
Ion  Ratio  Lower   Upper
 42  100
 71    0.0   21.3    49.7#
 72    0.0   22.3    51.9#
```





```
#97
Hexachlorobutadiene
Concen:    0.26 ug/L
RT: 19.67 min   Scan# 1653
Delta R.T.    -0.03 min
Lab File:   11M98465.D
Acq: 19 Jan 2014  15:38

Tgt Ion:225 Resp:     1282
Ion  Ratio  Lower   Upper
225  100
227    0.0   38.2    89.0#
118   20.7   27.9    65.1#
```



```
                               Quantitation Report    (Not Reviewed)

Data File : C:\MSDchem\1\data\011914\11M98466.D          Vial: 5
Acq On    : 19 Jan 2014  16:10                       Operator: adc
Sample    : WG459903-02 20ug/L LCS 8260              Inst    : hpms11
Misc      : 1,1 STD62287                             Multiplr: 1.00
MS Integration Params: rteint.p
Quant Time: Jan 19 16:32:07 2014          Quant Results File: 8260_WT.RES

Quant Method : C:\MSDCHEM\1\METHODS\8260_WT.M (RTE Integrator)
Title        : 8260B/624 (SOP: OVL MSV01) Water 11/05/13 HPMS11
Last Update  : Mon Dec 16 17:06:06 2013
Response via : Initial Calibration
DataAcq Meth : 8260_WT

 Internal Standards                R.T. QIon  Response  Conc Units Dev(Min)
 --------------------------------------------------------------------------
   1) Fluorobenzene               10.61   96   808926    25.00 ug/L   -0.02
  56) Chlorobenzene-d5            14.24  117   662255    25.00 ug/L   -0.02
  76) 1,4-Dichlorobenzene-d4      17.05  152   370395    25.00 ug/L   -0.02

 System Monitoring Compounds
  37) Dibromofluoromethane         9.62  111   242602    24.7919 ug/L -0.02
   Spiked Amount     25.000   Range  86 - 118    Recovery   =   99.16%
  43) 1,2-Dichloroethane-d4       10.23   65   270686    24.4934 ug/L -0.02
   Spiked Amount     25.000   Range  80 - 120    Recovery   =   97.96%
  57) Toluene-d8                  12.47   98   901657    27.1095 ug/L -0.02
   Spiked Amount     25.000   Range  88 - 110    Recovery   =  108.44%
  78) p-Bromofluorobenzene        15.63   95   377668    25.3888 ug/L -0.02
   Spiked Amount     25.000   Range  86 - 115    Recovery   =  101.56%

 Target Compounds                                                   Qvalue
   2) Dichlorodifluoromethane      3.22   85   221388    27.7455 ug/L   100
   3) Chloromethane                3.69   50   254788    22.6230 ug/L    98
   4) Vinyl Chloride               3.92   62   249051    23.3356 ug/L    99
   5) 1,3-Butadiene                3.96   54   125473    17.0391 ug/L    99
   6) Bromomethane                 4.83   94   122868    26.8320 ug/L    98
   7) Chloroethane                 4.98   64   146985    23.6716 ug/L    98
   8) Trichlorofluoromethane       5.47  101   343435    23.1129 ug/L    99
   9) Diethyl ether                5.99   59   802124   128.6615 ug/L    94
  10) Isoprene                     6.03   67   261102    21.3520 ug/L    84
  11) Acrolein                     6.22   56   167092   596.2463 ug/L    94
  12) 1,1,2-Trichloro-1,2,2-Trif   6.25  101   213076    24.5685 ug/L    83
  13) Acetone                      6.33   43    58740    31.2588 ug/L    83
  14) 1,1-Dichloroethene           6.55   61   309226    21.0664 ug/L    96
  15) Tert-Butyl Alcohol           6.65   59   151232   259.0437 ug/L    98
  16) Dimethyl Sulfide             6.80   62   193158    23.1929 ug/L    89
  17) Iodomethane                  7.05  142    73005    15.9268 ug/L    89
  18) Methyl acetate               7.06   43   132857    24.4001 ug/L    95
  19) Methylene Chloride           7.31   84   200790    21.3920 ug/L    96
  20) Carbon Disulfide             7.35   76   558682    20.9075 ug/L   100
  21) Acrylonitrile                7.49   53    66245    28.8891 ug/L    98
  22) Methyl Tert Butyl Ether      7.51   73   527987    24.1139 ug/L    97
  23) trans-1,2-Dichloroethene     7.74   96   204193    22.0258 ug/L    93
  24) n-Hexane                     7.82   57   251891    21.9717 ug/L    99
  25) Diisopropyl ether            8.14   45  3525774   120.1907 ug/L    97
  26) Vinyl Acetate                8.30   43   356739    32.3953 ug/L    97
  27) 1,1-Dichloroethane           8.34   63   373029    22.1501 ug/L    98
  28) Ethyl-Tert-Butyl ether       8.69   59  3152149   116.8741 ug/L    95
  29) 2-Butanone                   8.86   43    76453    27.9935 ug/L    91
  30) Propionitrile                8.97   54   114715   150.8005 ug/L    97
  31) 2,2-Dichloropropane          9.08   77   322575    20.0549 ug/L    97
  32) cis-1,2-Dichloroethene       9.15   96   220686    22.3129 ug/L    97
  33) Chloroform                   9.35   83   357677    21.1466 ug/L   100
  34) 1-Bromopropane               9.47  122    45206    25.6105 ug/L    97
  35) Bromochloromethane           9.56  130   131927    23.9321 ug/L    95
  36) Tetrahydrofuran              9.59   42   243390   150.1357 ug/L    98
  38) 1,1,1-Trichloroethane        9.85   97   324128    21.2858 ug/L    93
  39) Cyclohexane                  9.88   56   348758    21.8846 ug/L    99
  40) 1,1-Dichloropropene         10.04   75   294122    22.9800 ug/L    97
  41) Carbon Tetrachloride        10.17  117   298067    21.2862 ug/L    98
  42) Tert-Amyl-Methyl ether      10.12   73  2741034   123.3870 ug/L    95
 --------------------------------------------------------------------------
 (#) = qualifier out of range (m) = manual integration
 11M98466.D  8260_WT.M      Sun Jan 19 16:32:08 2014                                   Page 1
```

```
                            Quantitation Report    (Not Reviewed)

Data File : C:\MSDchem\1\data\011914\11M98466.D          Vial: 5
Acq On    : 19 Jan 2014  16:10                       Operator: adc
Sample    : WG459903-02 20ug/L LCS 8260              Inst    : hpms11
Misc      : 1,1 STD62287                             Multiplr: 1.00
MS Integration Params: rteint.p
Quant Time: Jan 19 16:32:07 2014          Quant Results File: 8260_WT.RES

Quant Method : C:\MSDCHEM\1\METHODS\8260_WT.M (RTE Integrator)
Title        : 8260B/624 (SOP: OVL MSV01) Water 11/05/13 HPMS11
Last Update  : Mon Dec 16 17:06:06 2013
Response via : Initial Calibration
DataAcq Meth : 8260_WT


      Compound                     R.T. QIon  Response  Conc Unit   Qvalue
 -------------------------------------------------------------------------
  44) 1,2-Dichloroethane          10.34   62   285313    23.3341 ug/L    94
  45) Benzene                     10.38   78   786981    22.2942 ug/L    99
  46) Trichloroethene             11.08  130   218057    22.5016 ug/L    98
  47) Methylcyclohexane           11.17   83   309774    23.1018 ug/L    90
  48) 1,2-Dichloropropane         11.29   63   217446    23.6808 ug/L    82
  49) 1,4-Dioxane                 11.56   88    13270   221.0835 ug/L    84
  50) Bromodichloromethane        11.57   83   268347    21.0310 ug/L    99
  51) Dibromomethane              11.65   93   117037    23.2996 ug/L    93
  52) 2-Chloroethyl Vinyl Ether   11.84   63    84947    19.8982 ug/L    98
  53) 4-Methyl-2-Pentanone        11.86   58    57678    25.9323 ug/L    99
  54) cis-1,3-Dichloropropene     12.16   75   354996    24.2413 ug/L   100
  55) Dimethyl Disulfide          12.42   79   178635    22.1876 ug/L    85
  58) Toluene                     12.56   91   832335    22.5933 ug/L   100
  59) Ethyl Methacrylate          12.64   69   215477    23.7462 ug/L    88
  60) trans-1,3-Dichloropropene   12.72   75   303260    22.8549 ug/L    93
  61) 1,1,2-Trichloroethane       12.92   97   166451    24.9068 ug/L    97
  62) 2-Hexanone                  12.85   43   110026    26.2093 ug/L #  84
  63) 1,3-Dichloropropane         13.20   76   300170    24.5782 ug/L    89
  64) Tetrachloroethene           13.33  164   167841    21.5719 ug/L    98
  65) Dibromochloromethane        13.58  129   203399    22.7131 ug/L    99
  66) 1,2-Dibromoethane           13.82  107   167343    24.5124 ug/L    98
  67) 1-Chlorohexane              13.89   91   271358    21.8209 ug/L    87
  68) Chlorobenzene               14.29  112   525826    20.2421 ug/L   100
  69) 1,1,1,2-Tetrachloroethane   14.31  131   216382    22.3385 ug/L    96
  70) Ethylbenzene                14.30  106   306594    21.3152 ug/L    92
  71) m-,p-Xylene                 14.38  106   715539    42.9011 ug/L    90
  72) o-Xylene                    14.91  106   337787    19.8175 ug/L    86
  73) Styrene                     14.95  104   592353    21.8302 ug/L    86
  74) Bromoform                   15.42  173   127098    24.3459 ug/L    98
  75) Isopropylbenzene            15.30  105   844147    21.4678 ug/L    97
  77) 1,1,2,2-Tetrachloroethane   15.51   83   204473    24.6539 ug/L    97
  79) 1,2,3-Trichloropropane      15.69  110    60568    24.5496 ug/L #  59
  80) trans-1,4-Dichloro-2-Buten  15.73   53    40236    13.5443 ug/L #   1
  81) n-Propylbenzene             15.78   91   997731    19.7563 ug/L    99
  82) Bromobenzene                15.91  156   236192    21.2089 ug/L    62
  83) 1,3,5-Trimethylbenzene      15.95  105   795445    22.2641 ug/L    94
  84) 2-Chlorotoluene             16.04   91   642199    19.4716 ug/L    92
  85) 4-Chlorotoluene             16.08   91   607468    18.0066 ug/L    87
  86) a-Methylstyrene             16.33  118   393331    20.5805 ug/L    91
  87) tert-Butylbenzene           16.39  134   147069    19.4282 ug/L    88
  88) 1,2,4-Trimethylbenzene      16.43  105   798790    22.0239 ug/L    96
  89) sec-Butylbenzene            16.64  105   864493    21.1084 ug/L    99
  90) p-Isopropyltoluene          16.78  119   749122    21.4042 ug/L   100
  91) 1,3-Dichlorobenzene         16.97  146   414745    19.9163 ug/L    99
  92) 1,4-Dichlorobenzene         17.09  146   447581    20.4585 ug/L    98
  93) n-Butylbenzene              17.27   91   701960    22.5172 ug/L    99
  94) 1,2-Dichlorobenzene         17.56  146   399153    20.3729 ug/L    99
  95) 1,2-Dibromo-3-Chloropropan  18.48   75    34951    22.7962 ug/L    96
  96) 1,2,4-Trichlorobenzene      19.53  180   294441    22.2295 ug/L    99
  97) Hexachlorobutadiene         19.68  225   110134    21.5238 ug/L    99
  98) Naphthalene                 19.88  128   634025    24.7569 ug/L    98
  99) 1,2,3-Trichlorobenzene      20.17  180   272986    22.3833 ug/L    99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 (#) = qualifier out of range (m) = manual integration
 11M98466.D  8260_WT.M      Sun Jan 19 16:32:08 2014                            Page 2
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                          Quantitation Report    (Not Reviewed)

  Data File : C:\MSDchem\1\data\011914\11M98466.D          Vial: 5
  Acq On    : 19 Jan 2014  16:10                       Operator: adc
  Sample    : WG459903-02 20ug/L LCS 8260              Inst    : hpms11
  Misc      : 1,1 STD62287                             Multiplr: 1.00
  MS Integration Params: rteint.p
  Quant Time: Jan 19 16:32 2014           Quant Results File: 8260_WT.RES

  Method       : C:\MSDCHEM\1\METHODS\8260_WT.M (RTE Integrator)
  Title        : 8260B/624 (SOP: OVL MSV01) Water 11/05/13 HPMS11
  Last Update  : Mon Dec 16 17:06:06 2013
  Response via : Initial Calibration
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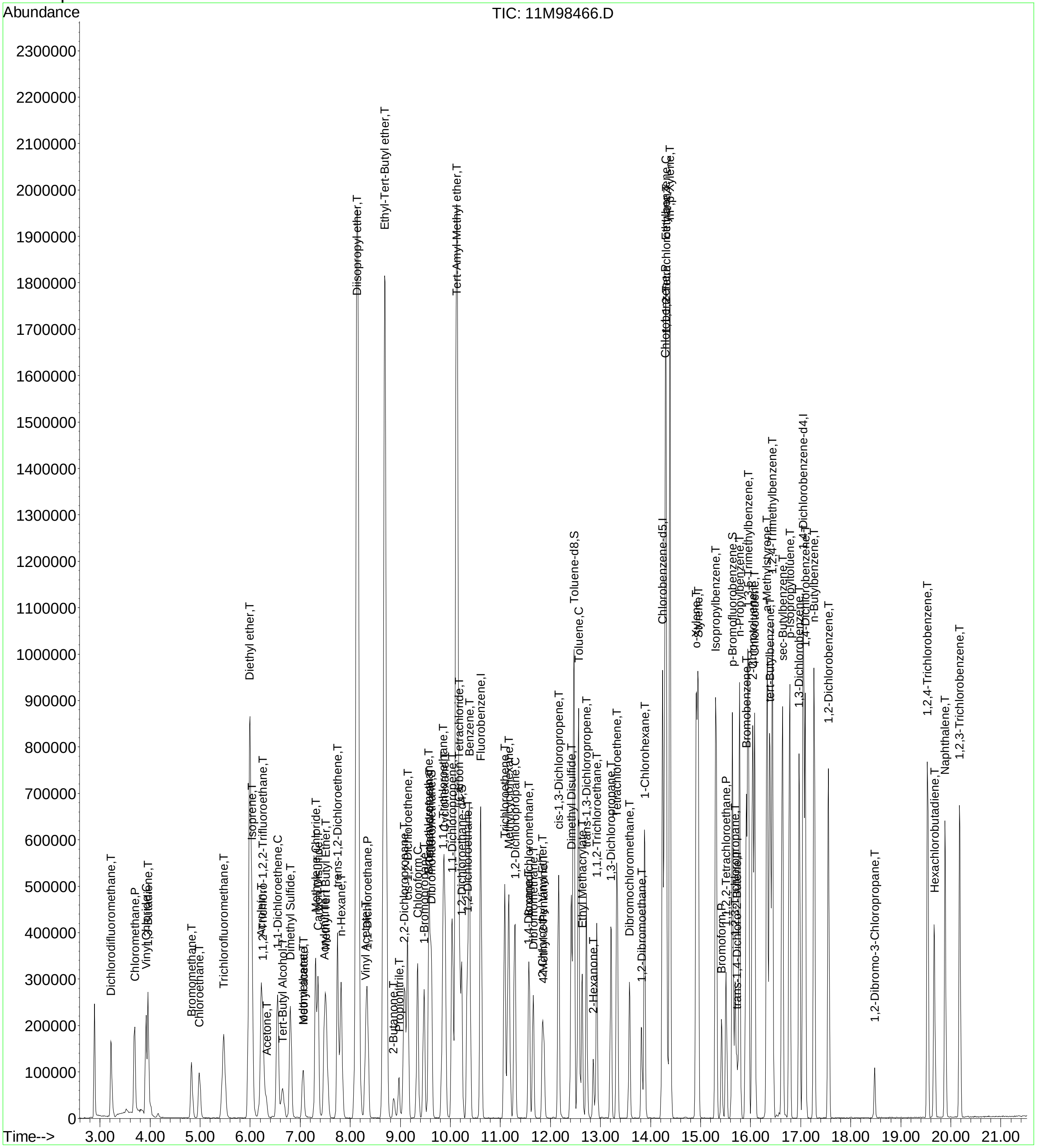

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11M98466.D  8260_WT.M       Sun Jan 19 16:32:09 2014                     Page 3
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                              Quantitation Report    (Not Reviewed)

Data File : C:\MSDchem\1\data\011914\11M98467.D          Vial: 6
Acq On    : 19 Jan 2014  16:42                        Operator: adc
Sample    : WG459903-03 20ug/L LCSDUP 8260            Inst    : hpms11
Misc      : 1,1 STD62287                              Multiplr: 1.00
MS Integration Params: rteint.p
Quant Time: Jan 19 17:03:46 2014          Quant Results File: 8260_WT.RES

Quant Method : C:\MSDCHEM\1\METHODS\8260_WT.M (RTE Integrator)
Title        : 8260B/624 (SOP: OVL MSV01) Water 11/05/13 HPMS11
Last Update  : Mon Dec 16 17:06:06 2013
Response via : Initial Calibration
DataAcq Meth : 8260_WT

 Internal Standards                R.T. QIon  Response  Conc Units Dev(Min)
 -------------------------------------------------------------------------
   1) Fluorobenzene               10.61   96   802390    25.00 ug/L   -0.02
  56) Chlorobenzene-d5            14.24  117   667768    25.00 ug/L   -0.02
  76) 1,4-Dichlorobenzene-d4      17.05  152   364208    25.00 ug/L   -0.02

 System Monitoring Compounds
  37) Dibromofluoromethane         9.62  111   246114    25.3557 ug/L -0.02
   Spiked Amount     25.000   Range  86 - 118    Recovery   =  101.44%
  43) 1,2-Dichloroethane-d4       10.23   65   267564    24.4081 ug/L -0.02
   Spiked Amount     25.000   Range  80 - 120    Recovery   =   97.64%
  57) Toluene-d8                  12.47   98   913374    27.2351 ug/L -0.02
   Spiked Amount     25.000   Range  88 - 110    Recovery   =  108.96%
  78) p-Bromofluorobenzene        15.63   95   381973    26.1145 ug/L -0.02
   Spiked Amount     25.000   Range  86 - 115    Recovery   =  104.44%

 Target Compounds                                                 Qvalue
   2) Dichlorodifluoromethane      3.22   85   213105    26.9250 ug/L   100
   3) Chloromethane                3.69   50   250128    22.3901 ug/L    98
   4) Vinyl Chloride               3.92   62   243735    23.0235 ug/L    98
   5) 1,3-Butadiene                3.96   54   122449    16.6937 ug/L    99
   6) Bromomethane                 4.83   94   121043    26.6487 ug/L    99
   7) Chloroethane                 4.98   64   146923    23.8544 ug/L    98
   8) Trichlorofluoromethane       5.47  101   328917    22.3161 ug/L    99
   9) Diethyl ether                5.99   59   801532   129.6138 ug/L    95
  10) Isoprene                     6.03   67   252543    20.8203 ug/L    85
  11) Acrolein                     6.22   56   162454   588.8843 ug/L    95
  12) 1,1,2-Trichloro-1,2,2-Trif   6.25  101   205271    23.8613 ug/L    84
  13) Acetone                      6.32   43    61129    32.7951 ug/L    90
  14) 1,1-Dichloroethene           6.55   61   302387    20.7683 ug/L    94
  15) Tert-Butyl Alcohol           6.64   59   156746   270.6756 ug/L    98
  16) Dimethyl Sulfide             6.80   62   190988    23.1192 ug/L    88
  17) Iodomethane                  7.05  142    80136    16.9555 ug/L    85
  18) Methyl acetate               7.05   43   135304    25.0519 ug/L    97
  19) Methylene Chloride           7.31   84   201356    21.6270 ug/L    93
  20) Carbon Disulfide             7.35   76   552160    20.8317 ug/L   100
  21) Acrylonitrile                7.48   53    67923    29.8622 ug/L    98
  22) Methyl Tert Butyl Ether      7.51   73   527127    24.2707 ug/L    98
  23) trans-1,2-Dichloroethene     7.74   96   201641    21.9277 ug/L    93
  24) n-Hexane                     7.82   57   246029    21.6351 ug/L    99
  25) Diisopropyl ether            8.14   45  3491565   119.9941 ug/L    97
  26) Vinyl Acetate                8.30   43   350075    32.0490 ug/L    97
  27) 1,1-Dichloroethane           8.34   63   367943    22.0260 ug/L    97
  28) Ethyl-Tert-Butyl ether       8.69   59  3105343   116.0765 ug/L    94
  29) 2-Butanone                   8.87   43    77095    28.4585 ug/L    93
  30) Propionitrile                8.97   54   117167   155.2784 ug/L    98
  31) 2,2-Dichloropropane          9.08   77   315381    19.7673 ug/L   100
  32) cis-1,2-Dichloroethene       9.14   96   212768    21.6875 ug/L    99
  33) Chloroform                   9.35   83   353763    21.0856 ug/L   100
  34) 1-Bromopropane               9.47  122    45444    25.9550 ug/L    97
  35) Bromochloromethane           9.56  130   130612    23.8865 ug/L    94
  36) Tetrahydrofuran              9.58   42   247716   154.0489 ug/L    99
  38) 1,1,1-Trichloroethane        9.85   97   323249    21.4010 ug/L    94
  39) Cyclohexane                  9.88   56   345593    21.8626 ug/L    99
  40) 1,1-Dichloropropene         10.04   75   283592    22.3378 ug/L    96
  41) Carbon Tetrachloride        10.17  117   296382    21.3382 ug/L    98
  42) Tert-Amyl-Methyl ether      10.12   73  2736999   124.2090 ug/L    94
 -------------------------------------------------------------------------
 (#) = qualifier out of range (m) = manual integration
 11M98467.D  8260_WT.M      Sun Jan 19 17:03:47 2014                            Page 1
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                        Quantitation Report    (Not Reviewed)

Data File : C:\MSDchem\1\data\011914\11M98467.D          Vial: 6
Acq On    : 19 Jan 2014  16:42                        Operator: adc
Sample    : WG459903-03 20ug/L LCSDUP 8260            Inst    : hpms11
Misc      : 1,1 STD62287                              Multiplr: 1.00
MS Integration Params: rteint.p
Quant Time: Jan 19 17:03:46 2014          Quant Results File: 8260_WT.RES

Quant Method : C:\MSDCHEM\1\METHODS\8260_WT.M (RTE Integrator)
Title        : 8260B/624 (SOP: OVL MSV01) Water 11/05/13 HPMS11
Last Update  : Mon Dec 16 17:06:06 2013
Response via : Initial Calibration
DataAcq Meth : 8260_WT


      Compound                     R.T. QIon  Response  Conc Unit   Qvalue
 ---------------------------------------------------------------------------
  44) 1,2-Dichloroethane          10.34   62   286166    23.5945 ug/L    94
  45) Benzene                     10.38   78   775631    22.1516 ug/L    98
  46) Trichloroethene             11.08  130   217618    22.6392 ug/L    97
  47) Methylcyclohexane           11.17   83   299388    22.5092 ug/L    90
  48) 1,2-Dichloropropane         11.28   63   214710    23.5733 ug/L    83
  49) 1,4-Dioxane                 11.56   88    15374   258.2234 ug/L    91
  50) Bromodichloromethane        11.57   83   264859    20.9268 ug/L   100
  51) Dibromomethane              11.65   93   119085    23.9004 ug/L    93
  52) 2-Chloroethyl Vinyl Ether   11.84   63    84671    19.9951 ug/L    99
  53) 4-Methyl-2-Pentanone        11.86   58    59613    27.0206 ug/L    97
  54) cis-1,3-Dichloropropene     12.16   75   356274    24.5268 ug/L    98
  55) Dimethyl Disulfide          12.42   79   178032    22.2928 ug/L    83
  58) Toluene                     12.56   91   806109    21.7007 ug/L    99
  59) Ethyl Methacrylate          12.64   69   213387    23.3217 ug/L    88
  60) trans-1,3-Dichloropropene   12.72   75   300954    22.4938 ug/L    96
  61) 1,1,2-Trichloroethane       12.92   97   164801    24.4563 ug/L    94
  62) 2-Hexanone                  12.85   43   111384    26.3138 ug/L    86
  63) 1,3-Dichloropropane         13.21   76   299146    24.2922 ug/L    89
  64) Tetrachloroethene           13.33  164   163072    20.7859 ug/L    99
  65) Dibromochloromethane        13.58  129   206423    22.8605 ug/L    99
  66) 1,2-Dibromoethane           13.81  107   167630    24.3517 ug/L    99
  67) 1-Chlorohexane              13.89   91   264855    21.1221 ug/L    87
  68) Chlorobenzene               14.29  112   517682    19.7640 ug/L    99
  69) 1,1,1,2-Tetrachloroethane   14.31  131   207953    21.2911 ug/L    98
  70) Ethylbenzene                14.31  106   301079    20.7590 ug/L    94
  71) m-,p-Xylene                 14.38  106   698565    41.5376 ug/L    91
  72) o-Xylene                    14.91  106   326991    19.0257 ug/L    88
  73) Styrene                     14.95  104   578687    21.1505 ug/L    88
  74) Bromoform                   15.42  173   124810    23.7103 ug/L    98
  75) Isopropylbenzene            15.30  105   837521    21.1235 ug/L    98
  77) 1,1,2,2-Tetrachloroethane   15.51   83   208196    25.5292 ug/L    97
  79) 1,2,3-Trichloropropane      15.69  110    59878    24.6822 ug/L #  63
  80) trans-1,4-Dichloro-2-Buten  15.73   53    38681    13.2564 ug/L #   1
  81) n-Propylbenzene             15.78   91   970546    19.5445 ug/L    99
  82) Bromobenzene                15.91  156   230379    21.0383 ug/L    58
  83) 1,3,5-Trimethylbenzene      15.95  105   788043    22.4316 ug/L    95
  84) 2-Chlorotoluene             16.04   91   632215    19.4945 ug/L    91
  85) 4-Chlorotoluene             16.08   91   601391    18.1293 ug/L    87
  86) a-Methylstyrene             16.33  118   398183    21.1883 ug/L    88
  87) tert-Butylbenzene           16.39  134   143661    19.3004 ug/L    88
  88) 1,2,4-Trimethylbenzene      16.43  105   789424    22.1354 ug/L    96
  89) sec-Butylbenzene            16.64  105   848565    21.0714 ug/L    99
  90) p-Isopropyltoluene          16.78  119   743720    21.6108 ug/L   100
  91) 1,3-Dichlorobenzene         16.97  146   412050    20.1230 ug/L   100
  92) 1,4-Dichlorobenzene         17.09  146   448381    20.8432 ug/L    99
  93) n-Butylbenzene              17.27   91   687307    22.4217 ug/L    99
  94) 1,2-Dichlorobenzene         17.56  146   389880    20.2377 ug/L   100
  95) 1,2-Dibromo-3-Chloropropan  18.48   75    38366    25.4487 ug/L    97
  96) 1,2,4-Trichlorobenzene      19.53  180   292297    22.4425 ug/L    98
  97) Hexachlorobutadiene         19.67  225   111969    22.2541 ug/L    99
  98) Naphthalene                 19.88  128   642516    25.5146 ug/L    98
  99) 1,2,3-Trichlorobenzene      20.17  180   270747    22.5768 ug/L    99


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 (#) = qualifier out of range (m) = manual integration
 11M98467.D  8260_WT.M      Sun Jan 19 17:03:47 2014                            Page 2
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                    Quantitation Report    (Not Reviewed)

  Data File : C:\MSDchem\1\data\011914\11M98467.D          Vial: 6
  Acq On    : 19 Jan 2014  16:42                       Operator: adc
  Sample    : WG459903-03 20ug/L LCSDUP 8260           Inst    : hpms11
  Misc      : 1,1 STD62287                             Multiplr: 1.00
  MS Integration Params: rteint.p
  Quant Time: Jan 19 17:03 2014           Quant Results File: 8260_WT.RES

  Method       : C:\MSDCHEM\1\METHODS\8260_WT.M (RTE Integrator)
  Title        : 8260B/624 (SOP: OVL MSV01) Water 11/05/13 HPMS11
  Last Update  : Mon Dec 16 17:06:06 2013
  Response via : Initial Calibration
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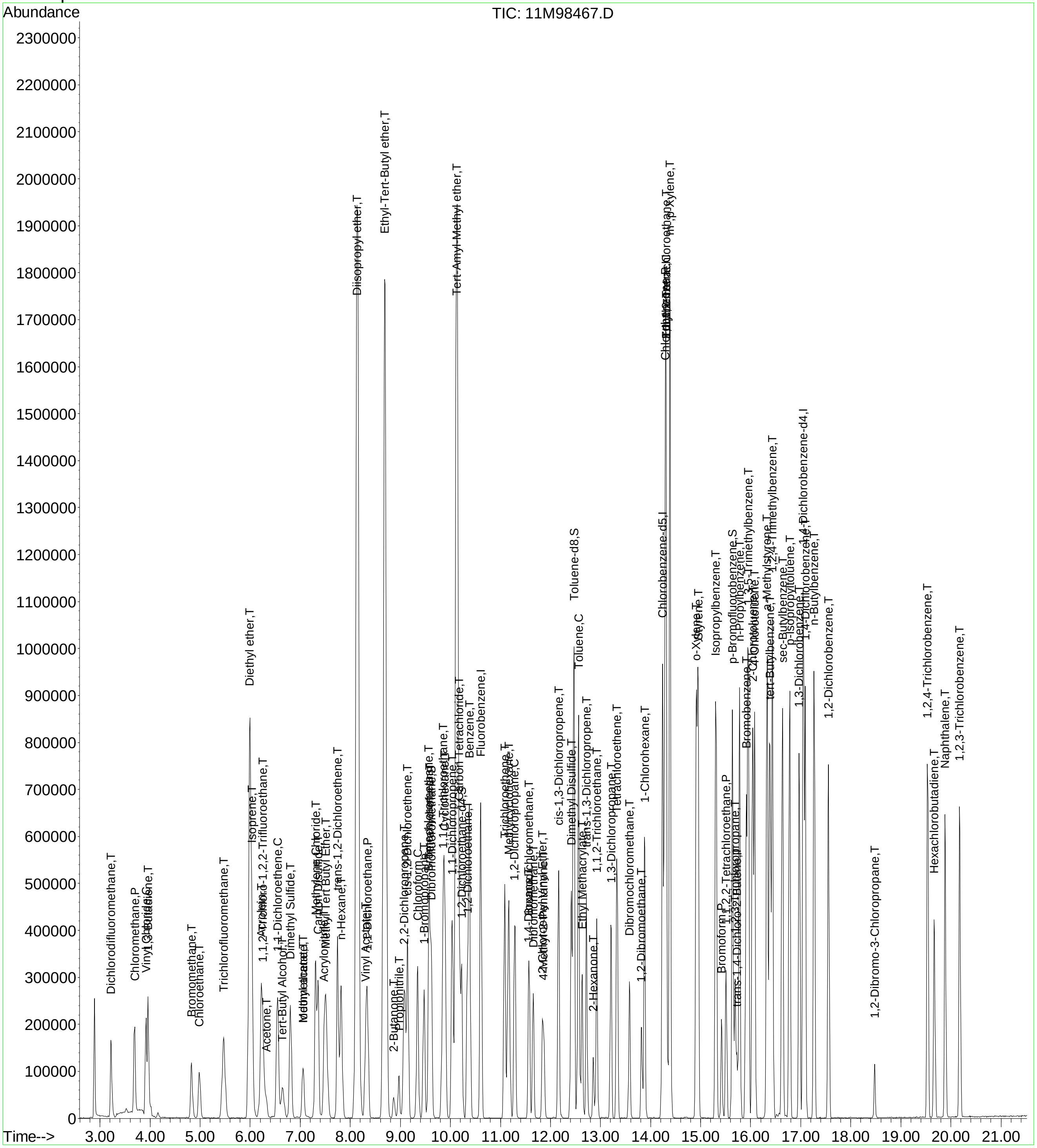

3.0 Attachments

Microbac Laboratories Inc.
Ohio Valley Division Analyst List
January 20, 2014

---

001 - BIO-CHEM TESTING WVDEP 220
002 - REIC Consultants, Inc. WVDEP 060
003 - Sturm Environmental
004 - MICROBAC PITTSBURGH
005 - ES LABORATORIES
ADC - ANTHONY D. CANTER
ADG - APRIL D. GREENE
AJF - AMANDA J. FICKIESEN
AML - TONY M. LONG
AZH - AFTER HOURS
BAF - BRICE A. FENTON
BJO - BRIAN J. OGDEN
BKT - BRENDAN TORRENCE
BLG - BRENDA L. GREENWALT
BRG - BRENDA R. GREGORY
CAA - CASSIE A. AUGENSTEIN
CAF - CHERYL A. FLOWERS
CEB - CHAD E. BARNES
CLC - CHRYS L. CRAWFORD
CLS - CARA L. STRICKLER
CLW - CHARISSA L. WINTERS
CPD - CHAD P. DAVIS
CRW - CHRISTINA R. WILSON
CSH - CHRIS S. HILL
CTB - CHRIS T. BUCINA
DAK - DEAN A. K
DCM - DAVID C. MERCKLE
DDE - DEBRA D. ELLIOTT
DEV - DAVID E. VANDENBERG
DIH - DEANNA I. HESSON
DLB - DAVID L. BUMGARNER
DLP - DOROTHY L. PAYNE
DLR - DIANNA L. RAUCH
DSM - DAVID S. MOSSOR
ECL - ERIC C. LAWSON
EDL - ERIN D. LONG
ENY - EMILY N. YOAK
EPT - ETHAN P. TIDD
ERP - ERIN R. PORTER
FJB - FRANCES J. BOLDEN
HCB - HEIDI C. BROWN
HJR - HOLLY J. REED
JBK - JEREMY B. KINNEY
JDH - JUSTIN D. HESSON
JDS - JARED D. SMITH
JKS - JANE K. SCHAAD
JLL - JOHN L. LENT
JWR - JOHN W. RICHARDS
JWS - JACK W. SHEAVES
JYH - JI Y. HU
KDW - KATHRYN D. WELCH
KEB - KATIE E. BARNES
KHR - KIM H. RHODES
KRA - KATHY R. ALBERTSON
KRB - KAELY R. BECKER
KSC - KELLY S. CUNNINGHAM
LKN - LINDA K. NEDEFF
LLS - LARRY L. STEPHENS
LSB - LESLIE S. BUCINA
MBK - MORGAN B. KNOWLTON
MDA - MIKE D. ALBERTSON
MDC - MIKE D. COCHRAN
MES - MARY E. SCHILLING
MLW - MATTHEW L. WARREN
MMB - MAREN M. BEERY
MRT - MICHELLE R. TAYLOR
MSW - MATT S. WILSON
PDM - PIERCE D. MORRIS
PIT - MICROBAC WARRENDALE
PSW - PEGGY S. WEBB
QX - QIN XU
RAH - ROY A. HALSTEAD
REK - BOB E. KYER
RLB - BOB BUCHANAN
RM - RAYMOND MALEKE
RNP - RICK N. PETTY
RS - ROSEMARY SCOTT
RWC - RODNEY W. CAMPBELL
SAV - SARAH A. VANDENBERG
SEP - SUZANNE J. PAUGH
SLM - STEPHANIE L. MOSSBURG
SLP - SHERI L. PFALZGRAF
TLC - TYLER L. CORDELL
TMB - TIFFANY M. BAILEY
TMM - TAMMY M. MORRIS
TPA - TYLER P. AMRINE
VC - VICKI COLLIER
WJB - WILL J. BEASLEY
WTD - WADE T. DELONG
XXX - UNAVAILABLE OR SUBCONTRACT

Microbac Laboratories Inc.
List of Valid Qualifiers
January 20, 2014

Qualkey: DOD

Qualifier	Description
*	Surrogate or spike compound out of range
+	Correlation coefficient for the MSA is less than 0.995
<	Result is less than the associated numerical value.
>	Greater than
A	See the report narrative
B	The reported result is associated with a contaminated method blank.
B1	Target analyte detected in method blank at or above the method reporting limit
B3	Target analyte detected in calibration blank at or above the method reporting limit
B4	The BOD unseeded dilution water blank exceeded 0.2 mg/L
C	Confirmed by GC/MS
CG	Confluent growth
CT1	The cooler temperature at receipt exceeded regulatory guidelines for requested testing.
DL	Surrogate or spike compound was diluted out
E	Estimated concentration due to sample matrix interference
EDL	Elevated sample reporting limits, presence of non-target analytes
EMPC	Estimated Maximum Possible Concentration
F, S	Estimated result below quantitation limit; method of standard additions(MSA)
F,CT1	Estimated value; the analyte concentration was less than the RL/LOQ. The cooler temperature at receipt exceeded regula
FL	Free Liquid
H1	Sample analysis performed past holding time.
I	Semiquantitative result (out of instrument calibration range)
J	Estimated concentration; sample matrix interference.
J	Estimated value ; the analyte concentration was greater than the highest standard
J	Estimated value ; the analyte concentration was less than the LOQ.
J	The reported result is an estimated value.
J,B	Analyte detected in both the method blank and sample above the MDL.
J,CT1	Estimated value; the analyte concentration was less than the RL/LOQ.
J,CT1	Estimated value; the analyte concentration was less than the RL/LOQ. The cooler temperature at receipt exceeded regula
J,P	Estimate; columns don't agree to within 40%
J,S	Estimated concentration; analyzed by method of standard addition (MSA)
JB	The reported result is an estimated value. The reported result is also associated with a contaminated method blank.
JQ	The reported result is an estimated value and one or more quality control criteria failed. See narrative.
L	Sample reporting limits elevated due to matrix interference
L1	The associated blank spike (LCS) recovery was above the laboratory acceptance limits.
L2	The associated blank spike (LCS) recovery was below the laboratory acceptance limits.
M	Matrix effect; the concentration is an estimate due to matrix effect.
N	Nontarget analyte; the analyte is a tentativlely identified compound (TIC) by GC/MS
NA	Not applicable
ND	Not detected at or above the reporting limit (RL/MDL).
ND, CT1	Analyte was not detected. The concentration is below the reported LOD. The cooler temperature at receipt exceeded reg
ND, H1	Not detected; Sample analysis performed past holding time.
ND, L	Not detected; sample reporting limit (RL) elevated due to interference
ND, S	Not detected; analyzed by method of standard addition (MSA)
NF	Not found by library search
NFL	No free liquid
NI	Non-ignitable
NR	Analyte is not required to be analyzed
NS	Not spiked
P	Concentrations >40% difference between the two GC columns
Q	One or more quality control criteria failed. See narrative.
QNS	Quantity of sample not sufficient to perform analysis
RA	Reanalysis confirms reported results
RE	Reanalysis confirms sample matrix interference
S	Analyzed by method of standard addition (MSA)
SMI	Sample matrix interference on surrogate
SP	Reported results are for spike compounds only
TIC	Library Search Compound
TNTC	Too numerous to count
U	Analyte was not detected. The concentration is below the reported LOD.
UJ	Undetected; the MDL and RL are estimated due to quality control discrepancies.
UQ	Undetected; the analyte was analyzed for, but not detected.
W	Post-digestion spike for furnace AA out of control limits
X	Exceeds regulatory limit
X, S	Exceeds regulatory limit; method of standard additions (MSA)
Z	Cannot be resolved from isomer - see below

AECOM

Chain of Custody Record

COC Number:

Laboratory: Microbac POC: Kathy Albertson
Address: 158 Starlite Drive
Marietta, OH 45750
Phone: 1-800-373-4071

Client: AECOM
Address: 112 East Pecan Ste. 400
San Antonio, TX 78205
Turn Around Time: STANDARD
Project Name/Location: Longhorn
Project Number: 60256135.0005AA

Project Manager: Dave Wacker
Phone/Fax Number: 210-296-2000
Sampler (print): Scott Beesinger
Signature: Scott Beesinger

pH:

Mail to: Linda Raabe
112 East Pecan STE. 400
San Antonio, TX 78205
210-296-2000

Fed Ex Airbill No:

Program:

ERPIMS REQUIRED FIELDS

Site Name	Sample ID/Location ID	SBD	SED	Date	Time	Comp*	Grab	Matrix	Number of Containers	VOC								SA CODE	Cooler ID	LOT CONTROL NUMBERS ABLOT	EBLOT	TBLOT
SITE 12	12WW23-010814			1/8/14	0925		✓	W	3	✓												
	12WW22-010814			1/8/14	1045		✓	W	3	✓												
	12WW21-010814			1/8/14	1315		✓	W	3	✓												
	12WW20-010814			1/8/14	1430		✓	W	3	✓												
	Trip BLANK			1/8/14			✓	W	2													

Comments: **STANDARD TAT**

Relinquished by: (Signature) Scott Beesinger	Date 1/8/14	Time 1530	Received by: (Signature)
Relinquished by: (Signature)	Date	Time	Received for Laboratory (Signature)

Microbac OVD
Received: 01/09/2014 10:17
By: CARA STRICKLER 221000047739
Cara Strickler

…nquished by: (Signature)

…marks:

*Homogenize all composite samples prior to analysis

Distribution: White to Laboratory, Canary to Project Manager, Pink QA/QC Manager

Microbac Laboratories Inc.

Internal Chain of Custody Report

Login: L14010285
Account: 2551
Project: 2551.096
Samples: 5
Due Date: 20-JAN-2014

Samplenum	**Container ID**	**Products**
L14010285-01	301558	826-LOW

Bottle: 1

Seq.	Purpose	From	To	Date/Time	Accept	Relinquish	pH
1	LOGIN	COOLER	V1	09-JAN-2014 16:49	RS		<2
2	ANALYZ	V1	ORG4	10-JAN-2014 10:16	JDS	CLS	
3	STORE	ORG4	A1	17-JAN-2014 08:27	CLS	AWE	
4	ANALYZ	A1	ORG4	17-JAN-2014 09:47	AWE	CLS	

Bottle: 2

Seq.	Purpose	From	To	Date/Time	Accept	Relinquish	pH
1	LOGIN	COOLER	V1	09-JAN-2014 16:49	RS		<2
2	ANALYZ	V1	ORG4	10-JAN-2014 10:16	JDS	CLS	
3	STORE	ORG4	A1	17-JAN-2014 08:27	CLS	AWE	
4	ANALYZ	A1	ORG4	17-JAN-2014 09:47	AWE	CLS	

Bottle: 3

Seq.	Purpose	From	To	Date/Time	Accept	Relinquish	pH
1	LOGIN	COOLER	V1	09-JAN-2014 16:49	RS		<2
2	ANALYZ	V1	ORG4	10-JAN-2014 10:16	JDS	CLS	
3	STORE	ORG4	A1	17-JAN-2014 08:27	CLS	AWE	
4	ANALYZ	A1	ORG4	17-JAN-2014 09:47	AWE	CLS	

Samplenum	**Container ID**	**Products**
L14010285-02	301559	826-LOW

Bottle: 1

Seq.	Purpose	From	To	Date/Time	Accept	Relinquish	pH
1	LOGIN	COOLER	V1	09-JAN-2014 16:49	RS		<2
2	ANALYZ	V1	ORG4	10-JAN-2014 10:16	JDS	CLS	
3	STORE	ORG4	A1	17-JAN-2014 08:27	CLS	AWE	
4	ANALYZ	A1	ORG4	17-JAN-2014 09:47	AWE	CLS	

Bottle: 2

Seq.	Purpose	From	To	Date/Time	Accept	Relinquish	pH
1	LOGIN	COOLER	V1	09-JAN-2014 16:49	RS		<2
2	ANALYZ	V1	ORG4	10-JAN-2014 10:16	JDS	CLS	
3	STORE	ORG4	A1	17-JAN-2014 08:27	CLS	AWE	
4	ANALYZ	A1	ORG4	17-JAN-2014 09:47	AWE	CLS	

Bottle: 3

Seq.	Purpose	From	To	Date/Time	Accept	Relinquish	pH
1	LOGIN	COOLER	V1	09-JAN-2014 16:49	RS		<2
2	ANALYZ	V1	ORG4	10-JAN-2014 10:16	JDS	CLS	
3	STORE	ORG4	A1	17-JAN-2014 08:27	CLS	AWE	
4	ANALYZ	A1	ORG4	17-JAN-2014 09:47	AWE	CLS	

A1 - Sample Archive (COLD)
A2 - Sample Archive (AMBIENT)
F1 - Volatiles Freezer in Login
V1 - Volatiles Refrigerator in Login
W1 - Walkin Cooler in Login

Microbac Laboratories Inc.

Internal Chain of Custody Report

Login: L14010285
Account: 2551
Project: 2551.096
Samples: 5
Due Date: 20-JAN-2014

Samplenum	Container ID	Products
L14010285-03	301560	826-LOW

Bottle: 1

Seq.	Purpose	From	To	Date/Time	Accept	Relinquish	pH
1	LOGIN	COOLER	V1	09-JAN-2014 16:49	RS		<2
2	ANALYZ	V1	ORG4	10-JAN-2014 10:16	JDS	CLS	
3	STORE	ORG4	A1	17-JAN-2014 08:27	CLS	AWE	
4	ANALYZ	A1	ORG4	17-JAN-2014 09:47	AWE	CLS	

Bottle: 2

Seq.	Purpose	From	To	Date/Time	Accept	Relinquish	pH
1	LOGIN	COOLER	V1	09-JAN-2014 16:49	RS		<2
2	ANALYZ	V1	ORG4	10-JAN-2014 10:16	JDS	CLS	
3	STORE	ORG4	A1	17-JAN-2014 08:27	CLS	AWE	
4	ANALYZ	A1	ORG4	17-JAN-2014 09:47	AWE	CLS	

Bottle: 3

Seq.	Purpose	From	To	Date/Time	Accept	Relinquish	pH
1	LOGIN	COOLER	V1	09-JAN-2014 16:49	RS		<2
2	ANALYZ	V1	ORG4	10-JAN-2014 10:16	JDS	CLS	
3	STORE	ORG4	A1	17-JAN-2014 08:27	CLS	AWE	
4	ANALYZ	A1	ORG4	17-JAN-2014 09:47	AWE	CLS	

Samplenum	Container ID	Products
L14010285-04	301561	826-LOW

Bottle: 1

Seq.	Purpose	From	To	Date/Time	Accept	Relinquish	pH
1	LOGIN	COOLER	V1	09-JAN-2014 16:49	RS		<2
2	ANALYZ	V1	ORG4	10-JAN-2014 10:16	JDS	CLS	
3	STORE	ORG4	A1	17-JAN-2014 08:27	CLS	AWE	
4	ANALYZ	A1	ORG4	17-JAN-2014 09:47	AWE	CLS	

Bottle: 2

Seq.	Purpose	From	To	Date/Time	Accept	Relinquish	pH
1	LOGIN	COOLER	V1	09-JAN-2014 16:49	RS		<2
2	ANALYZ	V1	ORG4	10-JAN-2014 10:16	JDS	CLS	
3	STORE	ORG4	A1	17-JAN-2014 08:27	CLS	AWE	
4	ANALYZ	A1	ORG4	17-JAN-2014 09:47	AWE	CLS	

Bottle: 3

Seq.	Purpose	From	To	Date/Time	Accept	Relinquish	pH
1	LOGIN	COOLER	V1	09-JAN-2014 16:49	RS		<2
2	ANALYZ	V1	ORG4	10-JAN-2014 10:16	JDS	CLS	
3	STORE	ORG4	A1	17-JAN-2014 08:27	CLS	AWE	
4	ANALYZ	A1	ORG4	17-JAN-2014 09:47	AWE	CLS	

A1 - Sample Archive (COLD)
A2 - Sample Archive (AMBIENT)
F1 - Volatiles Freezer in Login
V1 - Volatiles Refrigerator in Login
W1 - Walkin Cooler in Login

Microbac Laboratories Inc.

Internal Chain of Custody Report

Login: L14010285
Account: 2551
Project: 2551.096
Samples: 5
Due Date: 20-JAN-2014

Samplenum	Container ID	Products
L14010285-05	301562	826-LOW

Bottle: 1

Seq.	Purpose	From	To	Date/Time	Accept	Relinquish	pH
1	LOGIN	COOLER	V1	09-JAN-2014 16:49	RS		<2
2	ANALYZ	V1	ORG4	10-JAN-2014 10:16	JDS	CLS	
3	STORE	ORG4	A1	17-JAN-2014 08:27	CLS	AWE	
4	ANALYZ	A1	ORG4	17-JAN-2014 09:47	AWE	CLS	

Bottle: 2

Seq.	Purpose	From	To	Date/Time	Accept	Relinquish	pH
1	LOGIN	COOLER	V1	09-JAN-2014 16:49	RS		<2
2	ANALYZ	V1	ORG4	10-JAN-2014 10:16	JDS	CLS	
3	STORE	ORG4	A1	17-JAN-2014 08:27	CLS	AWE	
4	ANALYZ	A1	ORG4	17-JAN-2014 09:47	AWE	CLS	

Bottle: 3

Seq.	Purpose	From	To	Date/Time	Accept	Relinquish	pH
1	LOGIN	COOLER		09-JAN-2014 16:49	RS		<2

A1 - Sample Archive (COLD)
A2 - Sample Archive (AMBIENT)
F1 - Volatiles Freezer in Login
V1 - Volatiles Refrigerator in Login
W1 - Walkin Cooler in Login

NELAP Addendum - November 13, 2013

Non-NELAP LIMS Product and Description

The following is a list of those tests that are not included in the Microbac – OVL NELAP Scope of Accreditation:

Heat of Combustion (BTU)
Total Halide by Bomb Combustion (TX)
Particle Sizing - 200 Mesh (PS200)
Specific Gravity/Density (SPGRAV)
Total Residual Chlorine (CL-TRL)
Total Volatile Solids (all forms) (TVS)
Total Coliform Bacteria (all methods)
Fecal Coliform Bacteria (all methods)
Sulfite (SO3)
Thiodiglycol (TDG-LCMS)

NELAP Accreditation by Laboratory SOP

NONPOTABLE WATER

OVL HPLC02/HPLC-UV

Nitroglycerin
Nitroguanidine
Acetic acid
Butyric acid
Lactic acid
Propionic acid
Pyruvic acid

OVL KNITRO-C-WUV-VIS

Nitrocellulose

OVL MSS01/GC-MS

1,4-Phenylenediamine
1-Methylnaphthalene
1,4-Dioxane
Atrazine
Benzaldehyde
Biphenyl
Caprolactam
Hexamethylphosphoramide (HMPA)
Pentachlorobenzene
Pentachloroethane

NELAP Accreditation by Laboratory SOP

NONPOTABLE WATER

OVL MSV0I/GC-MS

1, 1, 2-Trichloro-1,2,2-trifluoroethane
1,3-Butadiene
Cyclohexane
Cyclohexanone
Dimethyl disulfide
Dimethylsulfide
Ethyl-t-butylether (ETBE)
lsoprene
Methylacetate
Methylcyclohexane
T-amylmethylether (TAME)
Tetrahydrofuran (THF)

OVL RSKOl/GC-FID

lsobutane
n-Butane
Propane
Propylene
Propyne

OVL HPLC07/HPLC-MS-MS

Hexamethylphosphoramide (XMPA-LCMS)

SOLID AND HAZARDOUS CHEMICALS

OVL HPLCOS-HPLC-UV

Nitroguanidine

OVL KNITRO-C-S/UV-VIS

Nitrocellulose

OVL MSS0I/GC-MS

1-Methylnaphthalene
Benzaldehyde
Biphenyl
Caprolactam
Pentachloroethane

NELAP Accreditation by Laboratory SOP

SOLID AND HAZARDOUS CHEMICALS

OVL MSV0I/GC-MS

1.3-Butadiene
Cyclohexane
Cyclohexanone
Dimethyl disulfide
Dimethylsulfide
Ethyl-t-butylether (ETBE)
Isoprene
Methylacetate
Methylcyclohexane
n-Hexane
T-amylmethylether (TAME)

Microbac

Laboratory Report Number: L14090460

Kayla Teague
AECOM Technical Services, Inc.
16000 Dallas Parkway
Dallas, TX 75248

Please find enclosed the analytical results for the samples you submitted to Microbac Laboratories. Review and compilation of your report was completed by Microbac's Ohio Valley Division (OVD). If you have any questions, comments, or require further assistance regarding this report, please contact your service representative listed below.

Laboratory Contact:
Kathy Albertson – Team Chemist/Data Specialist
(740) 373-4071
Kathy.Albertson@microbac.com

I certify that all test results meet all of the requirements of the DoD QSM and other applicable contract terms and conditions. Any exceptions are attached to this cover page or addressed in the method narratives presented in the report. All results for soil samples are reported on a 'dry-weight' basis unless specified otherwise. Analytical results for water and wastes are reported on a 'as received' basis unless specified otherwise. A statement of uncertainty for each analysis is available upon request. This laboratory report shall not be reproduced, except in full, without the written approval of Microbac Laboratories, DoD ELAP certification number 2936.01. The reported results are related only to the samples analyzed as received.

This report was certified on September 12 2014

David E. Vandenberg

David Vandenberg – Managing Director

State of Origin: TX
Accrediting Authority: Texas Commission on Environmental Quality ID:T104704252-07-TX
QAPP: DOD Ver 4.1

Record of Sample Receipt and Inspection

Comments/Discrepancies

This is the record of the shipment conditions and the inspection records for the samples received and reported as a sample delivery group (SDG). All of the samples were inspected and observed to conform to our receipt policies, except as noted below.

There were no discrepancies.

Discrepancy	Resolution

Coolers

Cooler #	Temperature Gun	Temperature	COC #	Airbill #	Temp Required?
0019519	I	2.0		J2317156500	X

Inspection Checklist

#	Question	Result
1	Were shipping coolers sealed?	Yes
2	Were custody seals intact?	Yes
3	Were cooler temperatures in range of 0-6?	Yes
4	Was ice present?	Yes
5	Were COC's received/information complete/signed and dated?	Yes
6	Were sample containers intact and match COC?	Yes
7	Were sample labels intact and match COC?	Yes
8	Were the correct containers and volumes received?	Yes
9	Were samples received within EPA hold times?	Yes
10	Were correct preservatives used? (water only)	Yes
11	Were pH ranges acceptable? (voa's excluded)	NA
12	Were VOA samples free of headspace (less than 6mm)?	Yes

Samples Received

Client ID	Laboratory ID	Date Collected	Date Received
12WW25(30)080914	L14090460-01	09/08/2014 12:40	09/09/2014 09:37
12TB080914	L14090460-02	09/08/2014 00:01	09/09/2014 09:37

Microbac REPORT L14090460
PREPARED FOR AECOM Technical Services, Inc.
WORK ID:

1.0 Summary Data

1.1 Narratives

Microbac

Texas Risk Reduction Program (TRRP) Checklist

Laboratory Name:	Microbac OVD	**Laboratory Log Number:**	L14090460
Project Name:		**Method:**	8260
Prep Batch Number(s):	491672, 491746	**Reviewer Name:**	Michael Albertson
LRC Date:	2014-09-12 00:00:00		

Laboratory Data Package Cover Page

X	R1	Field chain-of-custody documentation;
X	R2	Sample identification cross-reference;
X	R3	Test reports (analytical data sheets) for each environmental sample that includes: (a) Items consistent with NELAC Chapter 5, (b) dilution factors, (c) preparation methods, (d) cleanup methods, and (e) a.if required for the project, tentatively identified compounds (TICs).
X	R4	Surrogate recovery data including: (a) Calculated recovery (%R), and (b) the laboratory's surrogate QC limits.
X	R5	Test reports/summary forms for blank samples;
X	R6	Test reports/summary forms for laboratory control samples (LCSs) including: (a) LCS spiking amounts, (b) calculated %R for each analyte, and (c) the laboratory's LCS QC limits.
X	R7	Test reports for project matrix spike/matrix spike duplicates (MS/MSDs) including: (a) samples associated with the MS/MSD clearly identified, (b) MS/MSD spiking compounds, (c) concentration of each MS/MSD analyte measured in the parent and spiked samples, (d) calculated %Rs and relative percent differences (RPDs), and (e) the laboratory's MS/MSD QC limits.
X	R8	Laboratory analytical duplicate (if applicable) recovery and precision: (a) the amount of analyte measured in the duplicate, (b) the calculated RPD, and (c) the laboratory's QC limits for analytical duplicates.
X	R9	List of method quantitation limits (MQLs) and detectability check sample results for each analyte for each method and matrix.
X	R10	Other problems or anomalies.

Name (Printed)	Signature	Official Title (Printed)	Date
Michael Albertson		Volatiles Supervisor	2014-09-12 19:13:26

RG-366/TRRP-13 May 2010 **ID:** 5484

Microbac

Texas Risk Reduction Program (TRRP) Checklist

Laboratory Name:	Microbac OVD	**Laboratory Log Number:**	L14090460
Project Name:		**Method:**	8260
Prep Batch Number(s):	491672, 491746	**Reviewer Name:**	Michael Albertson
LRC Date:	2014-09-12 00:00:00		

Description	**Yes**	**No**	**NA**	**NR**	**ER#**
Chain-of-custody (C-O-C)					
Did samples meet the laboratory's standard conditions of sample acceptability upon receipt?	X				
Were all departures from standard conditions described in an exception report?	X				
Sample and quality control (QC) identification	X				
Are all field sample ID numbers cross-referenced to the laboratory ID numbers?	X				
Are all laboratory ID numbers cross-referenced to the corresponding QC data?	X				
Test reports					
Were all samples prepared and analyzed within holding times?	X				
Other than those results < MQL, were all other raw values bracketed by calibration standards?	X				
Were calculations checked by a peer or supervisor?	X				
Were all analyte identifications checked by a peer or supervisor?	X				
Were sample detection limits reported for all analytes not detected?	X				
Were all results for soil and sediment samples reported on a dry weight basis?	X				
Were % moisture (or solids) reported for all soil and sediment samples?	X				
Were bulk soils/solids samples for volatile analysis extracted with methanol per SW846 Method 5035?			X		
If required for the project, are TICs reported?			X		
Surrogate recovery data					
Were surrogates added prior to extraction?	X				
Were surrogate percent recoveries in all samples within the laboratory QC limits?	X				
Test reports/summary forms for blank samples	X				
Were appropriate type(s) of blanks analyzed?	X				
Were blanks analyzed at the appropriate frequency?	X				
Were method blanks taken through the entire analytical process, including preparation and, if applicable, cleanup procedures?	X				
Were blank concentrations < MQL?	X				
Laboratory control samples (LCS):					
Were all COCs included in the LCS?	X				

Texas Risk Reduction Program (TRRP) Checklist

Laboratory Name:	Microbac OVD	**Laboratory Log Number:**	L14090460
Project Name:		**Method:**	8260
Prep Batch Number(s):	491672, 491746	**Reviewer Name:**	Michael Albertson
LRC Date:	2014-09-12 00:00:00		

Was each LCS taken through the entire analytical procedure, including prep and cleanup steps?	X				
Were LCSs analyzed at the required frequency?	X				
Were LCS (and LCSD, if applicable) %Rs within the laboratory QC limits?	X				
Does the detectability check sample data document the laboratory's capability to detect the COCs at the MDL used to calculate the SDLs?	X				
Was the LCSD RPD within QC limits?	X				
Matrix spike (MS) and matrix spike duplicate (MSD) data					
Were the project/method specified analytes included in the MS and MSD?			X		
Were MS/MSD analyzed at the appropriate frequency?			X		
Were MS (and MSD, if applicable) %Rs within the laboratory QC limits?			X		
Were MS/MSD RPDs within laboratory QC limits?			X		
Analytical duplicate data					
Were appropriate analytical duplicates analyzed for each matrix?			X		
Were analytical duplicates analyzed at the appropriate frequency?			X		
Were RPDs or relative standard deviations within the laboratory QC limits?			X		
Method quantitation limits (MQLs):					
Are the MQLs for each method analyte included in the laboratory data package?	X				
Do the MQLs correspond to the concentration of the lowest non-zero calibration standard?	X				
Are unadjusted MQLs and DCSs included in the laboratory data package?	X				
Other problems/anomalies					
Are all known problems/anomalies/special conditions noted in this LRC and ER?	X				
Was applicable and available technology used to lower the SDL to minimize the matrix interference effects on the sample results?	X				
Is the laboratory NELAC-accredited under the Texas Laboratory Accreditation Program for the analytes, matrices and methods associated with this laboratory data package?	X				
Initial calibration (ICAL)					
Were response factors and/or relative response factors for each analyte within QC limits?	X				
Were percent RSDs or correlation coefficient criteria met?	X				

Texas Risk Reduction Program (TRRP) Checklist

Laboratory Name:	Microbac OVD	**Laboratory Log Number:**	L14090460
Project Name:		**Method:**	8260
Prep Batch Number(s):	491672, 491746	**Reviewer Name:**	Michael Albertson
LRC Date:	2014-09-12 00:00:00		

Was the number of standards recommended in the method used for all analytes?	X				
Were all points generated between the lowest and highest standard used to calculate the curve?	X				
Are ICAL data available for all instruments used?	X				
Has the initial calibration curve been verified using an appropriate second source standard?	X				
Initial and continuing calibration verification (ICCV and CCV) and continuing calibration blank (CCB):					
Was the CCV analyzed at the method-required frequency?	X				
Were percent differences for each analyte within the method-required QC limits?		X			2
Was the ICAL curve verified for each analyte?		X			1
Was the absolute value of the analyte concentration in the inorganic CCB < MDL?			X		
Mass spectral tuning					
Was the appropriate compound for the method used for tuning?	X				
Were ion abundance data within the method-required QC limits?	X				
Internal standards (IS)					
Were IS area counts and retention times within the method-required QC limits?	X				
Raw data (NELAC Section 5.5.10)					
Were the raw data (for example, chromatograms, spectral data) reviewed by an analyst?	X				
Were data associated with manual integrations flagged on the raw data?	X				
Dual column confirmation					
Did dual column confirmation results meet the method-required QC?			X		
Tentatively identified compounds (TICs)					
If TICs were requested, were the mass spectra and TIC data subject to appropriate checks?			X		
Interference Check Sample (ICS) results					
Were percent recoveries within method QC limits?			X		
Serial dilutions, post digestion spikes, and method of standard additions					
Were percent differences, recoveries, and the linearity within the QC limits specified in the method?			X		
Method detection limit (MDL) studies					

RG-366/TRRP-13 May 2010

ID: 5484

Texas Risk Reduction Program (TRRP) Checklist

Laboratory Name:	Microbac OVD	**Laboratory Log Number:**	L14090460
Project Name:		**Method:**	8260
Prep Batch Number(s):	491672, 491746	**Reviewer Name:**	Michael Albertson
LRC Date:	2014-09-12 00:00:00		

Was a MDL study performed for each reported analyte?	X				
Is the MDL either adjusted or supported by the analysis of DCSs?	X				
Proficiency test reports					
Was the laboratory's performance acceptable on the applicable proficiency tests or evaluation studies?	X				
Standards documentation					
Are all standards used in the analyses NIST-traceable or obtained from other appropriate sources?	X				
Compound/analyte identification procedures					
Are the procedures for compound/analyte identification documented?	X				
Demonstration of analyst competency (DOC)					
Was DOC conducted consistent with NELAC Chapter 5?	X				
Is documentation of the analyst's competency up-to-date and on file?	X				
Verification/validation documentation for methods (NELAC Chapter 5)					
Are all the methods used to generate the data documented, verified, and validated, where applicable?	X				
Laboratory standard operating procedures (SOPs)					
Are laboratory SOPs current and on file for each method performed	X				

1. Items identified by the letter “R” must be included in the laboratory data package submitted in the TRRP-required report(s). Items identified by the letter “S” should be retained and made available upon request for the appropriate retention period;
2. O = organic analyses; I = inorganic analyses (and general chemistry, when applicable);
3. NA = Not applicable;
4. NR = Not reviewed;
5. ER# = Exception Report identification number (an Exception Report should be completed for an item if “NR” or “No” is checked).

The Exception Report for each “No” or “Not Reviewed (NR)” item in Laboratory Review Checklist and for each analyte, matrix, and method for which the laboratory does not hold NELAC accreditation under the Texas Laboratory Accreditation Program.

Release Statement: I am responsible for the release of this laboratory data package. This laboratory is NELAC accredited under the Texas Laboratory Accreditation Program for all the methods, analytes, and matrices reported in this data package except as noted in the Exception Reports. The data have been reviewed and are technically compliant with the requirements of the methods used, except where noted by the laboratory in the Exception Reports. By my signature

Texas Risk Reduction Program (TRRP) Checklist

Laboratory Name:	Microbac OVD	**Laboratory Log Number:**	L14090460
Project Name:		**Method:**	8260
Prep Batch Number(s):	491672, 491746	**Reviewer Name:**	Michael Albertson
LRC Date:	2014-09-12 00:00:00		

below, I affirm to the best of my knowledge all problems/anomalies observed by the laboratory have been identified in the Laboratory Review Checklist, and no information affecting the quality of the data has been knowingly withheld.

Check, if applicable: [ ] This laboratory meets an exception under 30 TAC §25.6 and was last inspection by [ ] TCEQ or [ ] ___________ on **(enter date of last inspection)**. Any findings affecting the data in this laboratory data package are noted in the Exception Reports herein. The official signing the cover page of the report in which these data are used is responsible for releasing this data package and is by signature affirming the above release statement is true.

Exceptions Report

1) The percent difference was out of range for the following analytes: carbon disulfide, dichlorodifluoromethane.
2) Recoveries out of range were observed for the following analytes: bromomethane, carbon disulfide, dichlorodifluoromethane, trichloroethene..

1.2 Certificate of Analysis

Microbac

Lab Report #: L14090460
Lab Project #: 2551.096
Project Name: Longhorn Army Ammunition
Lab Contact: Kathy Albertson

Certificate of Analysis

Sample #:	L14090460-01	**PrePrep Method:**	N/A	**Instrument:**	HPMS17
Client ID:	12WW25(30)080914	**Prep Method:**	5030B/5030C/5035A	**Prep Date:**	N/A
Matrix:	Water	**Analytical Method:**	8260B	**Cal Date:**	08/12/2014 17:50
Workgroup #:	WG491746	**Analyst:**	FJB	**Run Date:**	09/10/2014 13:42
Collect Date:	09/08/2014 12:40	**Dilution:**	1	**File ID:**	17M008121
Sample Tag:	01	**Units:**	ug/L		

Analyte	CAS #	Result	Qual	LOQ	LOD	DL
Acetone	67-64-1	5.15	J	10.0	5.00	2.50
Benzene	71-43-2	0.380	J	1.00	0.250	0.125
Bromobenzene	108-86-1	0.250	U	1.00	0.250	0.125
Bromochloromethane	74-97-5	0.400	U	1.00	0.400	0.200
Bromodichloromethane	75-27-4	0.500	U	1.00	0.500	0.250
Bromoform	75-25-2	1.00	U	2.00	1.00	0.500
Bromomethane	74-83-9	1.00	Q	2.00	1.00	0.500
2-Butanone	78-93-3	5.00	U	10.0	5.00	2.50
n-Butylbenzene	104-51-8	0.500	U	1.00	0.500	0.250
sec-Butylbenzene	135-98-8	0.500	U	1.00	0.500	0.250
tert-Butylbenzene	98-06-6	0.500	U	1.00	0.500	0.250
Carbon disulfide	75-15-0	1.00	U	2.00	1.00	0.500
Carbon tetrachloride	56-23-5	0.500	U	1.00	0.500	0.250
Chlorobenzene	108-90-7	0.873	J	1.00	0.250	0.125
Chlorodibromomethane	124-48-1	0.500	U	1.00	0.500	0.250
Chloroethane	75-00-3	1.00	U	2.00	1.00	0.500
Chloroform	67-66-3	0.250	U	1.00	0.250	0.125
Chloromethane	74-87-3	1.00	U	2.00	1.00	0.500
2-Chlorotoluene	95-49-8	0.250	U	1.00	0.250	0.125
4-Chlorotoluene	106-43-4	0.500	U	1.00	0.500	0.250
1,2-Dibromo-3-chloropropane	96-12-8	2.00	U	5.00	2.00	1.00
1,2-Dibromoethane	106-93-4	0.500	U	1.00	0.500	0.250
Dibromomethane	74-95-3	0.500	U	1.00	0.500	0.250
1,2-Dichlorobenzene	95-50-1	0.250	U	1.00	0.250	0.125
1,3-Dichlorobenzene	541-73-1	0.500	U	1.00	0.500	0.250
1,4-Dichlorobenzene	106-46-7	0.293	J	1.00	0.250	0.125
Dichlorodifluoromethane	75-71-8	0.500	Q	1.00	0.500	0.250
1,1-Dichloroethane	75-34-3	0.250	U	1.00	0.250	0.125
1,2-Dichloroethane	107-06-2	0.500	U	1.00	0.500	0.250
1,1-Dichloroethene	75-35-4	1.00	U	2.00	1.00	0.500
cis-1,2-Dichloroethene	156-59-2	0.402	J	1.00	0.500	0.250
trans-1,2-Dichloroethene	156-60-5	0.500	U	1.00	0.500	0.250

Analyte	CAS #	Result	Qual	LOQ	LOD	DL
1,2-Dichloropropane	78-87-5	0.400	U	1.00	0.400	0.200
1,3-Dichloropropane	142-28-9	0.400	U	1.00	0.400	0.200
2,2-Dichloropropane	594-20-7	0.500	U	1.00	0.500	0.250
cis-1,3-Dichloropropene	10061-01-5	0.500	U	1.00	0.500	0.250
trans-1,3-Dichloropropene	10061-02-6	1.00	U	2.00	1.00	0.500
1,1-Dichloropropene	563-58-6	0.500	U	1.00	0.500	0.250
Ethylbenzene	100-41-4	0.500	U	1.00	0.500	0.250
2-Hexanone	591-78-6	5.00	U	10.0	5.00	2.50
Hexachlorobutadiene	87-68-3	0.500	U	1.00	0.500	0.250
Isopropylbenzene	98-82-8	0.500	U	1.00	0.500	0.250
p-Isopropyltoluene	99-87-6	0.500	U	1.00	0.500	0.250
4-Methyl-2-pentanone	108-10-1	5.00	U	10.0	5.00	2.50
Methylene chloride	75-09-2	0.388	J	1.00	0.500	0.250
Naphthalene	91-20-3	0.400	U	1.00	0.400	0.200
n-Propylbenzene	103-65-1	0.250	U	1.00	0.250	0.125
Styrene	100-42-5	0.250	U	1.00	0.250	0.125
1,1,1,2-Tetrachloroethane	630-20-6	0.500	U	1.00	0.500	0.250
1,1,2,2-Tetrachloroethane	79-34-5	0.400	U	1.00	0.400	0.200
Tetrachloroethene	127-18-4	0.500	U	1.00	0.500	0.250
Toluene	108-88-3	0.500	U	1.00	0.500	0.250
1,2,3-Trichlorobenzene	87-61-6	0.300	U	1.00	0.300	0.150
1,2,4-Trichlorobenzene	120-82-1	0.400	U	1.00	0.400	0.200
1,1,1-Trichloroethane	71-55-6	0.500	U	1.00	0.500	0.250
1,1,2-Trichloroethane	79-00-5	0.500	U	1.00	0.500	0.250
Trichloroethene	79-01-6	0.317	Q	1.00	0.500	0.250
Trichlorofluoromethane	75-69-4	0.500	U	1.00	0.500	0.250
1,2,3-Trichloropropane	96-18-4	1.00	U	2.00	1.00	0.500
1,2,4-Trimethylbenzene	95-63-6	0.500	U	1.00	0.500	0.250
1,3,5-Trimethylbenzene	108-67-8	0.500	U	1.00	0.500	0.250
Vinyl chloride	75-01-4	0.500	U	1.00	0.500	0.250
o-Xylene	95-47-6	0.500	U	1.00	0.500	0.250
m-,p-Xylene	179601-23-1	1.00	U	2.00	1.00	0.500

Surrogate	Recovery	Lower Limit	Upper Limit	Q
Dibromofluoromethane	94.2	85	115	
1,2-Dichloroethane-d4	96.4	70	120	
Toluene-d8	102	85	120	
4-Bromofluorobenzene	112	75	120	

J	Estimated value ; the analyte concentration was less than the LOQ.
Q	One or more quality control criteria failed. See narrative.

U	Analyte was not detected. The concentration is below the reported LOD.

Microbac

Lab Report #: L14090460
Lab Project #: 2551.096
Project Name: Longhorn Army Ammunition
Lab Contact: Kathy Albertson

Certificate of Analysis

Sample #:	L14090460-02	**PrePrep Method:**	N/A	**Instrument:**	HPMS17
Client ID:	12TB080914	**Prep Method:**	5030B/5030C/5035A	**Prep Date:**	N/A
Matrix:	Water	**Analytical Method:**	8260B	**Cal Date:**	08/12/2014 17:50
Workgroup #:	WG491672	**Analyst:**	ADC	**Run Date:**	09/10/2014 00:08
Collect Date:	09/08/2014 00:01	**Dilution:**	1	**File ID:**	17M008106
Sample Tag:	01	**Units:**	ug/L		

Analyte	CAS #	Result	Qual	LOQ	LOD	DL
Acetone	67-64-1	5.00	U	10.0	5.00	2.50
Benzene	71-43-2	0.250	U	1.00	0.250	0.125
Bromobenzene	108-86-1	0.250	U	1.00	0.250	0.125
Bromochloromethane	74-97-5	0.400	U	1.00	0.400	0.200
Bromodichloromethane	75-27-4	0.500	U	1.00	0.500	0.250
Bromoform	75-25-2	1.00	U	2.00	1.00	0.500
Bromomethane	74-83-9	1.00	Q	2.00	1.00	0.500
2-Butanone	78-93-3	5.00	U	10.0	5.00	2.50
n-Butylbenzene	104-51-8	0.500	U	1.00	0.500	0.250
sec-Butylbenzene	135-98-8	0.500	U	1.00	0.500	0.250
tert-Butylbenzene	98-06-6	0.500	U	1.00	0.500	0.250
Carbon disulfide	75-15-0	1.00	Q	2.00	1.00	0.500
Carbon tetrachloride	56-23-5	0.500	U	1.00	0.500	0.250
Chlorobenzene	108-90-7	0.250	U	1.00	0.250	0.125
Chlorodibromomethane	124-48-1	0.500	U	1.00	0.500	0.250
Chloroethane	75-00-3	1.00	U	2.00	1.00	0.500
Chloroform	67-66-3	0.250	U	1.00	0.250	0.125
Chloromethane	74-87-3	1.00	U	2.00	1.00	0.500
2-Chlorotoluene	95-49-8	0.250	U	1.00	0.250	0.125
4-Chlorotoluene	106-43-4	0.500	U	1.00	0.500	0.250
1,2-Dibromo-3-chloropropane	96-12-8	2.00	U	5.00	2.00	1.00
1,2-Dibromoethane	106-93-4	0.500	U	1.00	0.500	0.250
Dibromomethane	74-95-3	0.500	U	1.00	0.500	0.250
1,2-Dichlorobenzene	95-50-1	0.250	U	1.00	0.250	0.125
1,3-Dichlorobenzene	541-73-1	0.500	U	1.00	0.500	0.250
1,4-Dichlorobenzene	106-46-7	0.250	U	1.00	0.250	0.125
Dichlorodifluoromethane	75-71-8	0.500	U	1.00	0.500	0.250
1,1-Dichloroethane	75-34-3	0.250	U	1.00	0.250	0.125
1,2-Dichloroethane	107-06-2	0.500	U	1.00	0.500	0.250
1,1-Dichloroethene	75-35-4	1.00	U	2.00	1.00	0.500
cis-1,2-Dichloroethene	156-59-2	0.500	U	1.00	0.500	0.250

Analyte	CAS #	Result	Qual	LOQ	LOD	DL
trans-1,2-Dichloroethene	156-60-5	0.500	U	1.00	0.500	0.250
1,2-Dichloropropane	78-87-5	0.400	U	1.00	0.400	0.200
1,3-Dichloropropane	142-28-9	0.400	U	1.00	0.400	0.200
2,2-Dichloropropane	594-20-7	0.500	U	1.00	0.500	0.250
cis-1,3-Dichloropropene	10061-01-5	0.500	U	1.00	0.500	0.250
trans-1,3-Dichloropropene	10061-02-6	1.00	U	2.00	1.00	0.500
1,1-Dichloropropene	563-58-6	0.500	U	1.00	0.500	0.250
Ethylbenzene	100-41-4	0.500	U	1.00	0.500	0.250
2-Hexanone	591-78-6	5.00	U	10.0	5.00	2.50
Hexachlorobutadiene	87-68-3	0.500	U	1.00	0.500	0.250
Isopropylbenzene	98-82-8	0.500	U	1.00	0.500	0.250
p-Isopropyltoluene	99-87-6	0.500	U	1.00	0.500	0.250
4-Methyl-2-pentanone	108-10-1	5.00	U	10.0	5.00	2.50
Methylene chloride	75-09-2	0.500	U	1.00	0.500	0.250
Naphthalene	91-20-3	0.400	U	1.00	0.400	0.200
n-Propylbenzene	103-65-1	0.250	U	1.00	0.250	0.125
Styrene	100-42-5	0.250	U	1.00	0.250	0.125
1,1,1,2-Tetrachloroethane	630-20-6	0.500	U	1.00	0.500	0.250
1,1,2,2-Tetrachloroethane	79-34-5	0.400	U	1.00	0.400	0.200
Tetrachloroethene	127-18-4	0.500	U	1.00	0.500	0.250
Toluene	108-88-3	0.500	U	1.00	0.500	0.250
1,2,3-Trichlorobenzene	87-61-6	0.300	U	1.00	0.300	0.150
1,2,4-Trichlorobenzene	120-82-1	0.400	U	1.00	0.400	0.200
1,1,1-Trichloroethane	71-55-6	0.500	U	1.00	0.500	0.250
1,1,2-Trichloroethane	79-00-5	0.500	U	1.00	0.500	0.250
Trichloroethene	79-01-6	0.500	U	1.00	0.500	0.250
Trichlorofluoromethane	75-69-4	0.500	U	1.00	0.500	0.250
1,2,3-Trichloropropane	96-18-4	1.00	U	2.00	1.00	0.500
1,2,4-Trimethylbenzene	95-63-6	0.500	U	1.00	0.500	0.250
1,3,5-Trimethylbenzene	108-67-8	0.500	U	1.00	0.500	0.250
Vinyl chloride	75-01-4	0.500	U	1.00	0.500	0.250
o-Xylene	95-47-6	0.500	U	1.00	0.500	0.250
m-,p-Xylene	179601-23-1	1.00	U	2.00	1.00	0.500

Surrogate	Recovery	Lower Limit	Upper Limit	Q
Dibromofluoromethane	92.9	85	115	
1,2-Dichloroethane-d4	94.1	70	120	
Toluene-d8	101	85	120	
4-Bromofluorobenzene	108	75	120	

Q	One or more quality control criteria failed. See narrative.

U	Analyte was not detected. The concentration is below the reported LOD.

Certificate of Analysis

2.0 Full Sample Data Package

2.1 Volatiles Data

2.1.1 Volatiles GCMS Data (8260)

2.1.1.1 Summary Data

Certificate of Analysis

Sample #:	L14090460-01	**PrePrep Method:**	N/A	**Instrument:**	HPMS17
Client ID:	12WW25(30)080914	**Prep Method:**	5030B/5030C/5035A	**Prep Date:**	N/A
Matrix:	Water	**Analytical Method:**	8260B	**Cal Date:**	08/12/2014 17:50
Workgroup #:	WG491746	**Analyst:**	FJB	**Run Date:**	09/10/2014 13:42
Collect Date:	09/08/2014 12:40	**Dilution:**	1	**File ID:**	17M008121
Sample Tag:	01	**Units:**	ug/L		

Analyte	CAS #	Result	Qual	LOQ	LOD	DL
Acetone	67-64-1	5.15	J	10.0	5.00	2.50
Benzene	71-43-2	0.380	J	1.00	0.250	0.125
Bromobenzene	108-86-1	0.250	U	1.00	0.250	0.125
Bromochloromethane	74-97-5	0.400	U	1.00	0.400	0.200
Bromodichloromethane	75-27-4	0.500	U	1.00	0.500	0.250
Bromoform	75-25-2	1.00	U	2.00	1.00	0.500
Bromomethane	74-83-9	1.00	Q	2.00	1.00	0.500
2-Butanone	78-93-3	5.00	U	10.0	5.00	2.50
n-Butylbenzene	104-51-8	0.500	U	1.00	0.500	0.250
sec-Butylbenzene	135-98-8	0.500	U	1.00	0.500	0.250
tert-Butylbenzene	98-06-6	0.500	U	1.00	0.500	0.250
Carbon disulfide	75-15-0	1.00	U	2.00	1.00	0.500
Carbon tetrachloride	56-23-5	0.500	U	1.00	0.500	0.250
Chlorobenzene	108-90-7	0.873	J	1.00	0.250	0.125
Chlorodibromomethane	124-48-1	0.500	U	1.00	0.500	0.250
Chloroethane	75-00-3	1.00	U	2.00	1.00	0.500
Chloroform	67-66-3	0.250	U	1.00	0.250	0.125
Chloromethane	74-87-3	1.00	U	2.00	1.00	0.500
2-Chlorotoluene	95-49-8	0.250	U	1.00	0.250	0.125
4-Chlorotoluene	106-43-4	0.500	U	1.00	0.500	0.250
1,2-Dibromo-3-chloropropane	96-12-8	2.00	U	5.00	2.00	1.00
1,2-Dibromoethane	106-93-4	0.500	U	1.00	0.500	0.250
Dibromomethane	74-95-3	0.500	U	1.00	0.500	0.250
1,2-Dichlorobenzene	95-50-1	0.250	U	1.00	0.250	0.125
1,3-Dichlorobenzene	541-73-1	0.500	U	1.00	0.500	0.250
1,4-Dichlorobenzene	106-46-7	0.293	J	1.00	0.250	0.125
Dichlorodifluoromethane	75-71-8	0.500	Q	1.00	0.500	0.250
1,1-Dichloroethane	75-34-3	0.250	U	1.00	0.250	0.125
1,2-Dichloroethane	107-06-2	0.500	U	1.00	0.500	0.250
1,1-Dichloroethene	75-35-4	1.00	U	2.00	1.00	0.500
cis-1,2-Dichloroethene	156-59-2	0.402	J	1.00	0.500	0.250
trans-1,2-Dichloroethene	156-60-5	0.500	U	1.00	0.500	0.250

Analyte	CAS #	Result	Qual	LOQ	LOD	DL
1,2-Dichloropropane	78-87-5	0.400	U	1.00	0.400	0.200
1,3-Dichloropropane	142-28-9	0.400	U	1.00	0.400	0.200
2,2-Dichloropropane	594-20-7	0.500	U	1.00	0.500	0.250
cis-1,3-Dichloropropene	10061-01-5	0.500	U	1.00	0.500	0.250
trans-1,3-Dichloropropene	10061-02-6	1.00	U	2.00	1.00	0.500
1,1-Dichloropropene	563-58-6	0.500	U	1.00	0.500	0.250
Ethylbenzene	100-41-4	0.500	U	1.00	0.500	0.250
2-Hexanone	591-78-6	5.00	U	10.0	5.00	2.50
Hexachlorobutadiene	87-68-3	0.500	U	1.00	0.500	0.250
Isopropylbenzene	98-82-8	0.500	U	1.00	0.500	0.250
p-Isopropyltoluene	99-87-6	0.500	U	1.00	0.500	0.250
4-Methyl-2-pentanone	108-10-1	5.00	U	10.0	5.00	2.50
Methylene chloride	75-09-2	0.388	J	1.00	0.500	0.250
Naphthalene	91-20-3	0.400	U	1.00	0.400	0.200
n-Propylbenzene	103-65-1	0.250	U	1.00	0.250	0.125
Styrene	100-42-5	0.250	U	1.00	0.250	0.125
1,1,1,2-Tetrachloroethane	630-20-6	0.500	U	1.00	0.500	0.250
1,1,2,2-Tetrachloroethane	79-34-5	0.400	U	1.00	0.400	0.200
Tetrachloroethene	127-18-4	0.500	U	1.00	0.500	0.250
Toluene	108-88-3	0.500	U	1.00	0.500	0.250
1,2,3-Trichlorobenzene	87-61-6	0.300	U	1.00	0.300	0.150
1,2,4-Trichlorobenzene	120-82-1	0.400	U	1.00	0.400	0.200
1,1,1-Trichloroethane	71-55-6	0.500	U	1.00	0.500	0.250
1,1,2-Trichloroethane	79-00-5	0.500	U	1.00	0.500	0.250
Trichloroethene	79-01-6	0.317	Q	1.00	0.500	0.250
Trichlorofluoromethane	75-69-4	0.500	U	1.00	0.500	0.250
1,2,3-Trichloropropane	96-18-4	1.00	U	2.00	1.00	0.500
1,2,4-Trimethylbenzene	95-63-6	0.500	U	1.00	0.500	0.250
1,3,5-Trimethylbenzene	108-67-8	0.500	U	1.00	0.500	0.250
Vinyl chloride	75-01-4	0.500	U	1.00	0.500	0.250
o-Xylene	95-47-6	0.500	U	1.00	0.500	0.250
m-,p-Xylene	179601-23-1	1.00	U	2.00	1.00	0.500

Surrogate	Recovery	Lower Limit	Upper Limit	Q
Dibromofluoromethane	94.2	85	115	
1,2-Dichloroethane-d4	96.4	70	120	
Toluene-d8	102	85	120	
4-Bromofluorobenzene	112	75	120	

J	Estimated value ; the analyte concentration was less than the LOQ.
Q	One or more quality control criteria failed. See narrative.

U	Analyte was not detected. The concentration is below the reported LOD.

Certificate of Analysis

Sample #:	L14090460-02	**PrePrep Method:**	N/A	**Instrument:**	HPMS17
Client ID:	12TB080914	**Prep Method:**	5030B/5030C/5035A	**Prep Date:**	N/A
Matrix:	Water	**Analytical Method:**	8260B	**Cal Date:**	08/12/2014 17:50
Workgroup #:	WG491672	**Analyst:**	ADC	**Run Date:**	09/10/2014 00:08
Collect Date:	09/08/2014 00:01	**Dilution:**	1	**File ID:**	17M008106
Sample Tag:	01	**Units:**	ug/L		

Analyte	CAS #	Result	Qual	LOQ	LOD	DL
Acetone	67-64-1	5.00	U	10.0	5.00	2.50
Benzene	71-43-2	0.250	U	1.00	0.250	0.125
Bromobenzene	108-86-1	0.250	U	1.00	0.250	0.125
Bromochloromethane	74-97-5	0.400	U	1.00	0.400	0.200
Bromodichloromethane	75-27-4	0.500	U	1.00	0.500	0.250
Bromoform	75-25-2	1.00	U	2.00	1.00	0.500
Bromomethane	74-83-9	1.00	Q	2.00	1.00	0.500
2-Butanone	78-93-3	5.00	U	10.0	5.00	2.50
n-Butylbenzene	104-51-8	0.500	U	1.00	0.500	0.250
sec-Butylbenzene	135-98-8	0.500	U	1.00	0.500	0.250
tert-Butylbenzene	98-06-6	0.500	U	1.00	0.500	0.250
Carbon disulfide	75-15-0	1.00	Q	2.00	1.00	0.500
Carbon tetrachloride	56-23-5	0.500	U	1.00	0.500	0.250
Chlorobenzene	108-90-7	0.250	U	1.00	0.250	0.125
Chlorodibromomethane	124-48-1	0.500	U	1.00	0.500	0.250
Chloroethane	75-00-3	1.00	U	2.00	1.00	0.500
Chloroform	67-66-3	0.250	U	1.00	0.250	0.125
Chloromethane	74-87-3	1.00	U	2.00	1.00	0.500
2-Chlorotoluene	95-49-8	0.250	U	1.00	0.250	0.125
4-Chlorotoluene	106-43-4	0.500	U	1.00	0.500	0.250
1,2-Dibromo-3-chloropropane	96-12-8	2.00	U	5.00	2.00	1.00
1,2-Dibromoethane	106-93-4	0.500	U	1.00	0.500	0.250
Dibromomethane	74-95-3	0.500	U	1.00	0.500	0.250
1,2-Dichlorobenzene	95-50-1	0.250	U	1.00	0.250	0.125
1,3-Dichlorobenzene	541-73-1	0.500	U	1.00	0.500	0.250
1,4-Dichlorobenzene	106-46-7	0.250	U	1.00	0.250	0.125
Dichlorodifluoromethane	75-71-8	0.500	U	1.00	0.500	0.250
1,1-Dichloroethane	75-34-3	0.250	U	1.00	0.250	0.125
1,2-Dichloroethane	107-06-2	0.500	U	1.00	0.500	0.250
1,1-Dichloroethene	75-35-4	1.00	U	2.00	1.00	0.500
cis-1,2-Dichloroethene	156-59-2	0.500	U	1.00	0.500	0.250

Analyte	CAS #	Result	Qual	LOQ	LOD	DL
trans-1,2-Dichloroethene	156-60-5	0.500	U	1.00	0.500	0.250
1,2-Dichloropropane	78-87-5	0.400	U	1.00	0.400	0.200
1,3-Dichloropropane	142-28-9	0.400	U	1.00	0.400	0.200
2,2-Dichloropropane	594-20-7	0.500	U	1.00	0.500	0.250
cis-1,3-Dichloropropene	10061-01-5	0.500	U	1.00	0.500	0.250
trans-1,3-Dichloropropene	10061-02-6	1.00	U	2.00	1.00	0.500
1,1-Dichloropropene	563-58-6	0.500	U	1.00	0.500	0.250
Ethylbenzene	100-41-4	0.500	U	1.00	0.500	0.250
2-Hexanone	591-78-6	5.00	U	10.0	5.00	2.50
Hexachlorobutadiene	87-68-3	0.500	U	1.00	0.500	0.250
Isopropylbenzene	98-82-8	0.500	U	1.00	0.500	0.250
p-Isopropyltoluene	99-87-6	0.500	U	1.00	0.500	0.250
4-Methyl-2-pentanone	108-10-1	5.00	U	10.0	5.00	2.50
Methylene chloride	75-09-2	0.500	U	1.00	0.500	0.250
Naphthalene	91-20-3	0.400	U	1.00	0.400	0.200
n-Propylbenzene	103-65-1	0.250	U	1.00	0.250	0.125
Styrene	100-42-5	0.250	U	1.00	0.250	0.125
1,1,1,2-Tetrachloroethane	630-20-6	0.500	U	1.00	0.500	0.250
1,1,2,2-Tetrachloroethane	79-34-5	0.400	U	1.00	0.400	0.200
Tetrachloroethene	127-18-4	0.500	U	1.00	0.500	0.250
Toluene	108-88-3	0.500	U	1.00	0.500	0.250
1,2,3-Trichlorobenzene	87-61-6	0.300	U	1.00	0.300	0.150
1,2,4-Trichlorobenzene	120-82-1	0.400	U	1.00	0.400	0.200
1,1,1-Trichloroethane	71-55-6	0.500	U	1.00	0.500	0.250
1,1,2-Trichloroethane	79-00-5	0.500	U	1.00	0.500	0.250
Trichloroethene	79-01-6	0.500	U	1.00	0.500	0.250
Trichlorofluoromethane	75-69-4	0.500	U	1.00	0.500	0.250
1,2,3-Trichloropropane	96-18-4	1.00	U	2.00	1.00	0.500
1,2,4-Trimethylbenzene	95-63-6	0.500	U	1.00	0.500	0.250
1,3,5-Trimethylbenzene	108-67-8	0.500	U	1.00	0.500	0.250
Vinyl chloride	75-01-4	0.500	U	1.00	0.500	0.250
o-Xylene	95-47-6	0.500	U	1.00	0.500	0.250
m-,p-Xylene	179601-23-1	1.00	U	2.00	1.00	0.500

Surrogate	Recovery	Lower Limit	Upper Limit	Q
Dibromofluoromethane	92.9	85	115	
1,2-Dichloroethane-d4	94.1	70	120	
Toluene-d8	101	85	120	
4-Bromofluorobenzene	108	75	120	

Q	One or more quality control criteria failed. See narrative.

U	Analyte was not detected. The concentration is below the reported LOD.

2.1.1.2 QC Summary Data

Example 8260 Calculations

1.0 Calculating the Response Factor (RF) from the initial calibration (ICAL) data:

$$RF = [(Ax) (Cis)] / [(Ais) (Cx)]$$

where:

	Example
Ax = Area of the characteristic ion for the compound being measured:	3399156
Cis = Concentration of the specific internal standard (ug/mL)	25
Ais = Area of the characteristic ion of the specific internal standard	846471
Cx = Concentration of the compound in the standard being measured (ug/mL)	100
RF = Calculated Response Factor	**1.0039**

2.0 Calculating the concentration (C) of a compound in water using the average RF: *

$$Cx = [(Ax) (Cis) (Vn)(D)] / [(Ais) (RF) (Vs)]$$

where:

	Example
Ax = Area of the characteristic ion for the compound being measured	**3122498**
Cis = Concentration of the specific internal standard (ug/L)	**25**
D = Dilution factor for sample as a multiplier (10x = 10)	**1**
Ais = Area of the characteristic ion of the specific internal standard	**611048**
RF = Average RF from the ICAL	**1.004**
Vs = Purge volume of sample (mL)	**10**
Vn = Nominal purge volume of sample (mL) (10.0 mL)	**10**
Cx = Concentration of the compound in the sample being measured (ug/L)	**127.2428**

3.0 Calculating the concentration (C) of a compound in soil using the average RF: *

$$Cx = [(Ax) (Cis) (Wn)(D)] / [(Ais) (RF) (Ws)]$$

where:

	Example
Ax = Area of the characteristic ion for the compound being measured	**3122498**
Cis = Concentration of the specific internal standard (ug/L)	**25**
D = Dilution factor for sample as a multiplier (10x = 10)	**1**
Ais = Area of the characteristic ion of the specific internal standard	**611048**
RF = Average RF from the ICAL	**1.004**
Ws = Weight of sample purged (g)	**5**
Wn = Nominal purge weight (g) (5.0 g)	**5**
Cx = Concentration of the compound in the sample being measured (ug/L)	**127.2428**

Dry weight correction:

Percent solids (PCT_S)	**50**
Cd = (Cx) (100)/PCT_S	**254.4856**

* Concentrations appearing on the instrument quantitation reports are on-column results and do not take into account initial volume, final volume, and the dilution factor.

4.0 Concentration from Linear Regression

Step 1: Retrieve Curve Data From Plot, $y = mx + b$

y = response ratio = response of analyte / response of IS = Ax/Ais

x = amount ratio = concentration analyte/concentration internal standard = Cx / Cis

m = slope from curve = 0.213

b = intercept from curve = - 0.00642

Step 2: Calculate y from Quantitation Report

y = 86550/593147 = 0.1459

Step 3: Solve for x

x = (y - b)/m = [(0.1459 -(- 0.00642)]/ 0.213 = 0.7152

Step 4: Solve for analyte concentration Cx

Cx = Cis (x) = (25.0)(0.7152) = 17.88

Example Spreadsheet Calculation:

Slope from curve, m:	**0.213**
Intercept from curve, b:	**-0.00642**
Area of analyte, Ax:	**86550**
Area of Internal Standard , Ais:	**593147**
Concentration of IS, Cis	**25.00**
Response Ratio:	**0.145917**
Amount Ratio:	**0.715195**
Concentration:	**17.87988**
Units of Internal Standard:	**ug/L**

5.0 Concentration from Quadratic Regression

Step 1 - Retrieve Curve Data from Plot, y = Ax^2 + Bx + C
Where:
Ax^2 + Bx + (C - y) = 0
A, B, C = constants from the ICAL quadratic regression
y = Response ratio = Area of analyte/Area of internal standard (IS)
x = Amount ratio = Concentration of analyte/concentration of IS

Step 2: Calculate y from Quantitation Report

y = Ax/Ais

Step 3: Solve for x using the quadratic formula
Ax^2 + Bx + C - y = 0

$$x = \frac{b \pm \sqrt{\left(b^2 - 4a\left(c - y\right)\right)}}{2a}$$

(Two possible solutions)

Step 4: Solve for analyte concentration Cx

Cx = (Cis)(Amount ratio)

Example Spreadsheet Calculation:

Value of A from plot:	**-0.00629**	
Value of B from plot:	**0.511**	
Value of C from plot:	**-0.0276**	
Area of unknown from quantitation report:	**293821**	
Area of IS from quantiation report:	**784848**	
Response ratio, y:	**0.374367**	
C - y:	**-0.40197**	
Root 1 - Computed amount ratio , X1:	**80.44567**	
Root 2 - Computed amount ratio , X2:	**0.794396**	use this solution
Concentration of IS, Cis:	**25.00**	
Concentration of analyte, Cx:	**19.86**	ug/L

TCLP Volatile

Analyst(s): Blg
Date: 9-8-14
Filter Lot #: 9198629

Agitator Speed 30 ± 2 rpm ☑

Analyst / Date		Analyst / Date	
Blg 9-8-14		Blg 9-9-14	
Time On	Temp On °C	Time Off	Temp Off °C
1620	23.7	0835	22.8

ZHE	Sample #	Pressure √	PSI ON	PSI OFF	Method	Fluid #	Matrix*	%Solid	Size Reduction Yes	Size Reduction No	Int. Wt. (g)	Fluid Vol. (mL)
A												
B												
C												
D												
E												
F												
G												
H												
I												
J												
K	9-369-2	✓	10	10	1311	F1991	S	100		✓	25.00	500
L	4	✓	↓	↓	↓	↓	↓	↓		✓	25.03	500
M												
N												
O												
P												
Q												
R												
S												
N/A	FBLK1	NA	NA	N/A	1311	F1991	W	NA		✓	NA	40

Blg 9-9-14

Blg 9-9-14

Blg 9-9-14

*Matrix Code = (S-solid) (SS-sand, soil or sludge) (P-paint) (O-organic) (W-water or waste)

Comments: ______

Peer Review By: Vicki Allen 9/9/14

Microbac Laboratories Inc.

Instrument Run Log

Instrument:	HPMS17	Dataset:	101313		
Analyst1:	MES	Analyst2:	NA		
Method:	8260B	SOP:	MSV01	Rev:	17
Method:	624	SOP:	MSV10	Rev:	10
Method:	5030B/5030C/5035A	SOP:	PAT01	Rev:	13
Maintenance Log ID:	47805				

Internal Standard: STD60409

Surrogate Standard: STD60842

CCV: STD60752

LCS: STD60749

MS/MSD: NA

Column 1 ID: RTX502.2

Column 2 ID: NA

Workgroups: WG448463

Comments: Rerun MDLs for isobutanol and cyclohexanone.

File ID	Sample Information	pH	Mat	Dil	Reference	Date/Time
17M000183	WG448462-01 50NG BFB STD 8260	NA	1	1	STD60561	10/13/13 16:29
17M000184	WG448462-01 50NG BFB STD 8260	NA	1	1	STD60561	10/13/13 16:45
17M000185	WG448466-02 50ug/L WATER STD 8260	NA	1	1	STD60687	10/13/13 17:20
17M000186	WG448462-02 5ug/L APPIX STD	NA	1	1	STD60752	10/13/13 17:48
17M000187	WG448462-03 20ug/L APPIX STD	NA	1	1	STD60752	10/13/13 18:15
17M000188	WG448462-04 50ug/L APPIX STD	NA	1	1	STD60752	10/13/13 18:43
17M000189	WG448462-05 100ug/L APPIX STD	NA	1	1	STD60752	10/13/13 19:11
17M000190	WG448462-06 200ug/L APPIX STD	NA	1	1	STD60752	10/13/13 19:39
17M000191	WG448462-07 300ug/L APPIX STD	NA	1	1	STD60752	10/13/13 20:07
17M000192	WG448462-08 400ug/L APPIX STD	NA	1	1	STD60752	10/13/13 20:35
17M000193	WG448462-09 500ug/L APPIX STD	NA	1	1	STD60752	10/13/13 21:03
17M000194	RINSE	NA	1	1		10/13/13 21:31
17M000195	WG448462-10 100ug/L APPIX ALT SRC	NA	1	1	STD60749	10/13/13 22:00
17M000196	RINSE	NA	1	1		10/13/13 22:27
17M000197	L13100005-12 BLANK	NA	1	1		10/13/13 22:55
17M000198	L13100005-13 BLANK	NA	1	1		10/13/13 23:23
17M000199	L13100005-01 MDL	NA	1	1	STD60752	10/13/13 23:51
17M000200	L13100005-02 MDL	NA	1	1	STD60752	10/14/13 00:18
17M000201	L13100005-03 MDL	NA	1	1	STD60752	10/14/13 00:47
17M000202	L13100005-04 MDL	NA	1	1	STD60752	10/14/13 01:14
17M000203	L13100005-05 MDL	NA	1	1	STD60752	10/14/13 01:43
17M000204	L13100005-06 MDL	NA	1	1	STD60752	10/14/13 02:11
17M000205	L13100005-07 MDL	NA	1	1	STD60752	10/14/13 02:39

Approved: October 18, 2013

Microbac Laboratories Inc.

Instrument Run Log

Instrument:	HPMS17	Dataset:	081214		
Analyst1:	ADC	Analyst2:	NA		
Method:	8260B	SOP:	MSV01	Rev:	19
Method:	5030C	SOP:	PAT01	Rev:	16
Method:	624	SOP:	MSV10	Rev:	12
Maintenance Log ID:	51343				

Internal Standard: STD65745
Surrogate Standard: STD65715
CCV: STD65747
LCS: STD65748
MS/MSD: STD65748

Column 1 ID: RTX-VMS
Column 2 ID: NA
Workgroups: WG487972 (ICAL)

Comments:

File ID	Sample Information	pH	Mat	Dil	Reference	Date/Time
17M007342	WG487972-01 50ng BFB 8260	NA	1	1	STD65934	08/12/14 14:16
17M007343	RINSE	NA	1	1		08/12/14 14:34
17M007344	WG487972-02 0.3ug/L STD 8260	NA	1	1	STD65747	08/12/14 14:53
17M007345	WG487972-03 0.4ug/L STD 8260	NA	1	1	STD65747	08/12/14 15:13
17M007346	WG487972-04 1.0ug/L STD 8260	NA	1	1	STD65747	08/12/14 15:33
17M007347	WG487972-05 2.0ug/L STD 8260	NA	1	1	STD65747	08/12/14 15:52
17M007348	WG487972-06 5.0ug/L STD 8260	NA	1	1	STD65747	08/12/14 16:12
17M007349	WG487972-07 20.0ug/L STD 8260	NA	1	1	STD65747	08/12/14 16:32
17M007350	WG487972-08 50.0ug/L STD 8260	NA	1	1	STD65747	08/12/14 16:51
17M007351	WG487972-09 100.0ug/L STD 8260	NA	1	1	STD65747	08/12/14 17:11
17M007352	WG487972-10 200.0ug/L STD 8260	NA	1	1	STD65747	08/12/14 17:30
17M007353	WG487972-11 300.0ug/L STD 8260	NA	1	1	STD65747	08/12/14 17:50
17M007354	RINSE	NA	1	1		08/12/14 18:10
17M007355	WG487972-12 50.0ug/L ALTSRC 8260	NA	1	1	STD65748	08/12/14 18:29

Approved: August 18, 2014

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Microbac Laboratories Inc.

Instrument Run Log

Instrument:	HPMS17	Dataset:	090914		
Analyst1:	ADC	Analyst2:	NA		
Method:	8260B	SOP:	MSV01	Rev:	19
Method:	5030C/5035A	SOP:	PAT01	Rev:	16
Method:	624	SOP:	MSV10	Rev:	12
Maintenance Log ID:	51602				

Internal Standard: STD66140

Surrogate Standard: STD66349

CCV: STD66320

LCS: STD66321

MS/MSD: NA

Column 1 ID: 624-VMS

Column 2 ID: NA

Workgroups: WG491621, WG491672

Comments:

File ID	Sample Information	pH	Mat	Dil	Reference	Date/Time
17M008073	WG491620-01 50ng BFB STD	NA	1	1	STD66239	09/09/14 13:18
17M008074	WG491620-02 50ug/L CCV 8260	NA	1	1	STD66320	09/09/14 13:36
17M008075	RINSE	NA	1	1		09/09/14 13:58
17M008076	WG491621-01 VBLK 0908 8260	NA	1	1		09/09/14 14:18
17M008077	WG491621-02 20ug/L LCS 8260	NA	1	1	STD66321	09/09/14 14:38
17M008078	WG491621-03 20ug/L LCSDUP 8260	NA	1	1	STD66321	09/09/14 14:57
17M008079	RINSE	NA	1	1		09/09/14 15:17
17M008080	WG491621-01 VBLK 0908 8260	NA	1	1		09/09/14 15:36
17M008081	L14090254-09 A 826-LOW FB	<2	1	1		09/09/14 15:56
17M008082	L14090254-10 A 826-LOW TB	<2	1	1		09/09/14 16:16
17M008083	L14090304-06 A 826-LOW TB	<2	1	1		09/09/14 16:35
17M008084	L14090317-07 B 5X 826-SPE D1	<2	1	5		09/09/14 16:55
17M008085	L14081618-11 B 10X 826-SPE D1	<2	1	10		09/09/14 17:15
17M008086	L14081618-12 B 10X 826-SPE D1	<2	1	10		09/09/14 17:35
17M008087	L14090254-01 A 826-LOW	<2	1	1		09/09/14 17:54
17M008088	L14090254-02 A 826-LOW	<2	1	1		09/09/14 18:14
17M008089	L14090254-03 A 826-LOW	<2	1	1		09/09/14 18:34
17M008090	L14090254-04 A 826-LOW	<2	1	1		09/09/14 18:53
17M008091	L14090254-05 A 826-LOW	<2	1	1		09/09/14 19:13
17M008092	L14090254-06 A 826-LOW	<2	1	1		09/09/14 19:33
17M008093	L14090254-07 A 826-LOW	<2	1	1		09/09/14 19:52
17M008094	L14090254-08 A 826-LOW	<2	1	1		09/09/14 20:12
17M008095	L14090304-01 A 826-LOW	<2	1	1		09/09/14 20:32
17M008096	L14090304-02 A 826-LOW	<2	1	1		09/09/14 20:51
17M008097	L14090304-03 A 826-LOW	<2	1	1		09/09/14 21:11
17M008098	L14090304-04 A 826-LOW	<2	1	1		09/09/14 21:31
17M008099	L14090304-05 A 826-LOW	<2	1	1		09/09/14 21:50
17M008100	L14090304-07 A 826-LOW	<2	1	1		09/09/14 22:10
17M008101	RINSE	NA	1	1		09/09/14 22:30
17M008102	WG491672-01 VBLK 0909 8260	NA	1	1		09/09/14 22:49
17M008103	WG491672-02 20ug/L LCS 8260	NA	1	1		09/09/14 23:09
17M008104	WG491672-03 20ug/L LCSDUP 8260	NA	1	1		09/09/14 23:29
17M008105	RINSE	NA	1	1		09/09/14 23:48
17M008106	L14090460-02 A 826-LOW	<2	1	1		09/10/14 00:08

Approved: September 11, 2014

Tiffany Bailey

Microbac

Run Log ID: **63339**

Microbac Laboratories Inc.

Instrument Run Log

Instrument:	HPMS17	Dataset:	090914		
Analyst1:	ADC	Analyst2:	NA		
Method:	8260B	SOP:	MSV01	Rev:	19
Method:	5030C/5035A	SOP:	PAT01	Rev:	16
Method:	624	SOP:	MSV10	Rev:	12
Maintenance Log ID:	51602				

Internal Standard: STD66140

Surrogate Standard: STD66349

CCV: STD66320

LCS: STD66321

MS/MSD: NA

Column 1 ID: 624-VMS

Column 2 ID: NA

Workgroups: WG491621, WG491672

Comments:

File ID	Sample Information	pH	Mat	Dil	Reference	Date/Time
17M008107	L14090369-02 A 10X 826-TC	NA	17	10		09/10/14 00:28
17M008108	L14090369-04 A 10X 826-TC	NA	17	10		09/10/14 00:48
17M008109	L14090460-01 A 100X 826-LOW	<2	1	100		09/10/14 01:07
17M008110	RINSE	NA	1	1		09/10/14 01:27
17M008111	RINSE	NA	1	1		09/10/14 01:47
17M008112	RINSE	NA	1	1		09/10/14 02:07
17M008113	WG491483-01 10X 826-TC BLK	NA	17	10		09/10/14 02:27

Comments

Seq.	Rerun	Dil.	Reason	Analytes
4 File ID: 17M008076				
	dnr rr			
37 File ID: 17M008109				
	rr 2x; sediment in vials			

Approved: September 11, 2014

Tiffany Bailey

Microbac Laboratories Inc.

Instrument Run Log

Instrument:	HPMS17	Dataset:	091014		
Analyst1:	FJB	Analyst2:	ADC		
Method:	8260B	SOP:	MSV01	Rev:	19
Method:	5030C	SOP:	PAT01	Rev:	16
Method:	624	SOP:	MSV10	Rev:	14
Maintenance Log ID:	51633				

Internal Standard: STD66140
Surrogate Standard: STD66349
CCV: STD66320
LCS: STD66321
MS/MSD: STD66321

Column 1 ID: RTX-VMS
Column 2 ID: NA
Workgroups: WG491746, WG491868

Comments: Unison L14090355's require reanalysis due to a failing LCS.

File ID	Sample Information	pH	Mat	Dil	Reference	Date/Time
17M008114	WG491745-01 BFB 50ng STD	NA	1	1	STD66239	09/10/14 11:20
17M008115	WG491745-02 50ug/L CCV 8260	NA	1	1	STD66320	09/10/14 11:38
17M008116	RINSE	NA	1	1		09/10/14 12:04
17M008117	WG491746-01 VBLK0910 BLANK 8260	NA	1	1		09/10/14 12:23
17M008118	WG491746-02 20ug/L LCS 8260	NA	1	1	STD66321	09/10/14 12:43
17M008119	WG491746-03 20ug/L LCSDUP 8260	NA	1	1	STD66321	09/10/14 13:03
17M008120	L14090295-02 A 826-SPE	<2	1	1		09/10/14 13:22
17M008121	L14090460-01 B+C 826-LOW	<2	1	1		09/10/14 13:42
17M008122	L14090295-03 A 826-SPE	<2	1	1		09/10/14 14:02
17M008123	L14090295-05 A 826-SPE	<2	1	1		09/10/14 14:21
17M008124	L14090123-03 A TB 826-LOW	<2	1	1		09/10/14 14:41
17M008125	L14090195-01 A TB 826-LOW	<2	1	1		09/10/14 15:01
17M008126	L14090191-04 A TB 826-SPE	NA	1	1		09/10/14 15:20
17M008127	L14090465-03 A TB 826-LOW	<2	1	1		09/10/14 15:40
17M008128	L14090195-02 A 826-LOW	<2	1	1		09/10/14 16:00
17M008129	L14090190-01 A 826-SPE	<2	1	1		09/10/14 16:20
17M008130	L14090190-05 A 826-SPE	<2	1	1		09/10/14 16:39
17M008131	L14090191-02 A 826-SPE	<2	1	1		09/10/14 16:59
17M008132	L14090191-03 A 826-SPE	<2	1	1		09/10/14 17:19
17M008133	L14090465-01 A 826-LOW	<2	1	1		09/10/14 17:38
17M008134	L14090191-01 A 826-SPE	<2	1	1		09/10/14 17:58
17M008135	L14090444-01 A 10X 826-TC	<2	17	10		09/10/14 18:18
17M008136	L14090295-07 200X A 826-SPE	<2	1	200		09/10/14 18:37
17M008137	L14090295-06 50X A 826-SPE	<2	1	50		09/10/14 18:57
17M008138	L14090295-04 5X A 826-SPE	<2	1	5		09/10/14 19:17
17M008139	L14090123-01 50X A 826-LOW	<2	1	50		09/10/14 19:36
17M008140	WG491868-01 VBLK0910 BLANK STD 826	NA	1	1		09/10/14 19:56
17M008141	WG491868-02 20ug/L LCS STD 8260	NA	1	1	STD66321	09/10/14 20:16
17M008142	WG491868-03 20ug/L LCSDUP STD 8260	NA	1	1	STD66321	09/10/14 20:35
17M008143	RINSE	NA	1	1		09/10/14 20:55
17M008144	WG491868-04 VBLK0910 BLANK STD 624	NA	2	1		09/10/14 21:15
17M008145	L14090355-03 A TB 826-SPE	<2	1	1		09/10/14 21:35
17M008146	L14090355-02 A 826-SPE	<2	1	1		09/10/14 21:54
17M008147	L14090355-01 A 826-SPE	<2	1	1		09/10/14 22:14

Approved: September 12, 2014

Microbac Laboratories Inc.

Instrument Run Log

Instrument: HPMS17 Dataset: 091014

Analyst1: FJB Analyst2: ADC

Method: 8260B SOP: MSV01 Rev: 19

Method: 5030C SOP: PAT01 Rev: 16

Method: 624 SOP: MSV10 Rev: 14

Maintenance Log ID: 51633

Internal Standard: STD66140 Surrogate Standard: STD66349

CCV: STD66320 LCS: STD66321 MS/MSD: STD66321

Column 1 ID: RTX-VMS Column 2 ID: NA

Workgroups: WG491746, WG491868

Comments: Unison L14090355's require reanalysis due to a failing LCS.

File ID	Sample Information	pH	Mat	Dil	Reference	Date/Time
17M008148	L14090492-01 A 624-SPE	7	2	1		09/10/14 22:34
17M008149	L14090492-02 A 624-SPE1	7	2	1		09/10/14 22:54
17M008150	L14090492-03 A 624-SPE2	7	2	1		09/10/14 23:14
17M008151	L14090492-04 A 624-SPE3	<2	2	1		09/10/14 23:33
17M008152	CCV	NA	1	1		09/10/14 23:53
17M008153	RINSE	NA	1	1		09/11/14 00:13
17M008154	WG491644-01 FBLK 10X 826-TC	NA	17	10		09/11/14 00:33

Comments

Seq.	Rerun	Dil.	Reason	Analytes
10	X	5	Over Calibration Range	DEE
File ID: 17M008123				
L14090295-05				

Approved: September 12, 2014

Checklist ID: 81270

Microbac Laboratories Inc.

Data Checklist

Date: 13-OCT-2013
Analyst: MES
Analyst: NA
Method: 8260/624
Instrument: HPMS17
Curve Workgroup: NA
Runlog ID: 56448
Analytical Workgroups: WG448463

System Performance Check	NA
BFB	X
Initial Calibration	X
Average RF	X
Linear Reg or Higher Order Curve	X
Second Source standard % Difference	X
Continuing Calibration /Check Standards	X
Project/Client Specific Requirements	X
Special Standards	X
Blanks	X
TCL's	X
Surrogates	X
LCS (Laboratory Control Sample)	NA
Recoveries	NA
Surrogates	NA
MS/MSD/Duplicates	NA
Samples	X
TCL Hits	X
Spectra of TCL Hits	X
Surrogates	NA
Internal Standards Criteria	X
Library Searches	NA
Calculations & Correct Factors	X
Dilutions Run	NA
Reruns	X
Manual Integrations	NA
Case Narrative	NA
Results Reporting/Data Qualifiers	X
KOBRA Workgroup Data	X
Check for Completeness	X
Primary Reviewer	MES
Secondary Reviewer	MDA
Check for compliance with method and project specific requirements	X
Check the completeness of reported information	X
Check the information for the report narrative	X
Check the reasonableness of the results	X

Primary Reviewer:
17-OCT-2013
Mary Schilling

Secondary Reviewer:
18-OCT-2013

CHECKLIST1 - Modified 03/05/2008
Generated: OCT-18-2013 08:13:54

Microbac

Microbac Laboratories Inc.

Data Checklist

Date: 12-AUG-2014
Analyst: ADC
Analyst: NA
Method: 8260/624
Instrument: HPMS17
Curve Workgroup: WG487972
Runlog ID: 62870
Analytical Workgroups:

System Performance Check	NA
BFB	X
Initial Calibration	X
Average RF	X
Linear Reg or Higher Order Curve	X
Second Source standard % Difference	X
Continuing Calibration /Check Standards	X
Project/Client Specific Requirements	X
Special Standards	NA
Blanks	X
TCL's	X
Surrogates	X
LCS (Laboratory Control Sample)	X
Recoveries	X
Surrogates	X
MS/MSD/Duplicates	NA
Samples	NA
TCL Hits	NA
Spectra of TCL Hits	ADC
Surrogates	NA
Internal Standards Criteria	X
Library Searches	NA
Calculations & Correct Factors	NA
Dilutions Run	NA
Reruns	NA
Manual Integrations	NA
Case Narrative	NA
Results Reporting/Data Qualifiers	NA
KOBRA Workgroup Data	X
Check for Completeness	X
Primary Reviewer	ADC
Secondary Reviewer	MDA
Check for compliance with method and project specific requirements	X
Check the completeness of reported information	X
Check the information for the report narrative	X
Check the reasonableness of the results	X

Primary Reviewer:	Secondary Reviewer:
15-AUG-2014	18-AUG-2014

CHECKLIST1 - Modified 03/05/2008
Generated: AUG-18-2014 08:25:45

Microbac Laboratories Inc.

Data Checklist

Date: 09-SEP-2014
Analyst: ADC
Analyst: NA
Method: 8260B/624
Instrument: HPMS17
Curve Workgroup: NA
Runlog ID: 63339
Analytical Workgroups: WG491621, WG491672

System Performance Check	NA
BFB	X
Initial Calibration	X
Average RF	X
Linear Reg or Higher Order Curve	X
Second Source standard % Difference	X
Continuing Calibration /Check Standards	X
Project/Client Specific Requirements	X
Special Standards	NA
Blanks	X
TCL's	X
Surrogates	X
LCS (Laboratory Control Sample)	X
Recoveries	X
Surrogates	X
MS/MSD/Duplicates	NA
Samples	X
TCL Hits	X
Spectra of TCL Hits	MDA
Surrogates	X
Internal Standards Criteria	X
Library Searches	NA
Calculations & Correct Factors	NDA
Dilutions Run	NA
Reruns	NA
Manual Integrations	NA
Case Narrative	X
Results Reporting/Data Qualifiers	X
KOBRA Workgroup Data	X
Check for Completeness	X
Primary Reviewer	MDA
Secondary Reviewer	TMB
Check for compliance with method and project specific requirements	X
Check the completeness of reported information	X
Check the information for the report narrative	X
Check the reasonableness of the results	X

Primary Reviewer:
10-SEP-2014

Secondary Reviewer:
11-SEP-2014
Tiffany Bailey

CHECKLIST1 - Modified 03/05/2008
Generated: SEP-11-2014 14:24:04

Microbac

Microbac Laboratories Inc.

Data Checklist

Date: 10-SEP-2014
Analyst: ADC
Analyst: NA
Method: 8260/624
Instrument: HPMS17
Curve Workgroup: NA
Runlog ID: 63374
Analytical Workgroups: WG491746, WG491868

System Performance Check	NA
BFB	X
Initial Calibration	X
Average RF	X
Linear Reg or Higher Order Curve	X
Second Source standard % Difference	X
Continuing Calibration /Check Standards	X
Project/Client Specific Requirements	X
Special Standards	NA
Blanks	X
TCL's	X
Surrogates	X
LCS (Laboratory Control Sample)	X
Recoveries	X
Surrogates	X
MS/MSD/Duplicates	X
Samples	X
TCL Hits	X
Spectra of TCL Hits	ADC
Surrogates	X
Internal Standards Criteria	X
Library Searches	NA
Calculations & Correct Factors	X
Dilutions Run	X
Reruns	X
Manual Integrations	NA
Case Narrative	X
Results Reporting/Data Qualifiers	X
KOBRA Workgroup Data	X
Check for Completeness	X
Primary Reviewer	ADC
Secondary Reviewer	MDA
Check for compliance with method and project specific requirements	X
Check the completeness of reported information	X
Check the information for the report narrative	X
Check the reasonableness of the results	X

Primary Reviewer:
12-SEP-2014

Secondary Reviewer:
12-SEP-2014

Microbac Laboratories Inc.

HOLDING TIMES
EQUIVALENT TO AFCEE FORM 9

Analytical Method: 8260B

AAB#: WG491672

Login Number: L14090460

Client ID	ID	Date Collected	TCLP Date	Time Held	Max Hold	Q	Extract Date	Time Held	Max Hold	Q	Run Date	Time Held	Max Hold	Q
12TB080914	02	09/08/14					9/10/2014	2	14		09/10/14	2	14	

*** = SEE PROJECT QAPP REQUIREMENTS**

HOLD_TIMES - Modified 03/06/2008
PDF File ID: 3749113
Report generated 09/12/2014 14:49

Microbac Laboratories Inc.

HOLDING TIMES
EQUIVALENT TO AFCEE FORM 9

Analytical Method: 8260B
AAB#: WG491746
Login Number: L14090460

Client ID	ID	Date Collected	TCLP Date	Time Held	Max Hold	Q	Extract Date	Time Held	Max Hold	Q	Run Date	Time Held	Max Hold	Q
12WW25(30)080914	01	09/08/14					09/10/2014	2	14		09/10/14	2	14	

* = SEE PROJECT QAPP REQUIREMENTS

HOLD_TIMES - Modified 03/06/2008
PDF File ID: 3749113
Report generated 09/12/2014 14:49

Microbac

Microbac Laboratories Inc.
SURROGATE STANDARDS

Login Number: L14090460
Instrument Id: HPMS17
Workgroup (AAB#): WG491746

Method: 8260
CAL ID: HPMS17 - 12-AUG-14
Matrix: Water

Sample Number	Dilution	Tag	1	2	3	4
L14090460-01	1.00	01	96.4	94.2	112	102
WG491746-01	1.00	01	96.0	94.7	113	102
WG491746-02	1.00	01	94.5	95.6	107	101
WG491746-03	1.00	01	93.1	94.1	102	99.3

Surrogates	Surrogate Limits		
1 - 1,2-Dichloroethane-d4	70	-	120
2 - Dibromofluoromethane	85	-	115
3 - 4-Bromofluorobenzene	75	-	120
4 - Toluene-d8	85	-	120

Underline = Result out of surrogate limits

DL = surrogate diluted out
ND = surrogate not detected

SURROGATES - Modified 03/06/2008
PDF File ID: 3749121
Report generated: 09/12/2014 14:49

Microbac Laboratories Inc.
SURROGATE STANDARDS

Login Number: L14090460
Instrument Id: HPMS17
Workgroup (AAB#): WG491672
Method: 8260
CAL ID: HPMS17 - 12-AUG-14
Matrix: Water

Sample Number	Dilution	Tag	1	2	3	4
L14090460-02	1.00	01	94.1	92.9	108	101
WG491672-01	1.00	01	92.5	90.7	109	99.4
WG491672-02	1.00	01	94.5	95.0	106	101
WG491672-03	1.00	01	97.0	96.7	110	104

	Surrogates	Surrogate Limits		
1	- 1,2-Dichloroethane-d4	70	-	120
2	- Dibromofluoromethane	85	-	115
3	- 4-Bromofluorobenzene	75	-	120
4	- Toluene-d8	85	-	120

Underline = Result out of surrogate limits

DL = surrogate diluted out
ND = surrogate not detected

SURROGATES - Modified 03/06/2008
PDF File ID: 3749121
Report generated: 09/12/2014 14:49

METHOD BLANK SUMMARY

Login Number: L14090460
Blank File ID: 17M008102
Prep Date: 09/09/14 22:49
Analyzed Date: 09/09/14 22:49
Analyst: ADC

Work Group: WG491672
Blank Sample ID: WG491672-01
Instrument ID: HPMS17
Method: 8260B

This Method Blank Applies To The Following Samples:

Client ID	Lab Sample ID	Lab File ID	Time Analyzed	TAG
LCS	WG491672-02	17M008103	09/09/14 23:09	01
LCS2	WG491672-03	17M008104	09/09/14 23:29	01
12TB080914	L14090460-02	17M008106	09/10/14 00:08	01

Report Name: BLANK_SUMMARY
PDF File ID: 3749114
Report generated 09/12/2014 14:49

METHOD BLANK SUMMARY

Login Number:	L14090460	Work Group:	WG491746
Blank File ID:	17M008117	Blank Sample ID:	WG491746-01
Prep Date:	09/10/14 12:23	Instrument ID:	HPMS17
Analyzed Date:	09/10/14 12:23	Method:	8260B
Analyst:	FJB		

This Method Blank Applies To The Following Samples:

Client ID	Lab Sample ID	Lab File ID	Time Analyzed	TAG
LCS	WG491746-02	17M008118	09/10/14 12:43	01
LCS2	WG491746-03	17M008119	09/10/14 13:03	01
12WW25(30)080914	L14090460-01	17M008121	09/10/14 13:42	01

Report Name: BLANK_SUMMARY
PDF File ID: 3749114
Report generated 09/12/2014 14:49

Microbac Laboratories Inc.
METHOD BLANK REPORT

Login Number:L14090460
Prep Date:09/09/14 22:49
Sample ID:WG491672-01
Instrument ID:HPMS17
Run Date:09/09/14 22:49
Prep Method:5030B/5030C/503
File ID:17M008102
Analyst:ADC
Method:8260B
Workgroup (AAB#):WG491672
Matrix:Water
Units:ug/L
Contract #:
Cal ID:HPMS17 - 12-AUG-14

Analytes	DL	LOQ	Concentration	Dilution	Qualifier
Acetone	2.50	10.0	2.50	1	U
Benzene	0.125	1.00	0.125	1	U
Bromobenzene	0.125	1.00	0.125	1	U
Bromochloromethane	0.200	1.00	0.200	1	U
Bromodichloromethane	0.250	1.00	0.250	1	U
Bromoform	0.500	2.00	0.500	1	U
Bromomethane	0.500	2.00	0.500	1	U
2-Butanone	2.50	10.0	2.50	1	U
n-Butylbenzene	0.250	1.00	0.250	1	U
sec-Butylbenzene	0.250	1.00	0.250	1	U
tert-Butylbenzene	0.250	1.00	0.250	1	U
Carbon disulfide	0.500	2.00	0.500	1	U
Carbon tetrachloride	0.250	1.00	0.250	1	U
Chlorobenzene	0.125	1.00	0.125	1	U
Chlorodibromomethane	0.250	1.00	0.250	1	U
Chloroethane	0.500	2.00	0.500	1	U
Chloroform	0.125	1.00	0.125	1	U
Chloromethane	0.500	2.00	0.500	1	U
2-Chlorotoluene	0.125	1.00	0.125	1	U
4-Chlorotoluene	0.250	1.00	0.250	1	U
1,2-Dibromo-3-chloropropane	1.00	5.00	1.00	1	U
1,2-Dibromoethane	0.250	1.00	0.250	1	U
Dibromomethane	0.250	1.00	0.250	1	U
1,2-Dichlorobenzene	0.125	1.00	0.125	1	U
1,3-Dichlorobenzene	0.250	1.00	0.250	1	U
1,4-Dichlorobenzene	0.125	1.00	0.125	1	U
Dichlorodifluoromethane	0.250	1.00	0.250	1	U
1,1-Dichloroethane	0.125	1.00	0.125	1	U
1,2-Dichloroethane	0.250	1.00	0.250	1	U
1,1-Dichloroethene	0.500	2.00	0.500	1	U
cis-1,2-Dichloroethene	0.250	1.00	0.250	1	U
trans-1,2-Dichloroethene	0.250	1.00	0.250	1	U
1,2-Dichloropropane	0.200	1.00	0.200	1	U
1,3-Dichloropropane	0.200	1.00	0.200	1	U
2,2-Dichloropropane	0.250	1.00	0.250	1	U
cis-1,3-Dichloropropene	0.250	1.00	0.250	1	U
trans-1,3-Dichloropropene	0.500	2.00	0.500	1	U
1,1-Dichloropropene	0.250	1.00	0.250	1	U
Ethylbenzene	0.250	1.00	0.250	1	U
2-Hexanone	2.50	10.0	2.50	1	U
Hexachlorobutadiene	0.250	1.00	0.250	1	U
Isopropylbenzene	0.250	1.00	0.250	1	U

Report Name:BLANK
PDF ID: 3749115
12-SEP-2014 14:49

Microbac Laboratories Inc.
METHOD BLANK REPORT

Login Number:	L14090460	Prep Date:	09/09/14 22:49	Sample ID:	WG491672-01
Instrument ID:	HPMS17	Run Date:	09/09/14 22:49	Prep Method:	5030B/5030C/503
File ID:	17M008102	Analyst:	ADC	Method:	8260B
Workgroup (AAB#):	WG491672	Matrix:	Water	Units:	ug/L
Contract #:		Cal ID:	HPMS17 - 12-AUG-14		

Analytes	DL	LOQ	Concentration	Dilution	Qualifier
p-Isopropyltoluene	0.250	1.00	0.250	1	U
4-Methyl-2-pentanone	2.50	10.0	2.50	1	U
Methylene chloride	0.250	1.00	0.250	1	U
Naphthalene	0.200	1.00	0.200	1	U
n-Propylbenzene	0.125	1.00	0.125	1	U
Styrene	0.125	1.00	0.125	1	U
1,1,1,2-Tetrachloroethane	0.250	1.00	0.250	1	U
1,1,2,2-Tetrachloroethane	0.200	1.00	0.200	1	U
Tetrachloroethene	0.250	1.00	0.250	1	U
Toluene	0.250	1.00	0.250	1	U
1,2,3-Trichlorobenzene	0.150	1.00	0.150	1	U
1,2,4-Trichlorobenzene	0.200	1.00	0.200	1	U
1,1,1-Trichloroethane	0.250	1.00	0.250	1	U
1,1,2-Trichloroethane	0.250	1.00	0.250	1	U
Trichloroethene	0.250	1.00	0.250	1	U
Trichlorofluoromethane	0.250	1.00	0.250	1	U
1,2,3-Trichloropropane	0.500	2.00	0.500	1	U
1,2,4-Trimethylbenzene	0.250	1.00	0.250	1	U
1,3,5-Trimethylbenzene	0.250	1.00	0.250	1	U
Vinyl chloride	0.250	1.00	0.250	1	U
o-Xylene	0.250	1.00	0.250	1	U
m-,p-Xylene	0.500	2.00	0.500	1	U

Surrogates	% Recovery	Surrogate Limits	Qualifier
Dibromofluoromethane	90.7	85 - 115	PASS
1,2-Dichloroethane-d4	92.5	70 - 120	PASS
Toluene-d8	99.4	85 - 120	PASS
4-Bromofluorobenzene	109	75 - 120	PASS

DL Method Detection Limit
LOQ Reporting/Practical Quantitation Limit
ND Analyte Not detected at or above reporting limit
* |Analyte concentration| > 1/2 RL

Report Name:BLANK
PDF ID: 3749115
12-SEP-2014 14:49

Microbac Laboratories Inc.
METHOD BLANK REPORT

Login Number:	L14090460	Prep Date:	09/10/14 12:23	Sample ID:	WG491746-01
Instrument ID:	HPMS17	Run Date:	09/10/14 12:23	Prep Method:	5030B/5030C/503
File ID:	17M008117	Analyst:	FJB	Method:	8260B
Workgroup (AAB#):	WG491746	Matrix:	Water	Units:	ug/L
Contract #:		Cal ID:	HPMS17 - 12-AUG-14		

Analytes	DL	LOQ	Concentration	Dilution	Qualifier
Acetone	2.50	10.0	2.50	1	U
Benzene	0.125	1.00	0.125	1	U
Bromobenzene	0.125	1.00	0.125	1	U
Bromochloromethane	0.200	1.00	0.200	1	U
Bromodichloromethane	0.250	1.00	0.250	1	U
Bromoform	0.500	2.00	0.500	1	U
Bromomethane	0.500	2.00	0.500	1	U
2-Butanone	2.50	10.0	2.50	1	U
n-Butylbenzene	0.250	1.00	0.250	1	U
sec-Butylbenzene	0.250	1.00	0.250	1	U
tert-Butylbenzene	0.250	1.00	0.250	1	U
Carbon disulfide	0.500	2.00	0.500	1	U
Carbon tetrachloride	0.250	1.00	0.250	1	U
Chlorobenzene	0.125	1.00	0.125	1	U
Chlorodibromomethane	0.250	1.00	0.250	1	U
Chloroethane	0.500	2.00	0.500	1	U
Chloroform	0.125	1.00	0.125	1	U
Chloromethane	0.500	2.00	0.500	1	U
2-Chlorotoluene	0.125	1.00	0.125	1	U
4-Chlorotoluene	0.250	1.00	0.250	1	U
1,2-Dibromo-3-chloropropane	1.00	5.00	1.00	1	U
1,2-Dibromoethane	0.250	1.00	0.250	1	U
Dibromomethane	0.250	1.00	0.250	1	U
1,2-Dichlorobenzene	0.125	1.00	0.125	1	U
1,3-Dichlorobenzene	0.250	1.00	0.250	1	U
1,4-Dichlorobenzene	0.125	1.00	0.125	1	U
Dichlorodifluoromethane	0.250	1.00	0.250	1	U
1,1-Dichloroethane	0.125	1.00	0.125	1	U
1,2-Dichloroethane	0.250	1.00	0.250	1	U
1,1-Dichloroethene	0.500	2.00	0.500	1	U
cis-1,2-Dichloroethene	0.250	1.00	0.250	1	U
trans-1,2-Dichloroethene	0.250	1.00	0.250	1	U
1,2-Dichloropropane	0.200	1.00	0.200	1	U
1,3-Dichloropropane	0.200	1.00	0.200	1	U
2,2-Dichloropropane	0.250	1.00	0.250	1	U
cis-1,3-Dichloropropene	0.250	1.00	0.250	1	U
trans-1,3-Dichloropropene	0.500	2.00	0.500	1	U
1,1-Dichloropropene	0.250	1.00	0.250	1	U
Ethylbenzene	0.250	1.00	0.250	1	U
2-Hexanone	2.50	10.0	2.50	1	U
Hexachlorobutadiene	0.250	1.00	0.250	1	U
Isopropylbenzene	0.250	1.00	0.250	1	U

Report Name:BLANK
PDF ID: 3749115
12-SEP-2014 14:49

Microbac Laboratories Inc.
METHOD BLANK REPORT

Login Number:	L14090460	Prep Date:	09/10/14 12:23	Sample ID:	WG491746-01
Instrument ID:	HPMS17	Run Date:	09/10/14 12:23	Prep Method:	5030B/5030C/503
File ID:	17M008117	Analyst:	FJB	Method:	8260B
Workgroup (AAB#):	WG491746	Matrix:	Water	Units:	ug/L
Contract #:		Cal ID:	HPMS17 - 12-AUG-14		

Analytes	DL	LOQ	Concentration	Dilution	Qualifier
p-Isopropyltoluene	0.250	1.00	0.250	1	U
4-Methyl-2-pentanone	2.50	10.0	2.50	1	U
Methylene chloride	0.250	1.00	0.280	1	J
Naphthalene	0.200	1.00	0.200	1	U
n-Propylbenzene	0.125	1.00	0.125	1	U
Styrene	0.125	1.00	0.125	1	U
1,1,1,2-Tetrachloroethane	0.250	1.00	0.250	1	U
1,1,2,2-Tetrachloroethane	0.200	1.00	0.200	1	U
Tetrachloroethene	0.250	1.00	0.250	1	U
Toluene	0.250	1.00	0.250	1	U
1,2,3-Trichlorobenzene	0.150	1.00	0.150	1	U
1,2,4-Trichlorobenzene	0.200	1.00	0.200	1	U
1,1,1-Trichloroethane	0.250	1.00	0.250	1	U
1,1,2-Trichloroethane	0.250	1.00	0.250	1	U
Trichloroethene	0.250	1.00	0.250	1	U
Trichlorofluoromethane	0.250	1.00	0.250	1	U
1,2,3-Trichloropropane	0.500	2.00	0.500	1	U
1,2,4-Trimethylbenzene	0.250	1.00	0.250	1	U
1,3,5-Trimethylbenzene	0.250	1.00	0.250	1	U
Vinyl chloride	0.250	1.00	0.250	1	U
o-Xylene	0.250	1.00	0.250	1	U
m-,p-Xylene	0.500	2.00	0.500	1	U

Surrogates	% Recovery	Surrogate Limits	Qualifier
Dibromofluoromethane	94.7	85 - 115	PASS
1,2-Dichloroethane-d4	96.0	70 - 120	PASS
Toluene-d8	102	85 - 120	PASS
4-Bromofluorobenzene	113	75 - 120	PASS

DL	Method Detection Limit
LOQ	Reporting/Practical Quantitation Limit
ND	Analyte Not detected at or above reporting limit
*	|Analyte concentration| > 1/2 RL

Report Name:BLANK
PDF ID: 3749115
12-SEP-2014 14:49

Microbac Laboratories Inc.
LABORATORY CONTROL SAMPLE (LCS)

Login Number: L14090460 Analyst: ADC Prep Method: 5030B/5030C/503
Instrument ID: HPMS17 Matrix: Water Method: 8260B
Workgroup (AAB#): WG491672 Units: ug/L
QC Key: DOD4 Lot #: STD66321

Sample ID: WG491672-02 LCS File ID: 17M008103 Run Date: 09/09/2014 23:09
Sample ID: WG491672-03 LCS2 File ID: 17M008104 Run Date: 09/09/2014 23:29

Analytes	LCS			LCS2			%RPD	%Rec Limits	RPD Lmt	Q
	Known	Found	% REC	Known	Found	% REC				
1,1,1,2-Tetrachloroethane	20.0	18.5	92.7	20.0	18.9	94.7	2.18	80 - 130	30	
1,1,1-Trichloroethane	20.0	18.5	92.3	20.0	18.3	91.5	0.845	65 - 130	30	
1,1,2,2-Tetrachloroethane	20.0	19.0	95.2	20.0	20.3	102	6.54	65 - 130	30	
1,1,2-Trichloroethane	20.0	18.8	93.8	20.0	19.6	98.2	4.66	75 - 125	30	
1,1-Dichloroethane	20.0	18.1	90.5	20.0	18.3	91.6	1.15	70 - 135	30	
1,1-Dichloroethene	20.0	17.7	88.5	20.0	17.6	88.2	0.402	70 - 130	30	
1,1-Dichloropropene	20.0	18.3	91.7	20.0	18.3	91.6	0.0843	75 - 130	30	
1,2,3-Trichlorobenzene	20.0	19.5	97.5	20.0	20.4	102	4.65	55 - 140	30	
1,2,3-Trichloropropane	20.0	19.7	98.6	20.0	20.8	104	5.28	75 - 125	30	
1,2,4-Trichlorobenzene	20.0	19.4	97.2	20.0	20.1	101	3.56	65 - 135	30	
1,2,4-Trimethylbenzene	20.0	20.4	102	20.0	21.2	106	3.46	75 - 130	30	
1,2-Dibromo-3-chloropropane	20.0	20.7	104	20.0	22.1	110	6.39	50 - 130	30	
1,2-Dibromoethane	20.0	18.8	94.2	20.0	19.7	98.3	4.18	80 - 120	30	
1,2-Dichlorobenzene	20.0	18.3	91.4	20.0	19.1	95.3	4.14	70 - 120	30	
1,2-Dichloroethane	20.0	19.7	98.3	20.0	19.9	99.7	1.40	70 - 130	30	
1,2-Dichloropropane	20.0	19.0	94.9	20.0	19.2	95.9	0.983	75 - 125	30	
1,3,5-Trimethylbenzene	20.0	20.6	103	20.0	21.2	106	3.17	75 - 130	30	
1,3-Dichlorobenzene	20.0	18.0	90.2	20.0	18.7	93.3	3.35	75 - 125	30	
1,3-Dichloropropane	20.0	19.2	96.2	20.0	20.2	101	5.00	75 - 125	30	
1,4-Dichlorobenzene	20.0	18.9	94.3	20.0	19.5	97.4	3.21	75 - 125	30	
2,2-Dichloropropane	20.0	14.7	73.7	20.0	14.8	73.9	0.253	70 - 135	30	
2-Butanone	20.0	19.7	98.3	20.0	20.5	102	4.22	30 - 150	30	
2-Chlorotoluene	20.0	19.1	95.6	20.0	19.7	98.7	3.19	75 - 125	30	
2-Hexanone	20.0	19.4	96.9	20.0	20.4	102	5.29	55 - 130	30	
4-Chlorotoluene	20.0	18.5	92.6	20.0	19.1	95.3	2.85	75 - 130	30	
4-Methyl-2-pentanone	20.0	18.9	94.6	20.0	19.9	99.5	5.10	60 - 135	30	
Acetone	20.0	23.1	116	20.0	24.3	122	5.05	40 - 140	30	
Benzene	20.0	18.4	92.0	20.0	18.6	92.8	0.773	80 - 120	30	
Bromobenzene	20.0	19.0	94.9	20.0	19.9	99.5	4.71	75 - 125	30	
Bromochloromethane	20.0	18.3	91.3	20.0	18.7	93.7	2.63	65 - 130	30	
Bromodichloromethane	20.0	18.5	92.3	20.0	18.5	92.7	0.488	75 - 120	30	
Bromoform	20.0	18.7	93.5	20.0	19.2	96.1	2.74	70 - 130	30	
Bromomethane	20.0	14.4	72.2	20.0	16.3	81.5	12.1	30 - 145	30	
Carbon disulfide	20.0	13.4	67.2	20.0	13.5	67.4	0.393	35 - 160	30	
Carbon tetrachloride	20.0	18.6	92.9	20.0	18.5	92.4	0.528	65 - 140	30	
Chlorobenzene	20.0	17.8	88.9	20.0	18.0	90.2	1.45	80 - 120	30	
Chloroethane	20.0	20.6	103	20.0	20.3	102	1.22	60 - 135	30	
Chloroform	20.0	18.6	92.8	20.0	18.7	93.6	0.872	65 - 135	30	
Chloromethane	20.0	20.6	103	20.0	21.3	106	3.15	40 - 125	30	
cis-1,2-Dichloroethene	20.0	18.5	92.6	20.0	18.7	93.3	0.751	70 - 125	30	

LCS_LCS2 - Modified 03/06/2008
PDF File ID: 3749116
Report generated: 09/12/2014 14:49

Microbac Laboratories Inc.
LABORATORY CONTROL SAMPLE (LCS)

Login Number: L14090460
Analyst: ADC
Prep Method: 5030B/5030C/503
Instrument ID: HPMS17
Matrix: Water
Method: 8260B
Workgroup (AAB#): WG491672
Units: ug/L
QC Key: DOD4
Lot #: STD66321

Sample ID: WG491672-02 LCS File ID: 17M008103 Run Date: 09/09/2014 23:09
Sample ID: WG491672-03 LCS2 File ID: 17M008104 Run Date: 09/09/2014 23:29

Analytes	LCS			LCS2			%RPD	%Rec Limits	RPD Lmt	Q
	Known	Found	% REC	Known	Found	% REC				
cis-1,3-Dichloropropene	20.0	18.5	92.4	20.0	18.7	93.5	1.27	70 - 130	30	
Chlorodibromomethane	20.0	18.7	93.7	20.0	19.2	96.0	2.51	60 - 135	30	
Dibromomethane	20.0	18.6	92.8	20.0	19.1	95.4	2.75	75 - 125	30	
Dichlorodifluoromethane	20.0	25.7	128	20.0	25.7	128	0.0588	30 - 155	30	
Ethylbenzene	20.0	19.0	95.2	20.0	19.3	96.7	1.55	75 - 125	30	
Hexachlorobutadiene	20.0	17.5	87.7	20.0	18.2	90.8	3.47	50 - 140	30	
Isopropylbenzene	20.0	18.3	91.5	20.0	18.6	93.1	1.77	75 - 125	30	
m-,p-Xylene	40.0	37.3	93.2	40.0	38.0	95.1	2.05	75 - 130	30	
Methylene chloride	20.0	18.3	91.3	20.0	18.5	92.7	1.48	55 - 140	30	
n-Butylbenzene	20.0	20.8	104	20.0	21.4	107	3.21	70 - 135	30	
n-Propylbenzene	20.0	18.9	94.7	20.0	19.5	97.3	2.72	70 - 130	30	
Naphthalene	20.0	19.1	95.6	20.0	20.8	104	8.20	55 - 140	30	
o-Xylene	20.0	17.9	89.7	20.0	18.2	91.1	1.50	80 - 120	30	
p-Isopropyltoluene	20.0	18.8	94.0	20.0	19.3	96.4	2.58	75 - 130	30	
sec-Butylbenzene	20.0	19.1	95.3	20.0	19.5	97.6	2.44	70 - 125	30	
Styrene	20.0	19.4	97.1	20.0	20.0	99.8	2.78	65 - 135	30	
tert-Butylbenzene	20.0	18.4	91.9	20.0	19.0	94.9	3.15	70 - 130	30	
Tetrachloroethene	20.0	17.7	88.3	20.0	18.0	90.1	2.00	45 - 150	30	
Toluene	20.0	19.1	95.4	20.0	19.6	97.9	2.55	75 - 120	30	
trans-1,2-Dichloroethene	20.0	18.4	92.1	20.0	18.7	93.7	1.81	60 - 140	30	
trans-1,3-Dichloropropene	20.0	17.1	85.5	20.0	17.6	88.2	3.11	55 - 140	30	
Trichloroethene	20.0	18.2	91.2	20.0	18.4	91.9	0.729	70 - 125	30	
Trichlorofluoromethane	20.0	19.9	99.7	20.0	19.4	96.8	2.94	60 - 145	30	
Vinyl chloride	20.0	20.0	99.8	20.0	20.3	102	1.76	50 - 145	30	

Surogates	LCS	LCS2	Surrogate Limits	Qualifier
	% Recovery	% Recovery		
1,2-Dichloroethane-d4	94.5	97.0	70 - 120	PASS
Dibromofluoromethane	95.0	96.7	85 - 115	PASS
4-Bromofluorobenzene	106	110	75 - 120	PASS
Toluene-d8	101	104	85 - 120	PASS

* EXCEEDS %REC LIMIT

\# EXCEEDS RPD LIMIT

LCS_LCS2 - Modified 03/06/2008
PDF File ID: 3749116
Report generated: 09/12/2014 14:49

Microbac Laboratories Inc.

LABORATORY CONTROL SAMPLE (LCS)

Login Number: L14090460
Analyst: FJB
Prep Method: 5030B/5030C/503
Instrument ID: HPMS17
Matrix: Water
Method: 8260B
Workgroup (AAB#): WG491746
Units: ug/L
QC Key: DOD4
Lot #: STD66321

Sample ID: WG491746-02 LCS File ID: 17M008118 Run Date: 09/10/2014 12:43
Sample ID: WG491746-03 LCS2 File ID: 17M008119 Run Date: 09/10/2014 13:03

Analytes	LCS			LCS2			%RPD	%Rec Limits	RPD Lmt	Q
	Known	Found	% REC	Known	Found	% REC				
1,1,1,2-Tetrachloroethane	20.0	18.6	93.1	20.0	17.8	89.1	4.38	80 - 130	30	
1,1,1-Trichloroethane	20.0	18.1	90.4	20.0	17.5	87.4	3.35	65 - 130	30	
1,1,2,2-Tetrachloroethane	20.0	21.5	108	20.0	19.6	98.0	9.41	65 - 130	30	
1,1,2-Trichloroethane	20.0	19.0	95.2	20.0	18.1	90.3	5.22	75 - 125	30	
1,1-Dichloroethane	20.0	18.1	90.6	20.0	17.3	86.6	4.53	70 - 135	30	
1,1-Dichloroethene	20.0	17.6	88.0	20.0	16.9	84.6	3.86	70 - 130	30	
1,1-Dichloropropene	20.0	18.2	91.0	20.0	17.4	87.2	4.32	75 - 130	30	
1,2,3-Trichlorobenzene	20.0	20.0	99.9	20.0	18.5	92.5	7.62	55 - 140	30	
1,2,3-Trichloropropane	20.0	20.7	103	20.0	18.7	93.5	9.96	75 - 125	30	
1,2,4-Trichlorobenzene	20.0	19.9	99.5	20.0	18.8	93.9	5.87	65 - 135	30	
1,2,4-Trimethylbenzene	20.0	21.0	105	20.0	19.5	97.4	7.66	75 - 130	30	
1,2-Dibromo-3-chloropropane	20.0	21.1	105	20.0	20.0	99.8	5.52	50 - 130	30	
1,2-Dibromoethane	20.0	19.3	96.4	20.0	18.2	91.1	5.63	80 - 120	30	
1,2-Dichlorobenzene	20.0	18.8	94.2	20.0	17.4	87.0	7.91	70 - 120	30	
1,2-Dichloroethane	20.0	19.5	97.3	20.0	18.6	92.8	4.79	70 - 130	30	
1,2-Dichloropropane	20.0	18.9	94.3	20.0	18.1	90.4	4.31	75 - 125	30	
1,3,5-Trimethylbenzene	20.0	21.2	106	20.0	19.6	97.9	7.72	75 - 130	30	
1,3-Dichlorobenzene	20.0	18.5	92.7	20.0	17.2	86.2	7.27	75 - 125	30	
1,3-Dichloropropane	20.0	19.3	96.7	20.0	18.4	91.9	5.02	75 - 125	30	
1,4-Dichlorobenzene	20.0	19.3	96.5	20.0	18.1	90.3	6.63	75 - 125	30	
2,2-Dichloropropane	20.0	18.5	92.3	20.0	17.4	86.9	6.07	70 - 135	30	
2-Butanone	20.0	20.1	101	20.0	19.2	95.8	5.01	30 - 150	30	
2-Chlorotoluene	20.0	19.5	97.3	20.0	18.2	91.1	6.56	75 - 125	30	
2-Hexanone	20.0	20.4	102	20.0	19.0	94.9	7.35	55 - 130	30	
4-Chlorotoluene	20.0	18.9	94.6	20.0	17.6	88.0	7.26	75 - 130	30	
4-Methyl-2-pentanone	20.0	19.4	97.2	20.0	18.3	91.3	6.22	60 - 135	30	
Acetone	20.0	22.1	111	20.0	20.4	102	7.88	40 - 140	30	
Benzene	20.0	18.3	91.5	20.0	17.6	88.1	3.79	80 - 120	30	
Bromobenzene	20.0	19.7	98.5	20.0	18.3	91.4	7.48	75 - 125	30	
Bromochloromethane	20.0	18.4	92.1	20.0	17.7	88.6	3.91	65 - 130	30	
Bromodichloromethane	20.0	18.4	92.2	20.0	17.6	87.8	4.89	75 - 120	30	
Bromoform	20.0	19.0	95.0	20.0	17.9	89.3	6.19	70 - 130	30	
Bromomethane	20.0	14.4	71.9	20.0	15.1	75.5	4.88	30 - 145	30	
Carbon disulfide	20.0	13.8	69.2	20.0	13.3	66.6	3.91	35 - 160	30	
Carbon tetrachloride	20.0	18.3	91.6	20.0	17.6	87.8	4.27	65 - 140	30	
Chlorobenzene	20.0	17.8	89.2	20.0	17.0	85.0	4.76	80 - 120	30	
Chloroethane	20.0	19.5	97.4	20.0	18.4	92.0	5.73	60 - 135	30	
Chloroform	20.0	18.4	92.0	20.0	17.6	88.2	4.31	65 - 135	30	
Chloromethane	20.0	20.6	103	20.0	20.3	102	1.37	40 - 125	30	
cis-1,2-Dichloroethene	20.0	18.4	92.1	20.0	17.8	88.9	3.59	70 - 125	30	

LCS_LCS2 - Modified 03/06/2008
PDF File ID: 3749116
Report generated: 09/12/2014 14:49

Microbac Laboratories Inc.
LABORATORY CONTROL SAMPLE (LCS)

Login Number: L14090460
Analyst: FJB
Prep Method: 5030B/5030C/503
Instrument ID: HPMS17
Matrix: Water
Method: 8260B
Workgroup (AAB#): WG491746
Units: ug/L
QC Key: DOD4
Lot #: STD66321

Sample ID: WG491746-02 LCS
File ID: 17M008118
Run Date: 09/10/2014 12:43
Sample ID: WG491746-03 LCS2
File ID: 17M008119
Run Date: 09/10/2014 13:03

Analytes	LCS			LCS2			%RPD	%Rec Limits	RPD Lmt	Q
	Known	Found	% REC	Known	Found	% REC				
cis-1,3-Dichloropropene	20.0	19.1	95.6	20.0	18.5	92.4	3.46	70 - 130	30	
Chlorodibromomethane	20.0	19.0	95.0	20.0	18.0	89.8	5.63	60 - 135	30	
Dibromomethane	20.0	18.6	92.9	20.0	17.9	89.4	3.81	75 - 125	30	
Dichlorodifluoromethane	20.0	25.1	125	20.0	24.0	120	4.36	30 - 155	30	
Ethylbenzene	20.0	19.0	94.9	20.0	18.0	90.2	5.14	75 - 125	30	
Hexachlorobutadiene	20.0	17.9	89.6	20.0	16.5	82.7	7.90	50 - 140	30	
Isopropylbenzene	20.0	18.4	91.8	20.0	17.4	87.1	5.31	75 - 125	30	
m-,p-Xylene	40.0	37.4	93.5	40.0	35.7	89.2	4.71	75 - 130	30	
Methylene chloride	20.0	18.4	91.9	20.0	17.7	88.3	3.97	55 - 140	30	
n-Butylbenzene	20.0	21.4	107	20.0	19.9	99.3	7.57	70 - 135	30	
n-Propylbenzene	20.0	19.4	96.9	20.0	18.0	89.9	7.50	70 - 130	30	
Naphthalene	20.0	19.3	96.6	20.0	18.3	91.5	5.39	55 - 140	30	
o-Xylene	20.0	18.1	90.3	20.0	17.1	85.7	5.15	80 - 120	30	
p-Isopropyltoluene	20.0	19.3	96.3	20.0	17.9	89.6	7.23	75 - 130	30	
sec-Butylbenzene	20.0	19.4	96.8	20.0	17.9	89.6	7.74	70 - 125	30	
Styrene	20.0	19.6	97.9	20.0	18.6	93.1	5.05	65 - 135	30	
tert-Butylbenzene	20.0	18.7	93.3	20.0	17.3	86.5	7.53	70 - 130	30	
Tetrachloroethene	20.0	17.8	89.0	20.0	16.8	84.1	5.63	45 - 150	30	
Toluene	20.0	19.3	96.3	20.0	18.3	91.4	5.21	75 - 120	30	
trans-1,2-Dichloroethene	20.0	18.3	91.6	20.0	17.6	88.2	3.71	60 - 140	30	
trans-1,3-Dichloropropene	20.0	18.0	89.9	20.0	17.1	85.4	5.11	55 - 140	30	
Trichloroethene	20.0	17.0	85.0	20.0	16.4	82.2	3.33	70 - 125	30	
Trichlorofluoromethane	20.0	19.0	95.1	20.0	18.0	90.0	5.60	60 - 145	30	
Vinyl chloride	20.0	20.1	100	20.0	19.2	96.2	4.31	50 - 145	30	

Surogates	LCS	LCS2	Surrogate Limits	Qualifier
	% Recovery	% Recovery		
1,2-Dichloroethane-d4	94.5	93.1	70 - 120	PASS
Dibromofluoromethane	95.6	94.1	85 - 115	PASS
4-Bromofluorobenzene	107	102	75 - 120	PASS
Toluene-d8	101	99.3	85 - 120	PASS

* EXCEEDS %REC LIMIT

\# EXCEEDS RPD LIMIT

LCS_LCS2 - Modified 03/06/2008
PDF File ID: 3749116
Report generated: 09/12/2014 14:49

Microbac Laboratories Inc.
ORGANIC INSTRUMENT CHECK

BFB

Login Number:	L14090460	Tune ID:	WG448462-01
Instrument:	HPMS17	Run Date:	10/13/2013
Analyst:	MES	Run Time:	16:45
Workgroup:	WG448462	File ID:	17M000184
		Cal ID:	HPMS17 - 13-OCT-13

Target Mass	Rel. to Mass	Lower Limit%	Upper Limit%	Rel. Abn%	Raw Abn	Result Pass/Fail
50.0	95.0	15.0	40.0	18.4	9603	PASS
75.0	95.0	30.0	60.0	46.9	24464	PASS
95.0	95.0	100	100	100	52213	PASS
96.0	95.0	5.00	9.00	7.19	3755	PASS
173	174	0	2.00	1.14	488	PASS
174	95.0	50.0	100	82.2	42925	PASS
175	174	5.00	9.00	7.26	3116	PASS
176	174	95.0	101	97.1	41672	PASS
177	176	5.00	9.00	6.38	2660	PASS

This check relates to the following samples:

Lab ID	Client ID	Tag	Date Analyzed	Q
WG448462-02	STD	01	10/13/2013 17:48	
WG448462-03	STD	01	10/13/2013 18:15	
WG448462-04	STD	01	10/13/2013 18:43	
WG448462-05	STD-CCV	01	10/13/2013 19:11	
WG448462-06	STD	01	10/13/2013 19:39	
WG448462-07	STD	01	10/13/2013 20:07	
WG448462-08	STD	01	10/13/2013 20:35	
WG448462-09	STD	01	10/13/2013 21:03	
WG448462-10	SSCV	01	10/13/2013 22:00	

* Sample past 12 hour tune limit

TUNE - Modified 03/06/2008
PDF File ID: 3749118
Report generated 09/12/2014 14:49

Microbac Laboratories Inc.
ORGANIC INSTRUMENT CHECK

BFB

Login Number: L14090460
Instrument: HPMS17
Analyst: ADC
Workgroup: WG487972

Tune ID: WG487972-01
Run Date: 08/12/2014
Run Time: 14:16
File ID: 17M007342
Cal ID: HPMS17 - 12-AUG-14

Target Mass	Rel. to Mass	Lower Limit%	Upper Limit%	Rel. Abn%	Raw Abn	Result Pass/Fail
50.0	95.0	15.0	40.0	17.2	8576	PASS
75.0	95.0	30.0	60.0	47.6	23704	PASS
95.0	95.0	100	100	100	49819	PASS
96.0	95.0	5.00	9.00	6.89	3435	PASS
173	174	0	2.00	1.04	482	PASS
174	95.0	50.0	100	92.7	46200	PASS
175	174	5.00	9.00	7.34	3392	PASS
176	174	95.0	101	97.4	45013	PASS
177	176	5.00	9.00	6.86	3088	PASS

This check relates to the following samples:

Lab ID	Client ID	Tag	Date Analyzed	Q
WG487972-02	STD	01	08/12/2014 14:53	
WG487972-03	STD	01	08/12/2014 15:13	
WG487972-04	STD	01	08/12/2014 15:33	
WG487972-05	STD	01	08/12/2014 15:52	
WG487972-06	STD	01	08/12/2014 16:12	
WG487972-07	STD	01	08/12/2014 16:32	
WG487972-08	STD-CCV	01	08/12/2014 16:51	
WG487972-09	STD	01	08/12/2014 17:11	
WG487972-10	STD	01	08/12/2014 17:30	
WG487972-11	STD	01	08/12/2014 17:50	
WG487972-12	SSCV	01	08/12/2014 18:29	

* Sample past 12 hour tune limit

TUNE - Modified 03/06/2008
PDF File ID: 3749118
Report generated 09/12/2014 14:49

Microbac Laboratories Inc.
ORGANIC INSTRUMENT CHECK

BFB

Login Number: L14090460
Instrument: HPMS17
Analyst: ADC
Workgroup: WG491620

Tune ID: WG491620-01
Run Date: 09/09/2014
Run Time: 13:18
File ID: 17M008073
Cal ID: HPMS17 - 12-AUG-14

Target Mass	Rel. to Mass	Lower Limit%	Upper Limit%	Rel. Abn%	Raw Abn	Result Pass/Fail
50.0	95.0	15.0	40.0	17.7	7293	PASS
75.0	95.0	30.0	60.0	47.9	19728	PASS
95.0	95.0	100	100	100	41205	PASS
96.0	95.0	5.00	9.00	6.77	2788	PASS
173	174	0	2.00	1.05	360	PASS
174	95.0	50.0	100	83.1	34221	PASS
175	174	5.00	9.00	7.84	2682	PASS
176	174	95.0	101	98.0	33531	PASS
177	176	5.00	9.00	6.64	2226	PASS

This check relates to the following samples:

Lab ID	Client ID	Tag	Date Analyzed	Q
WG491620-02	CCV	01	09/09/2014 13:36	
WG491672-01	BLANK	01	09/09/2014 22:49	
WG491672-02	LCS	01	09/09/2014 23:09	
WG491672-03	LCS2	01	09/09/2014 23:29	
L14090460-02	12TB080914	01	09/10/2014 00:08	
WG491483-01	FBLK1	DL01	09/10/2014 02:27	*

* Sample past 12 hour tune limit

TUNE - Modified 03/06/2008
PDF File ID: 3749118
Report generated 09/12/2014 14:49

BFB

Login Number:	L14090460	Tune ID:	WG491745-01
Instrument:	HPMS17	Run Date:	09/10/2014
Analyst:	FJB	Run Time:	11:20
Workgroup:	WG491745	File ID:	17M008114
		Cal ID:	HPMS17 - 12-AUG-14

Target Mass	Rel. to Mass	Lower Limit%	Upper Limit%	Rel. Abn%	Raw Abn	Result Pass/Fail
50.0	95.0	15.0	40.0	19.5	9411	PASS
75.0	95.0	30.0	60.0	50.4	24261	PASS
95.0	95.0	100	100	100	48139	PASS
96.0	95.0	5.00	9.00	6.56	3157	PASS
173	174	0	2.00	0.887	363	PASS
174	95.0	50.0	100	85.0	40936	PASS
175	174	5.00	9.00	7.86	3217	PASS
176	174	95.0	101	97.5	39904	PASS
177	176	5.00	9.00	6.74	2690	PASS

This check relates to the following samples:

Lab ID	Client ID	Tag	Date Analyzed	Q
WG491745-02	CCV	01	09/10/2014 11:38	
WG491746-01	BLANK	01	09/10/2014 12:23	
WG491746-02	LCS	01	09/10/2014 12:43	
WG491746-03	LCS2	01	09/10/2014 13:03	
L14090460-01	12WW25(30)080914	01	09/10/2014 13:42	

* Sample past 12 hour tune limit

TUNE - Modified 03/06/2008
PDF File ID: 3749118
Report generated 09/12/2014 14:49

```
                                       Response Factor Report HPMS17

  Method Path : D:\MassHunter\GCMS\1\methods\
  Method File : A9FOOWT.M
  Title     : Appendix IX (SOP:OVL MSV01) WATER 10/13/13 HPMS17
  Last Update  : Thu Oct 17 17:39:37 2013
  Response Via : Initial Calibration
  Curve:WG448462
  Calibration Files
  5   =17M000186.D  20  =17M000187.D  50  =17M000188.D  100 =17M000189.D  200 =17M000190.D  300 =17M000191.D  400 =17M00019
  500 =17M000193.D

        Compound            5     20    50    100   200   300   400   500   Avg      %RSD
  -------------------------------------------------------------------------------------------

  1) I   Fluorobenzene         ----------------ISTD--------------------                  Linear   Quadratic
  2) T   Acetonitrile            0.015 0.016 0.016 0.018 0.018 0.019 0.018 0.017    6.99
  3) T   3-Chloro-1-pro... 0.338 0.384 0.374 0.368 0.350 0.333 0.318 0.306 0.346    8.00
  4) T   2-Chloro-1,3-b... 0.284 0.344 0.339 0.340 0.330 0.319 0.309 0.299 0.320    6.81
  5) T   Methacrylonitrile 0.055 0.065 0.068 0.067 0.070 0.066 0.066 0.064 0.065    6.65
  6) T   Ethyl Acetate     0.124 0.142 0.149 0.150 0.156 0.149 0.150 0.146 0.146    6.70
  7) T   Isobutyl Alcohol        0.004 0.005 0.004 0.005 0.005 0.005 0.005 0.005    7.94
  8) T   1-Butanol                     0.002 0.002 0.002 0.003 0.003 0.003 0.002   24.53            0.996
  9) T   Methyl methacr... 0.110 0.132 0.142 0.147 0.151 0.141 0.140 0.135 0.137    9.17
 10) T   2-Nitropropane          0.039 0.048 0.051 0.056 0.055 0.056 0.055 0.051   12.15

 11)     Chlorobenzene-d5      ----------------ISTD--------------------
 12) T   Cyclohexanone                 0.004 0.004 0.005 0.005 0.006 0.006 0.005   18.06            0.993

 13) I   1,4-Dichlorobenzen... ----------------ISTD--------------------
 ---------------------------------------------------------------------------
 (#) = Out of Range

A9FOOWT.M Thu Oct 17 17:45:24 2013
```

```
Calibration Table Report
Method: 8260VMS.M
Title: 8260B/624 SOP:OVL MSV01 WATER 08/12/14 HPMS17
Last Calibration: Wed Aug 13 09:40:20 2014
Curve: WG487972
Calibration Files
                                     0.3     0.4       1       2       5      20      50     100     200     300                    R^2
                             17M007344.D 17M007345.D 17M007346.D 17M007347.D 17M007348.D 17M007349.D 17M007350.D 17M007351.D 17M007352.D 17M007353.D
Compound                                                                                                            Avg    %RSD   Linear  Quadratic

Fluorobenzene                    ISTD
Dichlorodifluoromethane            0.201   0.208   0.211   0.212   0.256   0.247   0.248   0.262   0.260   0.234  10.702
Chloromethane                      0.313   0.286   0.277   0.285   0.303   0.297   0.298   0.312   0.316   0.298   4.601
Vinyl Chloride                     0.318   0.295   0.298   0.307   0.324   0.316   0.321   0.343   0.342   0.318   5.290
1,3-Butadiene                      0.223   0.195   0.195   0.205   0.224   0.221   0.210   0.231   0.234   0.215   6.908
Bromomethane                               0.121   0.129   0.135   0.151   0.161   0.172   0.190   0.193   0.156  17.355   0.996
Chloroethane                               0.181   0.175   0.185   0.186   0.185   0.174   0.175   0.163   0.178   4.340
Trichlorofluoromethane             0.455   0.410   0.403   0.418   0.430   0.420   0.423   0.381   0.364   0.411   6.537
Diethyl ether                      0.187   0.166   0.169   0.170   0.183   0.175   0.169   0.182   0.183   0.176   4.450
1,1-Dichloroethene                 0.449   0.396   0.405   0.412   0.433   0.423   0.419   0.450   0.451   0.427   4.827
Carbon Disulfide                   0.946   0.675   0.673   0.659   0.724   0.713   0.666   0.747   0.759   0.729  12.216
1,1,2-Trichloro-1,2,2-Trifluoroet         0.304   0.244   0.255   0.256   0.270   0.262   0.255   0.277   0.275   0.266   6.618
Acrolein                                           0.024   0.025   0.026   0.026   0.024   0.027   0.027   0.026   4.465
Methylene Chloride                 0.351   0.281   0.302   0.289   0.300   0.295   0.281   0.306   0.307   0.301   6.955
Acetone                                                    0.059   0.057   0.054   0.053   0.058   0.054   0.056   4.557
trans-1,2-Dichloroethene           0.300   0.269   0.277   0.267   0.283   0.278   0.265   0.291   0.292   0.280   4.315
Methyl Tert Butyl Ether            0.746   0.724   0.726   0.729   0.760   0.734   0.714   0.764   0.749   0.738   2.332
1,1-Dichloroethane                 0.555   0.523   0.526   0.544   0.541   0.527   0.513   0.550   0.547   0.536   2.697
Acrylonitrile                              0.056   0.061   0.071   0.072   0.070   0.065   0.072   0.070   0.067   8.773
Vinyl Acetate                                              0.025   0.027   0.026   0.027   0.026   0.027   0.026   3.665
cis-1,2-Dichloroethene             0.346   0.304   0.304   0.321   0.302   0.300   0.315   0.325   0.317   0.315   4.678
2,2-Dichloropropane                0.479   0.413   0.417   0.443   0.428   0.427   0.428   0.441   0.436   0.435   4.451
Cyclohexane                        0.481   0.418   0.421   0.434   0.436   0.437   0.411   0.439   0.434   0.434   4.576
Bromochloromethane                 0.179   0.172   0.189   0.201   0.204   0.204   0.207   0.215   0.210   0.198   7.307
Chloroform                         0.533   0.564   0.508   0.508   0.527   0.523   0.518   0.519   0.537   0.532   0.527   3.118
Carbon Tetrachloride               0.392   0.377   0.397   0.420   0.431   0.429   0.433   0.451   0.452   0.420   6.271
Dibromofluoromethane                                       0.388   0.331   0.311   0.298   0.320   0.322   0.328   9.582
1,1,1-Trichloroethane              0.484   0.454   0.456   0.480   0.480   0.470   0.471   0.492   0.493   0.476   2.960
1,1-Dichloropropene                0.441   0.373   0.378   0.396   0.393   0.374   0.391   0.409   0.410   0.396   5.503
2-Butanone                                         0.087   0.095   0.089   0.084   0.090   0.095   0.093   0.090   4.413
Benzene                            1.276   1.146   1.147   1.196   1.182   1.147   1.161   1.199   1.193   1.183   3.490
1,2-Dichloroethane-d4                                      0.412   0.335   0.306   0.289   0.309   0.310   0.327  13.479
1,2-Dichloroethane                 0.353   0.332   0.339   0.365   0.352   0.351   0.351   0.367   0.365   0.353   3.380
Trichloroethene                    0.369   0.329   0.327   0.335   0.338   0.334   0.335   0.356   0.355   0.342   4.207
Dibromomethane                     0.165   0.163   0.160   0.171   0.172   0.171   0.175   0.184   0.185   0.172   4.962
1,2-Dichloropropane                0.305   0.322   0.314   0.341   0.329   0.304   0.325   0.341   0.328   0.323   4.178
Bromodichloromethane               0.394   0.377   0.378   0.401   0.407   0.395   0.412   0.429   0.428   0.402   4.696
1,4-Dioxane                                                        0.002   0.002   0.002   0.002   0.002   0.002   7.187
2-Chloroethyl Vinyl Ether                          0.142   0.153   0.159   0.161   0.166   0.173   0.174   0.161   7.104
cis-1,3-Dichloropropene            0.463   0.446   0.450   0.484   0.488   0.484   0.493   0.503   0.513   0.480   4.800
4-Methyl-2-Pentanone                               0.074   0.082   0.083   0.079   0.083   0.084   0.084   0.081   4.365
trans-1,3-Dichloropropene          0.427   0.369   0.377   0.422   0.424   0.422   0.429   0.449   0.448 0.41859  6.6733
Chlorobenzene-d5                 ISTD
Toluene-d8                                                 2.008   1.589   1.479   1.401   1.406    1.46 1.55711 14.8452
Toluene                            1.854   1.616   1.686   1.867   1.704   1.661   1.669   1.627   1.647 1.70355 5.47552
Tetrachloroethene                  0.517   0.427   0.449   0.499    0.46   0.452   0.456   0.454   0.477 0.46573 5.91622
1,1,2-Trichloroethane              0.341   0.289   0.296   0.346   0.316   0.305    0.31   0.309   0.313 0.31377 5.98289
Dibromochloromethane               0.384   0.368   0.381   0.443   0.421   0.421   0.428   0.438   0.437 0.41332 6.80594
1,3-Dichloropropane                 0.54     0.5   0.494   0.557   0.523    0.51   0.513   0.519   0.515 0.51885 3.76369
1,2-Dibromoethane                  0.291   0.294   0.291   0.332   0.315   0.308   0.317   0.322   0.321 0.31006 4.88029
2-Hexanone                                         0.189   0.207   0.195   0.188   0.192   0.197   0.191  0.1941 3.24042
Chlorobenzene                       1.23   1.092   1.064   1.096   1.095   1.082   1.091    1.11   1.093 1.10592 4.33944
1-Chlorohexane                     0.096   0.097    0.09   0.098   0.103   0.102   0.099   0.104   0.105 0.09926 4.74758
Ethylbenzene                       0.665   0.569   0.552   0.594   0.593   0.589   0.596   0.606   0.606  0.5967 5.19044
1,1,1,2-Tetrachloroethane          0.422   0.391   0.399   0.435   0.419   0.416   0.416   0.423   0.419 0.41562 3.13063
m-,p-Xylene                        0.762   0.674    0.67   0.729   0.713   0.715   0.727   0.724   0.692 0.71167 4.09513
o-Xylene                           0.741   0.689   0.649   0.758   0.662   0.705   0.686   0.724    0.71 0.70263 5.02578
Styrene                            1.108   1.026   1.001   1.181   1.066    1.15   1.154   1.197   1.178 1.11778 6.41507
Bromoform                           0.27   0.266    0.26   0.312   0.282   0.301   0.304   0.316   0.316 0.29201 7.67743
Isopropylbenzene                   1.911   1.778   1.653   1.991   1.741   1.831   1.838   1.802   1.698 1.80479 5.76781
1,4-Dichlorobenzene-d4           ISTD
1,3,5-Trimethylbenzene             3.327   3.009   2.945   3.143   3.108   3.044   3.165   3.062   2.852 3.07269 4.44445
p-Bromofluorobenzene                                       1.105   1.059    1.02   1.019   1.036   1.059 1.04963 3.07495
Bromobenzene                       1.025   1.058   0.953   0.921   0.957   0.949   0.961    1.01   0.973    0.99 0.97958 4.17758
n-Propylbenzene                    4.488   4.019   3.861    4.17   4.202   4.194   4.327   4.028   3.748  4.1152  5.5467
1,1,2,2-Tetrachloroethane          0.782   0.703   0.691    0.77   0.728   0.707    0.74   0.706   0.716 0.72696 4.32358
2-Chlorotoluene                    2.707   2.431   2.344    2.52   2.463   2.384   2.489   2.447   2.372 2.46193 4.39432
1,2,3-Trichloropropane             0.189   0.194    0.19   0.208   0.202   0.195   0.207   0.205   0.198  0.1987 3.61743
1,2,4-Trimethylbenzene              3.32   2.992   2.928   3.226   3.108    3.04   3.158   3.013   2.808 3.06589  5.0929
4-Chlorotoluene                    2.814   2.417   2.393   2.565   2.516   2.471   2.569   2.541   2.444 2.52568 4.96976
tert-Butylbenzene                  0.594   0.588   0.569   0.599   0.574    0.56    0.59   0.583    0.58 0.58167 2.13663
sec-Butylbenzene                   4.096   3.749   3.673    4.01   3.913    3.86   3.958   3.686   3.385  3.8144 5.67518
p-Isopropyltoluene                 3.409   3.108   3.018   3.347   3.298    3.29    3.39   3.167   2.943 3.21896 5.20434
1,3-Dichlorobenzene                1.926   1.685   1.656    1.79   1.733   1.753   1.831   1.774   1.757 1.76723 4.48633
1,4-Dichlorobenzene                2.195   2.065   1.736    1.67   1.814   1.725   1.752   1.806   1.792   1.758  1.8313  9.0546
n-Butylbenzene                     2.868   2.473   2.446   2.761   2.868    2.92   3.026     2.9   2.708 2.77457 7.21693
1,2-Dichlorobenzene                1.832   1.823   1.685   1.654    1.78   1.711   1.636   1.713   1.708   1.688 1.72303 3.89316
1,2-Dibromo-3-Chloropropane        0.119   0.111   0.123   0.139   0.139   0.136   0.142   0.137   0.136 0.13109 8.13026
Hexachlorobutadiene                0.765   0.716   0.698   0.755   0.766   0.756   0.805   0.781   0.802 0.76057 4.67539
```

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1,2,4-Trichlorobenzene                     1.152   1.048   1.056   1.159   1.258    1.29   1.372   1.341   1.346 1.22463 10.1941
Naphthalene                                1.872   1.716   1.933   2.167    2.46   2.401   2.565   2.394   2.321 2.20329 13.4985
1,2,3-Trichlorobenzene             0.993   0.958   0.924   0.994   1.108   1.233   1.191   1.267   1.229   1.225  1.1123 11.9228

Fri Aug 15 14:43:09 2014
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Microbac Laboratories Inc.
ALTERNATE SOURCE CALIBRATION REPORT

Login Number: L14090460
Run Date: 08/12/2014
Sample ID: WG487972-12
Instrument ID: HPMS17
Run Time: 18:29
Method: 8260B
File ID: 17M007355
Analyst: ADC
QC Key: DOD4
ICal Workgroup: WG487972
Cal ID: HPMS17 - 12-AUG-14

Analyte		Expected	Found	Units	RF	%D	UCL	Q
Chloroform	CCC	50.0	47.9	ug/L	0.505	4.20	20	
1,1-Dichloroethene	CCC	50.0	44.2	ug/L	0.377	11.6	20	
1,2-Dichloropropane	CCC	50.0	48.2	ug/L	0.312	3.50	20	
Ethylbenzene	CCC	50.0	48.7	ug/L	0.581	2.70	20	
Toluene	CCC	50.0	47.7	ug/L	1.63	4.50	20	
Vinyl Chloride	CCC	50.0	51.8	ug/L	0.329	3.50	20	
Bromoform	SPCC	50.0	51.4	ug/L	0.300	2.80	20	
Chlorobenzene	SPCC	50.0	46.2	ug/L	1.02	7.70	20	
Chloromethane	SPCC	50.0	54.2	ug/L	0.323	8.40	20	
1,1-Dichloroethane	SPCC	50.0	46.7	ug/L	0.501	6.60	20	
1,1,2,2-Tetrachloroethane	SPCC	50.0	47.3	ug/L	0.687	5.50	20	
Acetone		50.0	52.6	ug/L	0.0587	5.20	20	
Benzene		50.0	47.8	ug/L	1.13	4.50	20	
Bromobenzene		50.0	46.5	ug/L	0.912	6.90	20	
Bromochloromethane		50.0	49.0	ug/L	0.194	2.00	20	
Bromodichloromethane		50.0	48.5	ug/L	0.391	2.90	20	
Bromomethane		50.0	51.7	ug/L	0.162	3.50	20	
2-Butanone		50.0	51.2	ug/L	0.0925	2.30	20	
n-Butylbenzene		50.0	53.5	ug/L	2.97	7.10	20	
sec-Butylbenzene		50.0	46.9	ug/L	3.57	6.30	20	
tert-Butylbenzene		50.0	45.4	ug/L	0.528	9.30	20	
Carbon Disulfide		50.0	39.0	ug/L	0.568	22.1	20	*
Carbon Tetrachloride		50.0	49.2	ug/L	0.414	1.50	20	
Dibromochloromethane		50.0	49.5	ug/L	0.409	0.900	20	
Chloroethane		50.0	44.2	ug/L	0.157	11.7	20	
2-Chlorotoluene		50.0	45.9	ug/L	2.26	8.20	20	
4-Chlorotoluene		50.0	45.7	ug/L	2.31	8.70	20	
1,2-Dibromo-3-Chloropropane		50.0	51.0	ug/L	0.134	2.00	20	
1,2-Dibromoethane		50.0	48.3	ug/L	0.299	3.50	20	
Dibromomethane		50.0	48.6	ug/L	0.167	2.80	20	
1,2-Dichlorobenzene		50.0	46.1	ug/L	1.59	7.70	20	
1,3-Dichlorobenzene		50.0	46.0	ug/L	1.63	8.00	20	
1,4-Dichlorobenzene		50.0	48.1	ug/L	1.76	3.80	20	
Dichlorodifluoromethane		50.0	67.7	ug/L	0.317	35.3	20	*
1,2-Dichloroethane		50.0	49.4	ug/L	0.349	1.10	20	
cis-1,2-Dichloroethene		50.0	48.9	ug/L	0.308	2.10	20	
trans-1,2-Dichloroethene		50.0	47.9	ug/L	0.268	4.30	20	
1,3-Dichloropropane		50.0	47.9	ug/L	0.497	4.20	20	
2,2-Dichloropropane		50.0	44.9	ug/L	0.390	10.2	20	
cis-1,3-Dichloropropene		50.0	51.2	ug/L	0.492	2.40	20	
trans-1,3-Dichloropropene		50.0	48.0	ug/L	0.402	3.90	20	
1,1-Dichloropropene		50.0	46.8	ug/L	0.371	6.40	20	

ALT - Modified 09/06/2007
Version 1.5 PDF File ID: 3749117
Report generated 09/12/2014 14:49

Microbac Laboratories Inc.
ALTERNATE SOURCE CALIBRATION REPORT

Login Number:	L14090460	Run Date:	08/12/2014	Sample ID:	WG487972-12
Instrument ID:	HPMS17	Run Time:	18:29	Method:	8260B
File ID:	17M007355	Analyst:	ADC	QC Key:	DOD4
ICal Workgroup:	WG487972	Cal ID:	HPMS17 - 12-AUG-14		

Analyte		Expected	Found	Units	RF	%D	UCL	Q
2-Hexanone		50.0	51.2	ug/L	0.199	2.40	20	
Hexachlorobutadiene		50.0	49.7	ug/L	0.755	0.700	20	
Isopropylbenzene		50.0	47.4	ug/L	1.71	5.20	20	
p-Isopropyltoluene		50.0	47.3	ug/L	3.04	5.40	20	
4-Methyl-2-Pentanone		50.0	52.4	ug/L	0.0852	4.90	20	
Methylene Chloride		50.0	45.9	ug/L	0.276	8.20	20	
Naphthalene		50.0	51.9	ug/L	2.29	3.80	20	
n-Propylbenzene		50.0	45.1	ug/L	3.71	9.80	20	
Styrene		50.0	51.3	ug/L	1.15	2.50	20	
1,1,1,2-Tetrachloroethane		50.0	48.5	ug/L	0.403	3.10	20	
Tetrachloroethene		50.0	46.9	ug/L	0.437	6.20	20	
1,2,3-Trichlorobenzene		50.0	52.4	ug/L	1.17	4.80	20	
1,2,4-Trichlorobenzene		50.0	51.9	ug/L	1.27	3.80	20	
1,1,1-Trichloroethane		50.0	48.2	ug/L	0.458	3.60	20	
1,1,2-Trichloroethane		50.0	48.1	ug/L	0.302	3.90	20	
Trichloroethene		50.0	47.1	ug/L	0.322	5.70	20	
Trichlorofluoromethane		50.0	42.5	ug/L	0.350	14.9	20	
1,2,3-Trichloropropane		50.0	48.1	ug/L	0.191	3.80	20	
1,2,4-Trimethylbenzene		50.0	50.6	ug/L	3.10	1.10	20	
1,3,5-Trimethylbenzene		50.0	50.5	ug/L	3.11	1.10	20	
o-Xylene		50.0	45.7	ug/L	0.643	8.50	20	
m-,p-Xylene		100	96.9	ug/L	0.689	3.10	20	

* Exceeds %D Limit

CCC Calibration Check Compounds
SPCC System Performance Check Compounds

ALT - Modified 09/06/2007
Version 1.5 PDF File ID: 3749117
Report generated 09/12/2014 14:49

Microbac Laboratories Inc.
CONTINUING CALIBRATION VERIFICATION (CCV)

Login Number: L14090460
Run Date: 09/09/2014
Sample ID: WG491620-02
Instrument ID: HPMS17
Run Time: 13:36
Method: 8260B
File ID: 17M008074
Analyst: ADC
QC Key: DOD4
Workgroup (AAB#): WG491672
Cal ID: HPMS17 - 12-AUG-14
Matrix: WATER

Analyte		Expected	Found	UNITS	RF	%D	UCL	Q
Chloroform	CCC	50.0	47.1	ug/L	0.497	5.74	20	
1,1-Dichloroethene	CCC	50.0	49.2	ug/L	0.419	1.70	20	
1,2-Dichloropropane	CCC	50.0	47.2	ug/L	0.305	5.55	20	
Ethylbenzene	CCC	50.0	49.2	ug/L	0.587	1.69	20	
Toluene	CCC	50.0	48.8	ug/L	1.66	2.47	20	
Vinyl Chloride	CCC	50.0	48.4	ug/L	0.308	3.26	20	
Bromoform	SPCC	50.0	44.1	ug/L	0.257	11.9	20	
Chlorobenzene	SPCC	50.0	48.3	ug/L	1.07	3.50	20	
Chloromethane	SPCC	50.0	47.9	ug/L	0.286	4.12	20	
1,1-Dichloroethane	SPCC	50.0	47.4	ug/L	0.508	5.29	20	
1,1,2,2-Tetrachloroethane	SPCC	50.0	48.9	ug/L	0.711	2.26	20	
Xylenes		150	151	ug/L	0.709	0.685	20	
Acetone		50.0	42.2	ug/L	0.0471	15.6	20	
Benzene		50.0	46.1	ug/L	1.09	7.90	20	
Bromobenzene		50.0	49.4	ug/L	0.968	1.17	20	
Bromochloromethane		50.0	45.3	ug/L	0.179	9.35	20	
Bromodichloromethane		50.0	46.8	ug/L	0.376	6.43	20	
Bromomethane		50.0	37.2	ug/L	0.136	25.6	20	*
2-Butanone		50.0	41.6	ug/L	0.0752	16.9	20	
n-Butylbenzene		50.0	59.7	ug/L	3.31	19.3	20	
sec-Butylbenzene		50.0	55.6	ug/L	4.24	11.1	20	
tert-Butylbenzene		50.0	52.1	ug/L	0.606	4.11	20	
Carbon Disulfide		50.0	62.9	ug/L	0.918	25.9	20	*
Carbon Tetrachloride		50.0	48.8	ug/L	0.410	2.43	20	
Dibromochloromethane		50.0	45.8	ug/L	0.379	8.38	20	
Chloroethane		50.0	51.2	ug/L	0.183	2.48	20	
2-Chlorotoluene		50.0	53.6	ug/L	2.64	7.18	20	
4-Chlorotoluene		50.0	53.9	ug/L	2.72	7.74	20	
1,2-Dibromo-3-Chloropropane		50.0	45.9	ug/L	0.120	8.30	20	
1,2-Dibromoethane		50.0	45.3	ug/L	0.281	9.31	20	
Dibromomethane		50.0	44.2	ug/L	0.152	11.6	20	
1,2-Dichlorobenzene		50.0	49.7	ug/L	1.71	0.523	20	
1,3-Dichlorobenzene		50.0	51.9	ug/L	1.83	3.76	20	
1,4-Dichlorobenzene		50.0	49.9	ug/L	1.83	0.124	20	
Dichlorodifluoromethane		50.0	43.4	ug/L	0.203	13.2	20	
1,2-Dichloroethane		50.0	46.1	ug/L	0.325	7.80	20	
cis-1,2-Dichloroethene		50.0	46.6	ug/L	0.294	6.80	20	
trans-1,2-Dichloroethene		50.0	46.5	ug/L	0.261	7.01	20	
1,3-Dichloropropane		50.0	45.6	ug/L	0.473	8.82	20	
2,2-Dichloropropane		50.0	50.3	ug/L	0.437	0.603	20	
cis-1,3-Dichloropropene		50.0	47.3	ug/L	0.454	5.48	20	
trans-1,3-Dichloropropene		50.0	45.9	ug/L	0.384	8.21	20	

CCV - Modified 03/05/2008
PDF File ID: 3749119
Report generated 09/12/2014 14:49

Microbac Laboratories Inc.
CONTINUING CALIBRATION VERIFICATION (CCV)

Login Number: L14090460
Run Date: 09/09/2014
Sample ID: WG491620-02
Instrument ID: HPMS17
Run Time: 13:36
Method: 8260B
File ID: 17M008074
Analyst: ADC
QC Key: DOD4
Workgroup (AAB#): WG491672
Cal ID: HPMS17 - 12-AUG-14
Matrix: WATER

Analyte	Expected	Found	UNITS	RF	%D	UCL	Q
1,1-Dichloropropene	50.0	47.6	ug/L	0.377	4.72	20	
2-Hexanone	50.0	41.9	ug/L	0.163	16.2	20	
Hexachlorobutadiene	50.0	51.8	ug/L	0.789	3.70	20	
Isopropylbenzene	50.0	50.8	ug/L	1.83	1.64	20	
p-Isopropyltoluene	50.0	55.6	ug/L	3.58	11.2	20	
4-Methyl-2-Pentanone	50.0	40.8	ug/L	0.0663	18.4	20	
Methylene Chloride	50.0	46.0	ug/L	0.277	7.92	20	
Naphthalene	50.0	47.2	ug/L	2.08	5.66	20	
n-Propylbenzene	50.0	56.3	ug/L	4.63	12.6	20	
Styrene	50.0	50.7	ug/L	1.13	1.33	20	
1,1,1,2-Tetrachloroethane	50.0	47.7	ug/L	0.397	4.59	20	
Tetrachloroethene	50.0	47.6	ug/L	0.444	4.70	20	
1,2,3-Trichlorobenzene	50.0	50.2	ug/L	1.12	0.362	20	
1,2,4-Trichlorobenzene	50.0	52.6	ug/L	1.29	5.12	20	
1,1,1-Trichloroethane	50.0	47.0	ug/L	0.447	5.99	20	
1,1,2-Trichloroethane	50.0	44.3	ug/L	0.278	11.3	20	
Trichloroethene	50.0	43.3	ug/L	0.296	13.5	20	
Trichlorofluoromethane	50.0	51.2	ug/L	0.421	2.44	20	
1,2,3-Trichloropropane	50.0	46.0	ug/L	0.183	7.99	20	
1,2,4-Trimethylbenzene	50.0	53.9	ug/L	3.31	7.90	20	
1,3,5-Trimethylbenzene	50.0	54.5	ug/L	3.35	8.96	20	
o-Xylene	50.0	49.5	ug/L	0.696	0.943	20	
m-,p-Xylene	100	101	ug/L	0.722	1.50	20	

* Exceeds %D Criteria

CCC Calibration Check Compounds
SPCC System Performance Check Compounds

CCV - Modified 03/05/2008
PDF File ID: 3749119
Report generated 09/12/2014 14:49

Microbac Laboratories Inc.
CONTINUING CALIBRATION VERIFICATION (CCV)

Login Number: L14090460
Run Date: 09/10/2014
Sample ID: WG491745-02
Instrument ID: HPMS17
Run Time: 11:38
Method: 8260B
File ID: 17M008115
Analyst: FJB
QC Key: DOD4
Workgroup (AAB#): WG491746
Cal ID: HPMS17 - 12-AUG-14
Matrix: WATER

Analyte		Expected	Found	UNITS	RF	%D	UCL	Q
Chloroform	CCC	50.0	43.1	ug/L	0.454	13.8	20	
1,1-Dichloroethene	CCC	50.0	41.8	ug/L	0.357	16.3	20	
1,2-Dichloropropane	CCC	50.0	44.3	ug/L	0.286	11.4	20	
Ethylbenzene	CCC	50.0	44.0	ug/L	0.525	12.1	20	
Toluene	CCC	50.0	43.8	ug/L	1.49	12.4	20	
Vinyl Chloride	CCC	50.0	41.2	ug/L	0.262	17.6	20	
Bromoform	SPCC	50.0	42.0	ug/L	0.245	16.0	20	
Chlorobenzene	SPCC	50.0	44.3	ug/L	0.980	11.4	20	
Chloromethane	SPCC	50.0	40.3	ug/L	0.240	19.4	20	
1,1-Dichloroethane	SPCC	50.0	42.9	ug/L	0.460	14.2	20	
1,1,2,2-Tetrachloroethane	SPCC	50.0	47.2	ug/L	0.686	5.66	20	
Xylenes		150	136	ug/L	0.640	9.29	20	
Acetone		50.0	41.7	ug/L	0.0465	16.6	20	
Benzene		50.0	41.6	ug/L	0.984	16.9	20	
Bromobenzene		50.0	45.6	ug/L	0.894	8.72	20	
Bromochloromethane		50.0	42.7	ug/L	0.169	14.7	20	
Bromodichloromethane		50.0	44.1	ug/L	0.355	11.9	20	
Bromomethane		50.0	33.7	ug/L	0.123	32.5	20	*
2-Butanone		50.0	41.4	ug/L	0.0749	17.2	20	
n-Butylbenzene		50.0	52.1	ug/L	2.89	4.18	20	
sec-Butylbenzene		50.0	48.6	ug/L	3.71	2.83	20	
tert-Butylbenzene		50.0	45.8	ug/L	0.532	8.50	20	
Carbon Disulfide		50.0	56.5	ug/L	0.824	13.1	20	
Carbon Tetrachloride		50.0	41.9	ug/L	0.352	16.3	20	
Dibromochloromethane		50.0	43.6	ug/L	0.360	12.9	20	
Chloroethane		50.0	45.0	ug/L	0.160	10.0	20	
2-Chlorotoluene		50.0	48.4	ug/L	2.38	3.26	20	
4-Chlorotoluene		50.0	48.9	ug/L	2.47	2.12	20	
1,2-Dibromo-3-Chloropropane		50.0	45.2	ug/L	0.118	9.65	20	
1,2-Dibromoethane		50.0	43.6	ug/L	0.271	12.7	20	
Dibromomethane		50.0	42.6	ug/L	0.146	14.9	20	
1,2-Dichlorobenzene		50.0	46.2	ug/L	1.59	7.52	20	
1,3-Dichlorobenzene		50.0	47.1	ug/L	1.67	5.71	20	
1,4-Dichlorobenzene		50.0	45.9	ug/L	1.68	8.15	20	
Dichlorodifluoromethane		50.0	35.7	ug/L	0.167	28.7	20	*
1,2-Dichloroethane		50.0	44.3	ug/L	0.313	11.4	20	
cis-1,2-Dichloroethene		50.0	42.6	ug/L	0.268	14.8	20	
trans-1,2-Dichloroethene		50.0	41.5	ug/L	0.233	17.0	20	
1,3-Dichloropropane		50.0	43.4	ug/L	0.451	13.2	20	
2,2-Dichloropropane		50.0	44.8	ug/L	0.389	10.4	20	
cis-1,3-Dichloropropene		50.0	44.5	ug/L	0.428	10.9	20	
trans-1,3-Dichloropropene		50.0	44.1	ug/L	0.369	11.8	20	

CCV - Modified 03/05/2008
PDF File ID: 3749119
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CONTINUING CALIBRATION VERIFICATION (CCV)

Login Number: L14090460
Run Date: 09/10/2014
Sample ID: WG491745-02
Instrument ID: HPMS17
Run Time: 11:38
Method: 8260B
File ID: 17M008115
Analyst: FJB
QC Key: DOD4
Workgroup (AAB#): WG491746
Cal ID: HPMS17 - 12-AUG-14
Matrix: WATER

Analyte	Expected	Found	UNITS	RF	%D	UCL	Q
1,1-Dichloropropene	50.0	41.4	ug/L	0.328	17.3	20	
2-Hexanone	50.0	42.3	ug/L	0.164	15.3	20	
Hexachlorobutadiene	50.0	42.0	ug/L	0.639	16.0	20	
Isopropylbenzene	50.0	45.0	ug/L	1.63	9.95	20	
p-Isopropyltoluene	50.0	48.7	ug/L	3.13	2.67	20	
4-Methyl-2-Pentanone	50.0	40.6	ug/L	0.0659	18.9	20	
Methylene Chloride	50.0	43.0	ug/L	0.259	14.1	20	
Naphthalene	50.0	44.7	ug/L	1.97	10.5	20	
n-Propylbenzene	50.0	49.3	ug/L	4.06	1.40	20	
Styrene	50.0	46.7	ug/L	1.04	6.63	20	
1,1,1,2-Tetrachloroethane	50.0	44.1	ug/L	0.367	11.8	20	
Tetrachloroethene	50.0	41.0	ug/L	0.382	18.0	20	
1,2,3-Trichlorobenzene	50.0	46.3	ug/L	1.03	7.34	20	
1,2,4-Trichlorobenzene	50.0	48.2	ug/L	1.18	3.69	20	
1,1,1-Trichloroethane	50.0	40.8	ug/L	0.388	18.4	20	
1,1,2-Trichloroethane	50.0	42.4	ug/L	0.266	15.2	20	
Trichloroethene	50.0	38.4	ug/L	0.263	23.2	20	*
Trichlorofluoromethane	50.0	42.8	ug/L	0.352	14.5	20	
1,2,3-Trichloropropane	50.0	43.8	ug/L	0.174	12.3	20	
1,2,4-Trimethylbenzene	50.0	48.6	ug/L	2.98	2.87	20	
1,3,5-Trimethylbenzene	50.0	48.3	ug/L	2.97	3.42	20	
o-Xylene	50.0	45.0	ug/L	0.633	9.96	20	
m-,p-Xylene	100	91.0	ug/L	0.648	8.96	20	

* Exceeds %D Criteria

CCC Calibration Check Compounds
SPCC System Performance Check Compounds

CCV - Modified 03/05/2008
PDF File ID: 3749119
Report generated 09/12/2014 14:49

Microbac Laboratories Inc.

INTERNAL STANDARD AREA SUMMARY
(COMPARED TO MIDPOINT OF ICAL)

Login Number: L14090460
Instrument ID: HPMS17
Workgroup (AAB#): WG491672

ICAL CCV Number: WG487972-08
CAL ID: HPMS17 - 12-AUG-14
Matrix: WATER

Sample Number	Dilution	Tag	IS-1	IS-2	IS-3
WG487972-08	NA	NA	139515	275864	358634
Upper Limit	NA	NA	279030	551728	717268
Lower Limit	NA	NA	69758	137932	179317
L14090460-02	1.00	01	92275	203781	279748
WG491672-01	1.00	01	97050	214811	294980
WG491672-02	1.00	01	105019	214123	287489
WG491672-03	1.00	01	100352	206696	281385

IS-1 - 1,4-Dichlorobenzene-d4
IS-2 - Chlorobenzene-d5
IS-3 - Fluorobenzene

Underline = Response outside limits

INTERNAL_STD_ICAL - Modified 03/06/2008
PDF File ID: 3749120
Report generated 09/12/2014 14:49

INTERNAL STANDARD AREA SUMMARY
(COMPARED TO MIDPOINT OF ICAL)

Login Number: L14090460
Instrument ID: HPMS17
Workgroup (AAB#): WG491746

ICAL CCV Number: WG487972-08
CAL ID: HPMS17 - 12-AUG-14
Matrix: WATER

Sample Number	Dilution	Tag	IS-1	IS-2	IS-3
WG487972-08	NA	NA	139515	275864	358634
Upper Limit	NA	NA	279030	551728	717268
Lower Limit	NA	NA	69758	137932	179317
L14090460-01	1.00	01	101183	221340	302902
WG491746-01	1.00	01	101153	222048	305533
WG491746-02	1.00	01	107069	223093	302992
WG491746-03	1.00	01	111978	227635	306269

IS-1 - 1,4-Dichlorobenzene-d4
IS-2 - Chlorobenzene-d5
IS-3 - Fluorobenzene

Underline = Response outside limits

INTERNAL_STD_ICAL - Modified 03/06/2008
PDF File ID: 3749120
Report generated 09/12/2014 14:49

Microbac Laboratories Inc.

INTERNAL STANDARD RETENTION TIME SUMMARY
(COMPARED TO MIDPOINT OF ICAL)

Login Number: L14090460
Instrument ID: HPMS17
Workgroup (AAB#): WG491672

ICAL CCV Number: WG487972-08
CAL ID: HPMS17 - 12-AUG-14
Matrix: WATER

Sample Number	Dilution	Tag	IS-1	IS-2	IS-3
WG487972-08	NA	NA	9.154	7.785	4.852
Upper Limit	NA	NA	9.654	8.285	5.352
Lower Limit	NA	NA	8.654	7.285	4.352
L14090460-02	1.00	01	9.15	7.78	4.84
WG491672-01	1.00	01	9.15	7.78	4.85
WG491672-02	1.00	01	9.15	7.78	4.84
WG491672-03	1.00	01	9.15	7.78	4.84

IS-1 - 1,4-Dichlorobenzene-d4
IS-2 - Chlorobenzene-d5
IS-3 - Fluorobenzene

Underline = Response outside limits

INTERNAL_STD_RT_ICAL - Modified 03/06/2008
PDF File ID: 3749122
Report generated: 09/12/2014 14:49

Microbac Laboratories Inc.

INTERNAL STANDARD RETENTION TIME SUMMARY
(COMPARED TO MIDPOINT OF ICAL)

Login Number: L14090460
Instrument ID: HPMS17
Workgroup (AAB#): WG491746

ICAL CCV Number: WG487972-08
CAL ID: HPMS17 - 12-AUG-14
Matrix: WATER

Sample Number	Dilution	Tag	IS-1	IS-2	IS-3
WG487972-08	NA	NA	9.154	7.785	4.852
Upper Limit	NA	NA	9.654	8.285	5.352
Lower Limit	NA	NA	8.654	7.285	4.352
L14090460-01	1.00	01	9.15	7.78	4.85
WG491746-01	1.00	01	9.15	7.78	4.85
WG491746-02	1.00	01	9.15	7.78	4.84
WG491746-03	1.00	01	9.15	7.78	4.84

IS-1 - 1,4-Dichlorobenzene-d4
IS-2 - Chlorobenzene-d5
IS-3 - Fluorobenzene

Underline = Response outside limits

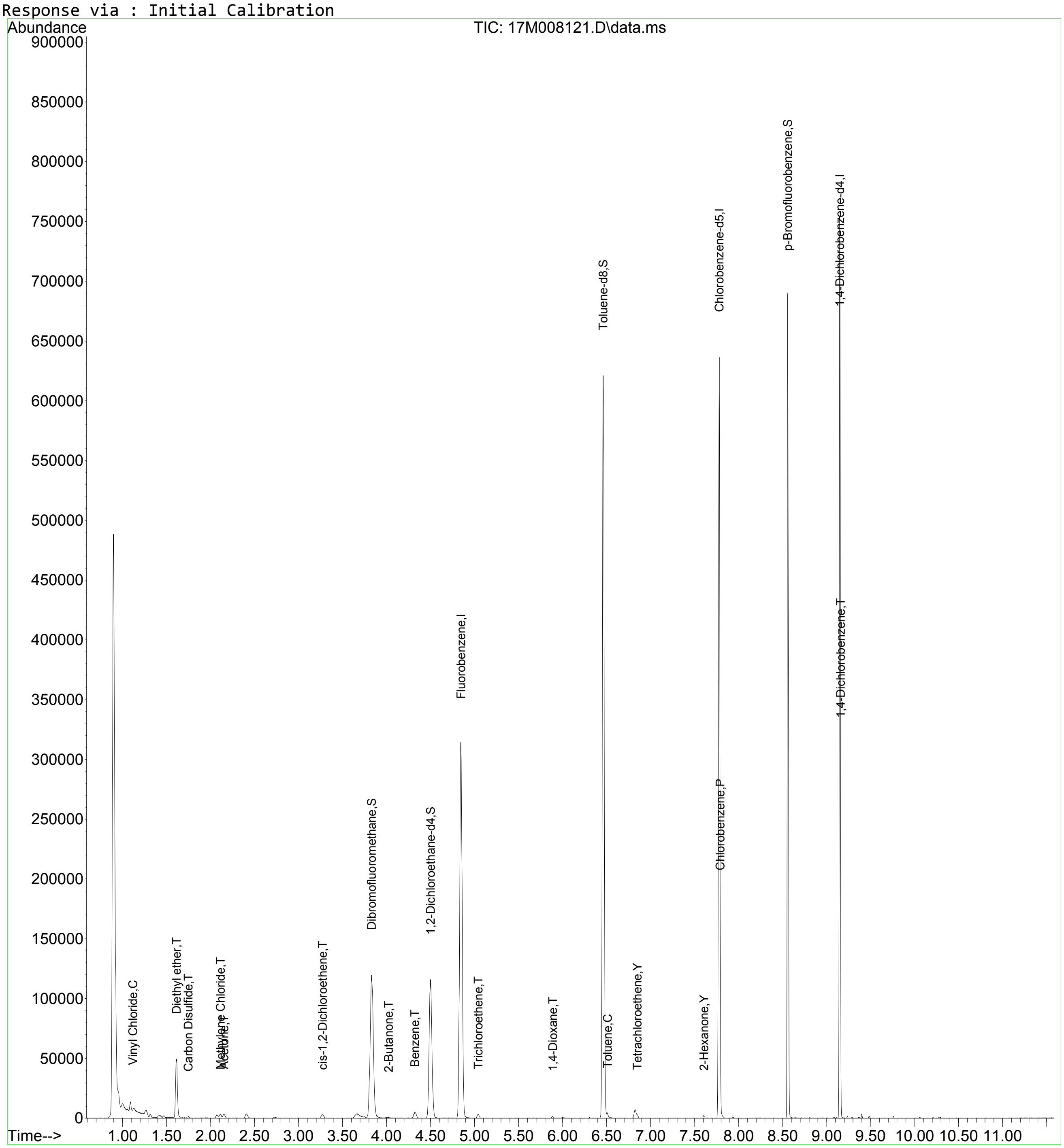
INTERNAL_STD_RT_ICAL - Modified 03/06/2008
PDF File ID: 3749122
Report generated: 09/12/2014 14:49

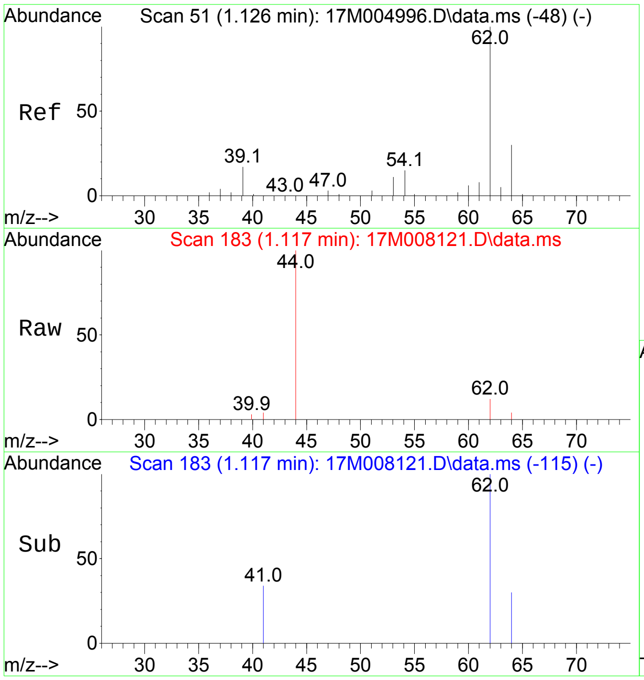
2.1.1.3 Sample Data

```
                                Quantitation Report    (Not Reviewed)

  Data Path : D:\MassHunter\GCMS\1\data\091014\
  Data File : 17M008121.D
  Acq On    : 10 Sep 2014  13:42
  Operator  : FJB
  Sample    : L14090460-01 B+C 826-LOW
  Misc      : 1,1
  ALS Vial  : 7   Sample Multiplier: 1

  Quant Time: Sep 12 12:44:31 2014
  Quant Method : D:\MassHunter\GCMS\1\methods\8260VMS.M
  Quant Title  : 8260B/624 SOP:OVL MSV01 WATER 08/12/14 HPMS17
  QLast Update : Fri Aug 15 15:53:53 2014
  Response via : Initial Calibration

          Compound                   R.T. QIon  Response  Conc Units Dev(Min)
   --------------------------------------------------------------------------
   Internal Standards
     1) Fluorobenzene               4.846   96   302902    25.00000 ug/L     0.0000
    43) Chlorobenzene-d5            7.779  117   221340    25.00000 ug/L     0.0000
    61) 1,4-Dichlorobenzene-d4      9.151  152   101183    25.00000 ug/L     0.0000

   System Monitoring Compounds
    27) Dibromofluoromethane        3.830  111    93691    23.5567 ug/L    0.0000
     Spiked Amount     25.000   Range  86 - 118    Recovery   =   94.227%
    32) 1,2-Dichloroethane-d4       4.498   65    95462    24.1008 ug/L    0.0000
     Spiked Amount     25.000   Range  80 - 120    Recovery   =   96.403%
    44) Toluene-d8                  6.462   98   350582    25.4303 ug/L    0.0000
     Spiked Amount     25.000   Range  88 - 110    Recovery   =  101.721%
    63) p-Bromofluorobenzene        8.558   95   119068    28.0279 ug/L    0.0000
     Spiked Amount     25.000   Range  86 - 115    Recovery   =  112.112%

   Target Compounds                                                 Qvalue
     4) Vinyl Chloride              1.117   62      829     0.2151 ug/L      84
     9) Diethyl ether               1.612   59    21908    10.2708 ug/L      98
    11) Carbon Disulfide            1.745   76     1195     0.1353 ug/L #    73
    14) Methylene Chloride          2.113   84     1416     0.3882 ug/L      92
    15) Acetone                     2.153   43     3484     5.1534 ug/L      94
    21) cis-1,2-Dichloroethene      3.274   96     1535     0.4022 ug/L      93
    30) 2-Butanone                  4.024   43      817     0.7457 ug/L #    40
    31) Benzene                     4.322   78     5445     0.3799 ug/L      96
    34) Trichloroethene             5.043  130     1313     0.3169 ug/L      94
    38) 1,4-Dioxane                 5.888   88      948    36.9637 ug/L      92
    45) Toluene                     6.511   91     2092     0.1387 ug/L      96
    46) Tetrachloroethene           6.849  166      655     0.1588 ug/L #    90
    51) 2-Hexanone                  7.608   43      323     0.1880 ug/L #    26
    52) Chlorobenzene               7.790  112     8543     0.8725 ug/L #    68
    75) 1,4-Dichlorobenzene         9.157  146     2172     0.2930 ug/L #    73
   --------------------------------------------------------------------------

   (#) = qualifier out of range (m) = manual integration (+) = signals summed
```

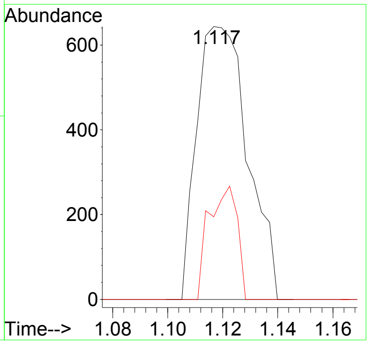
Quantitation Report   (Not Reviewed)

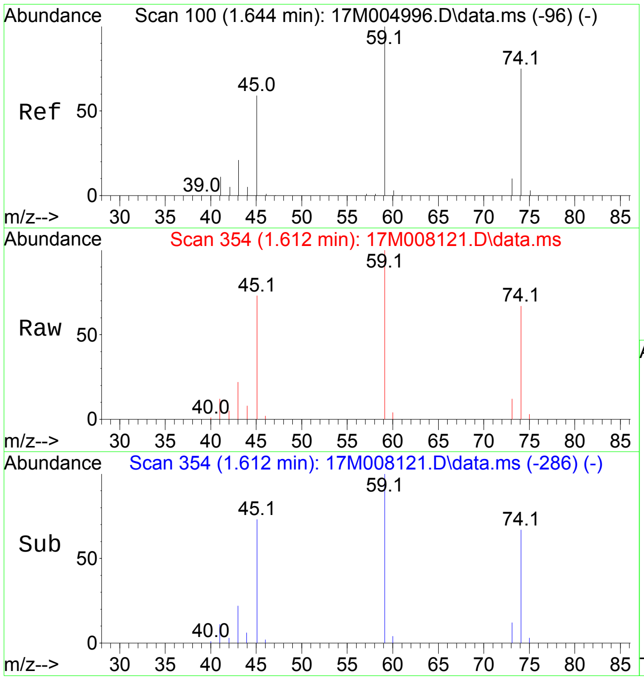
```
Data Path : D:\MassHunter\GCMS\1\data\091014\
Data File : 17M008121.D
Acq On    : 10 Sep 2014  13:42
Operator  : FJB
Sample    : L14090460-01 B+C 826-LOW
Misc      : 1,1
ALS Vial  : 7   Sample Multiplier: 1

Quant Time: Sep 12 12:44:31 2014
Quant Method : D:\MassHunter\GCMS\1\methods\8260VMS.M
Quant Title  : 8260B/624 SOP:OVL MSV01 WATER 08/12/14 HPMS17
QLast Update : Fri Aug 15 15:53:53 2014
Response via : Initial Calibration
```



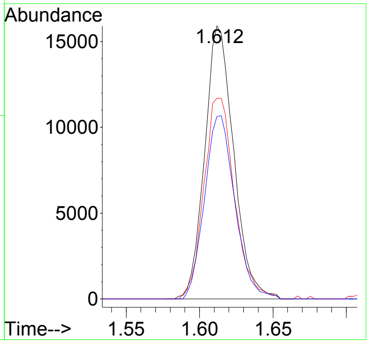


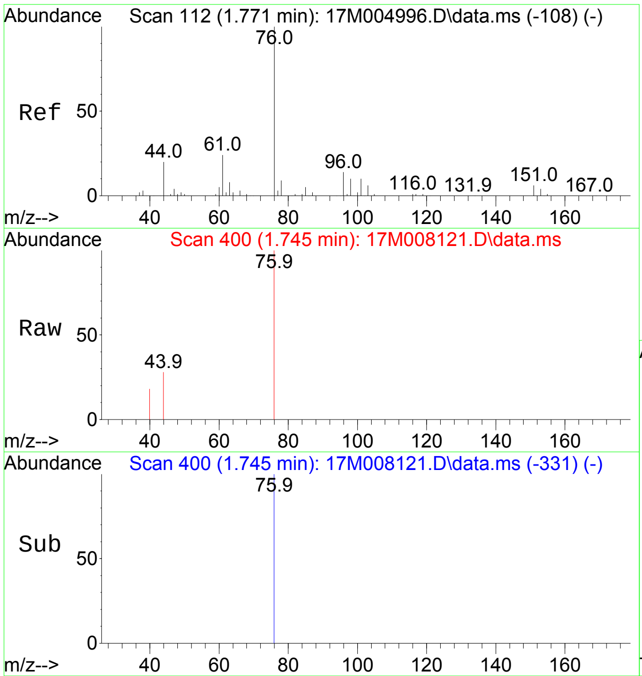
```
#4
Vinyl Chloride
Concen:    0.2151 ug/L
RT:    1.117 min  Scan# 183
Delta R.T.   -0.003 min
Lab File:    17M008121.D
Acq: 10 Sep 2014  13:42

Tgt Ion: 62 Resp:      829
Ion   Ratio  Lower   Upper
 62   100
 64    23.0   19.1    44.5
```



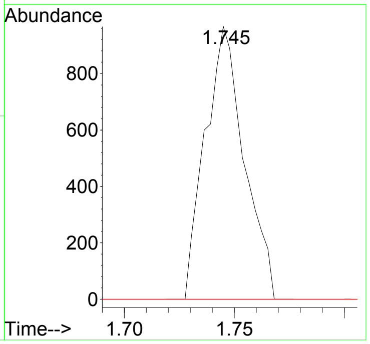


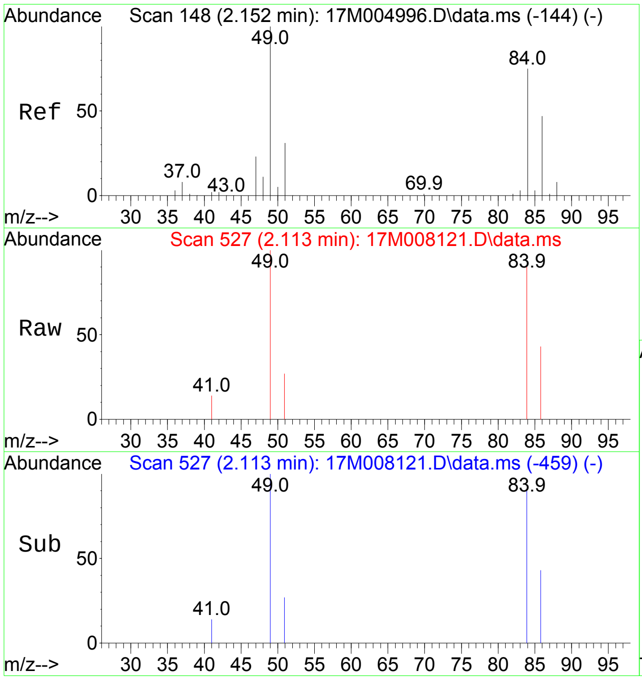
```
#9
Diethyl ether
Concen:   10.2708 ug/L
RT:    1.612 min  Scan# 354
Delta R.T.   -0.003 min
Lab File:    17M008121.D
Acq: 10 Sep 2014  13:42

Tgt Ion: 59 Resp:    21908
Ion   Ratio  Lower   Upper
 59   100
 45    77.6   45.4   106.0
 74    70.1   42.7    99.5
```



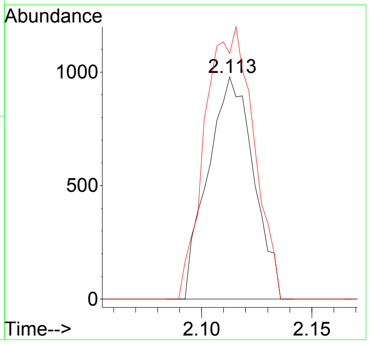


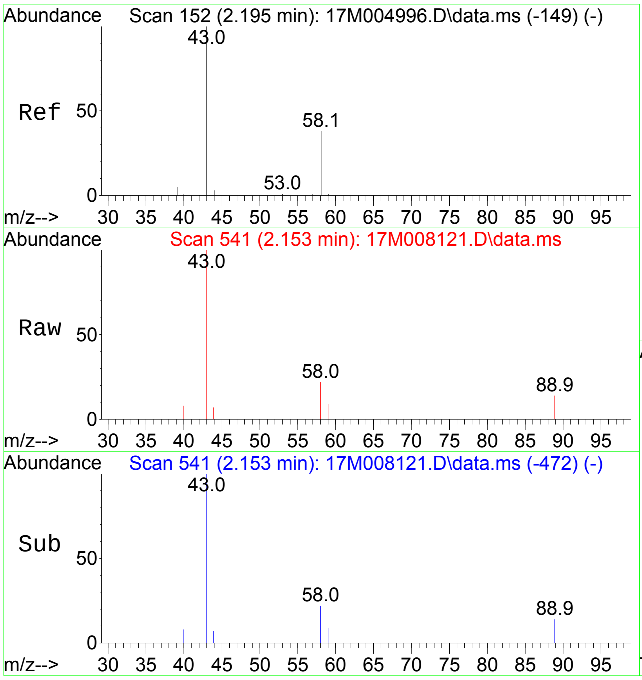
```
#11
Carbon Disulfide
Concen:    0.1353 ug/L
RT:   1.745 min  Scan# 400
Delta R.T.  0.000 min
Lab File:   17M008121.D
Acq: 10 Sep 2014  13:42

Tgt Ion: 76 Resp:    1195
Ion   Ratio  Lower   Upper
 76   100
 78     0.0    8.0   12.0#
```



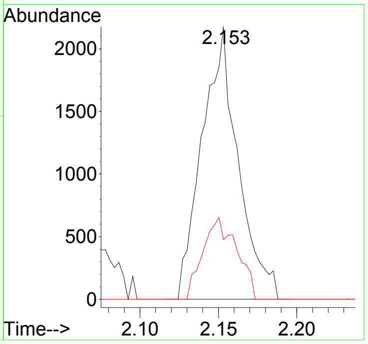


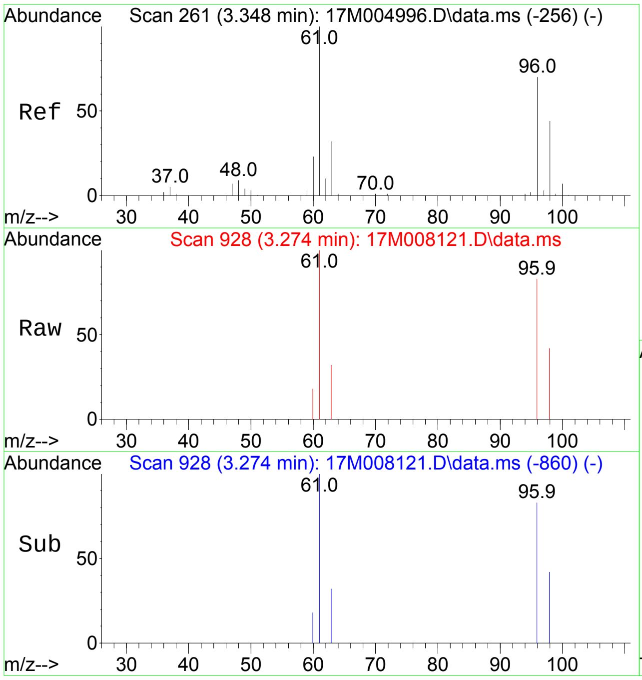
```
#14
Methylene Chloride
Concen:    0.3882 ug/L
RT:   2.113 min  Scan# 527
Delta R.T.  -0.003 min
Lab File:   17M008121.D
Acq: 10 Sep 2014  13:42

Tgt Ion: 84 Resp:    1416
Ion   Ratio  Lower   Upper
 84   100
 49   130.5   97.1   145.7
```



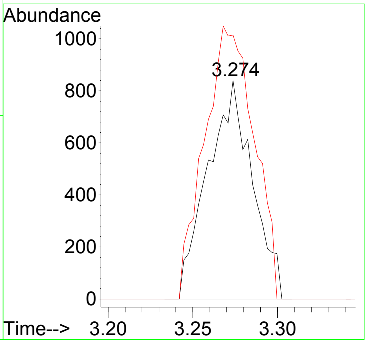


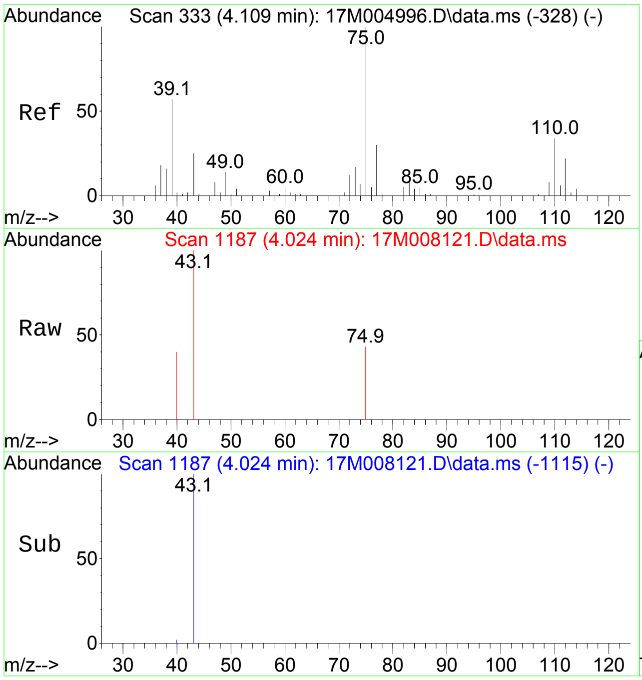
```
#15
Acetone
Concen:     5.1534 ug/L
RT:    2.153 min  Scan# 541
Delta R.T.   0.000 min
Lab File:    17M008121.D
Acq: 10 Sep 2014  13:42

Tgt Ion: 43 Resp:     3484
Ion   Ratio  Lower   Upper
 43   100
 58    28.2   18.7    43.7
```



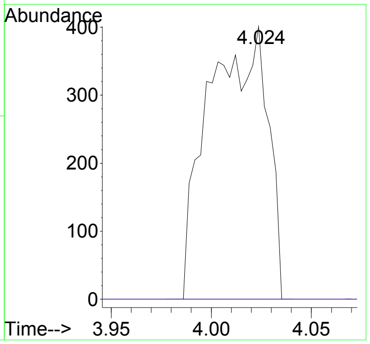


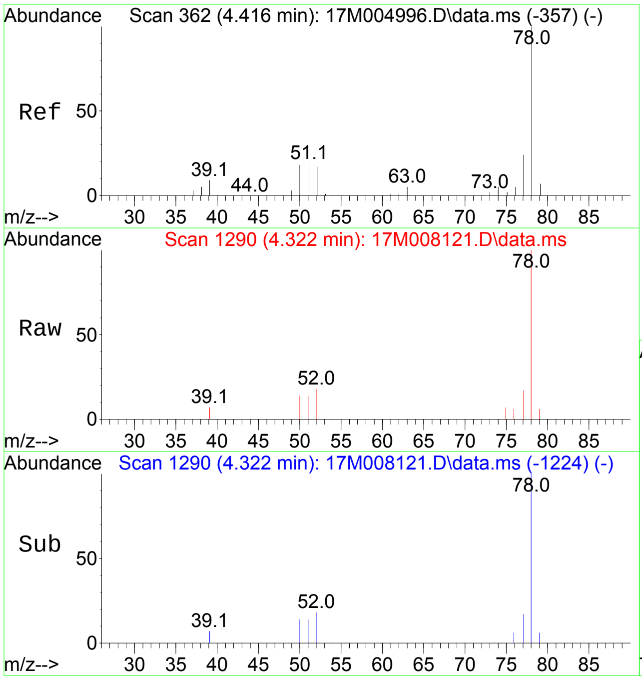
```
#21
cis-1,2-Dichloroethene
Concen:     0.4022 ug/L
RT:    3.274 min  Scan# 928
Delta R.T.   -0.003 min
Lab File:    17M008121.D
Acq: 10 Sep 2014  13:42

Tgt Ion: 96 Resp:     1535
Ion   Ratio  Lower   Upper
 96   100
 61   139.5  105.4   158.2
```



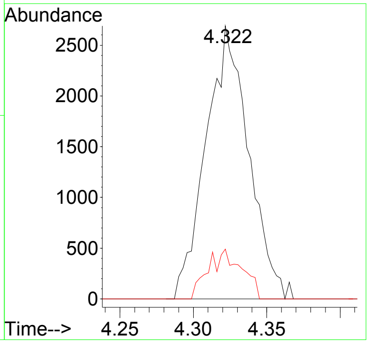


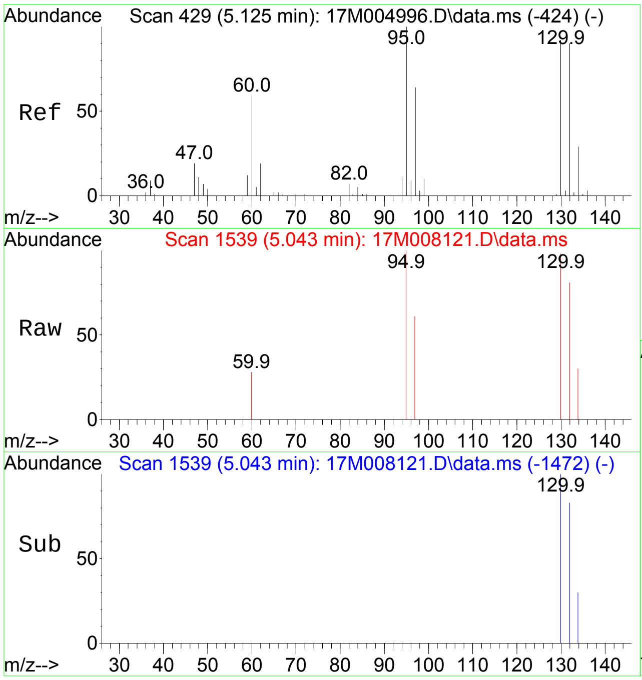
```
#30
2-Butanone
Concen:    0.7457 ug/L
RT:    4.024 min  Scan# 1187
Delta R.T.   0.009 min
Lab File:    17M008121.D
Acq: 10 Sep 2014  13:42

Tgt Ion: 43 Resp:     817
Ion   Ratio  Lower   Upper
 43   100
 72     0.0    34.1    51.1#
 57     0.0     6.4     9.6#
```





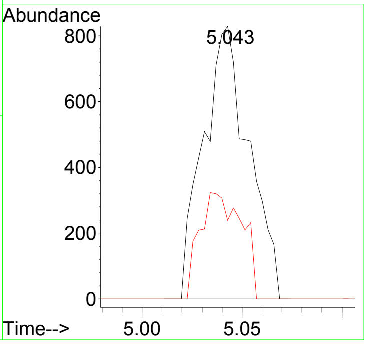
```
#31
Benzene
Concen:    0.3799 ug/L
RT:    4.322 min  Scan# 1290
Delta R.T.   -0.009 min
Lab File:    17M008121.D
Acq: 10 Sep 2014  13:42

Tgt Ion: 78 Resp:    5445
Ion   Ratio  Lower   Upper
 78   100
 52    14.5    12.9    19.3
```

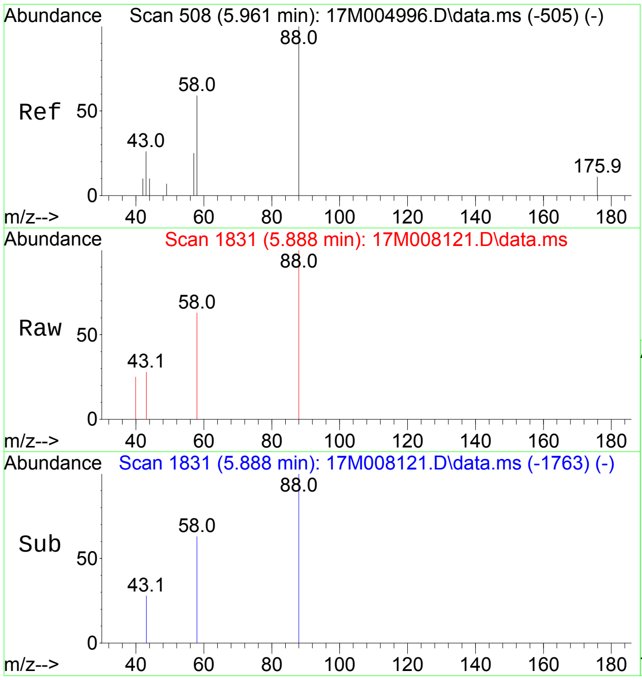




#34
Trichloroethene
Concen: 0.3169 ug/L
RT: 5.043 min Scan# 1539
Delta R.T. -0.006 min
Lab File: 17M008121.D
Acq: 10 Sep 2014 13:42

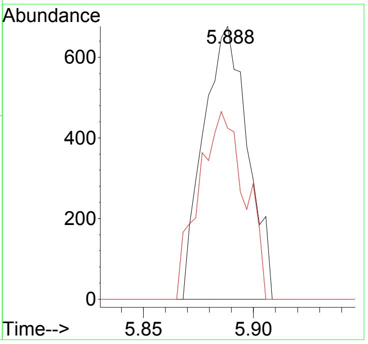
```
Tgt Ion:130 Resp:    1313
Ion  Ratio  Lower  Upper
130  100
 60   36.4   23.9   55.9
```

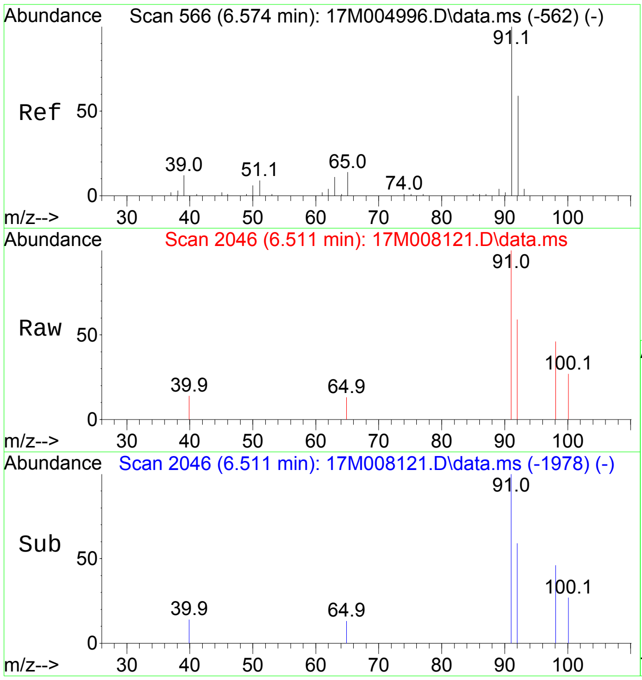




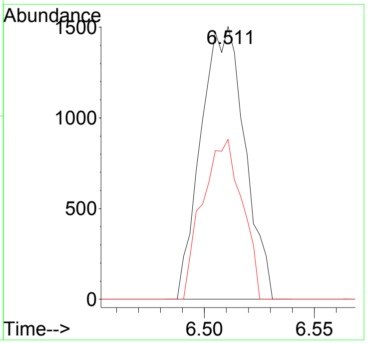
#38
1,4-Dioxane
Concen: 36.9637 ug/L
RT: 5.888 min Scan# 1831
Delta R.T. -0.003 min
Lab File: 17M008121.D
Acq: 10 Sep 2014 13:42

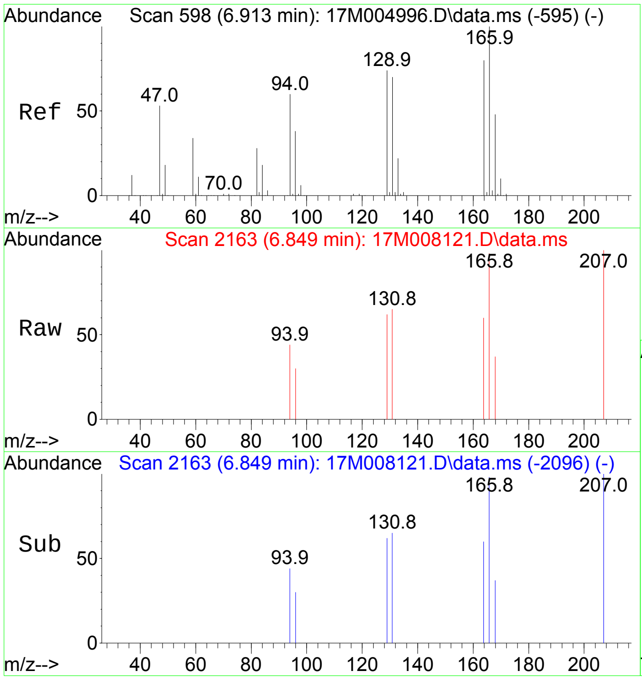
```
Tgt Ion: 88 Resp:     948
Ion  Ratio  Lower  Upper
 88  100
 58   71.9   39.4   92.0
```



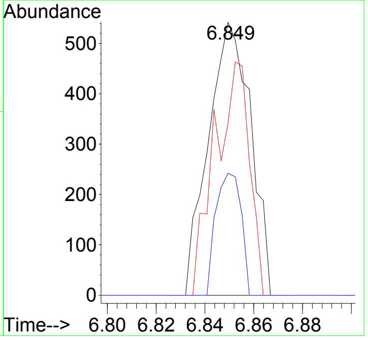


```
#45
Toluene
Concen:    0.1387 ug/L
RT:    6.511 min  Scan# 2046
Delta R.T.  -0.003 min
Lab File:   17M008121.D
Acq: 10 Sep 2014  13:42

Tgt Ion: 91 Resp:    2092
Ion  Ratio  Lower  Upper
 91  100
 92   53.0   33.7   78.7
```

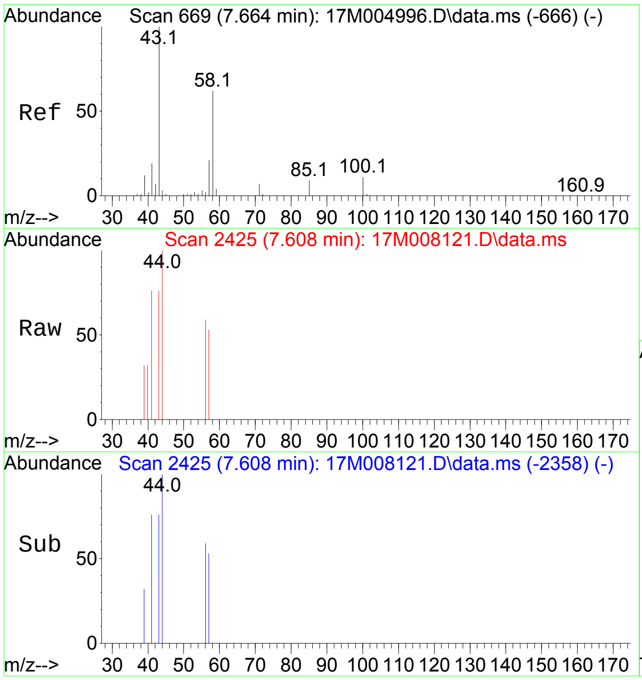


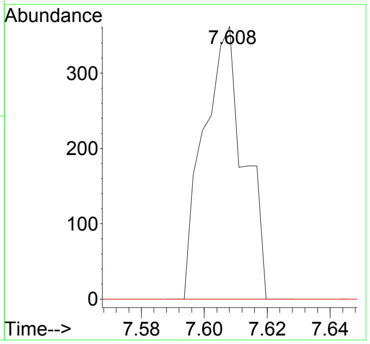


```
#46
Tetrachloroethene
Concen:    0.1588 ug/L
RT:    6.849 min  Scan# 2163
Delta R.T.  -0.006 min
Lab File:   17M008121.D
Acq: 10 Sep 2014  13:42

Tgt Ion:166 Resp:     655
Ion  Ratio  Lower  Upper
166  100
129   69.9   59.0   88.4
 94   26.6   31.3   46.9#
```

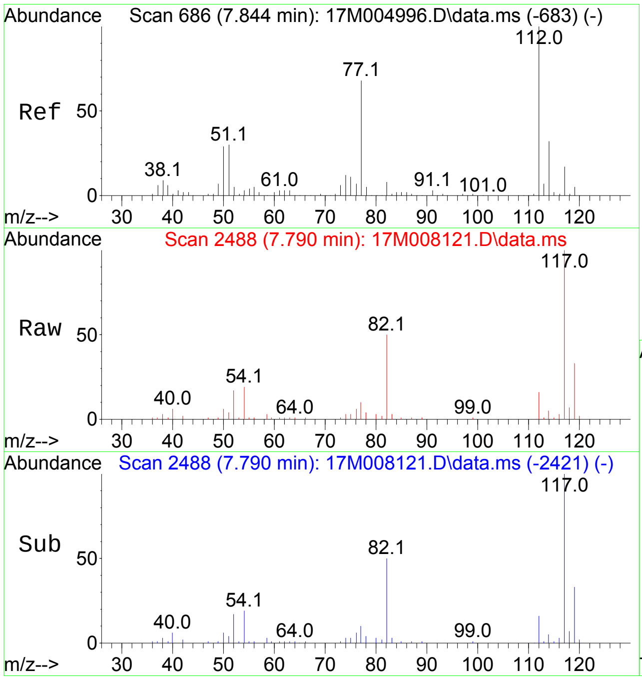


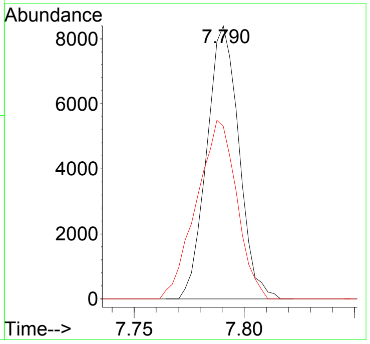
```
#51
2-Hexanone
Concen:    0.1880 ug/L
RT:    7.608 min  Scan# 2425
Delta R.T.   -0.006 min
Lab File:    17M008121.D
Acq: 10 Sep 2014  13:42

Tgt Ion: 43 Resp:      323
Ion   Ratio  Lower   Upper
 43   100
 58     0.0   42.2   63.2#
```

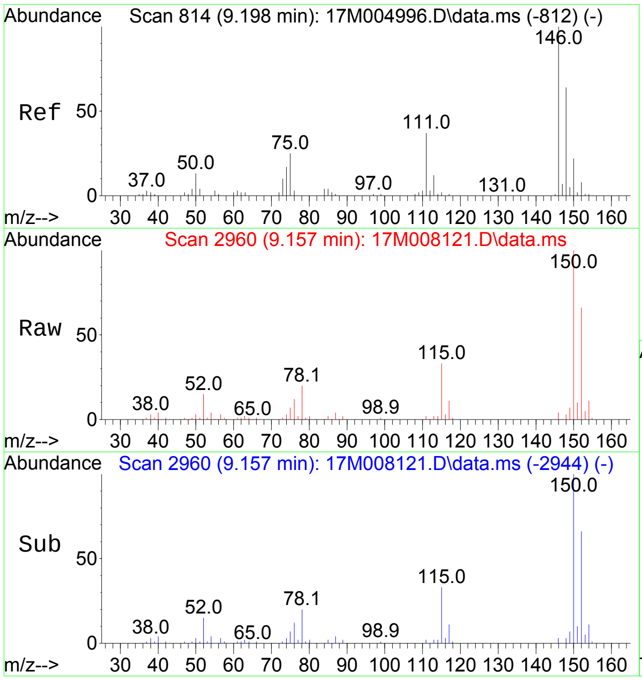




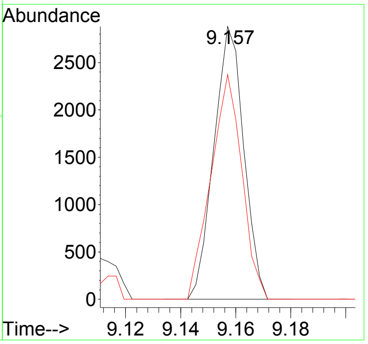
```
#52
Chlorobenzene
Concen:    0.8725 ug/L
RT:    7.790 min  Scan# 2488
Delta R.T.   -0.006 min
Lab File:    17M008121.D
Acq: 10 Sep 2014  13:42

Tgt Ion:112 Resp:     8543
Ion   Ratio  Lower   Upper
112   100
 77    81.6   34.6   80.6#
```





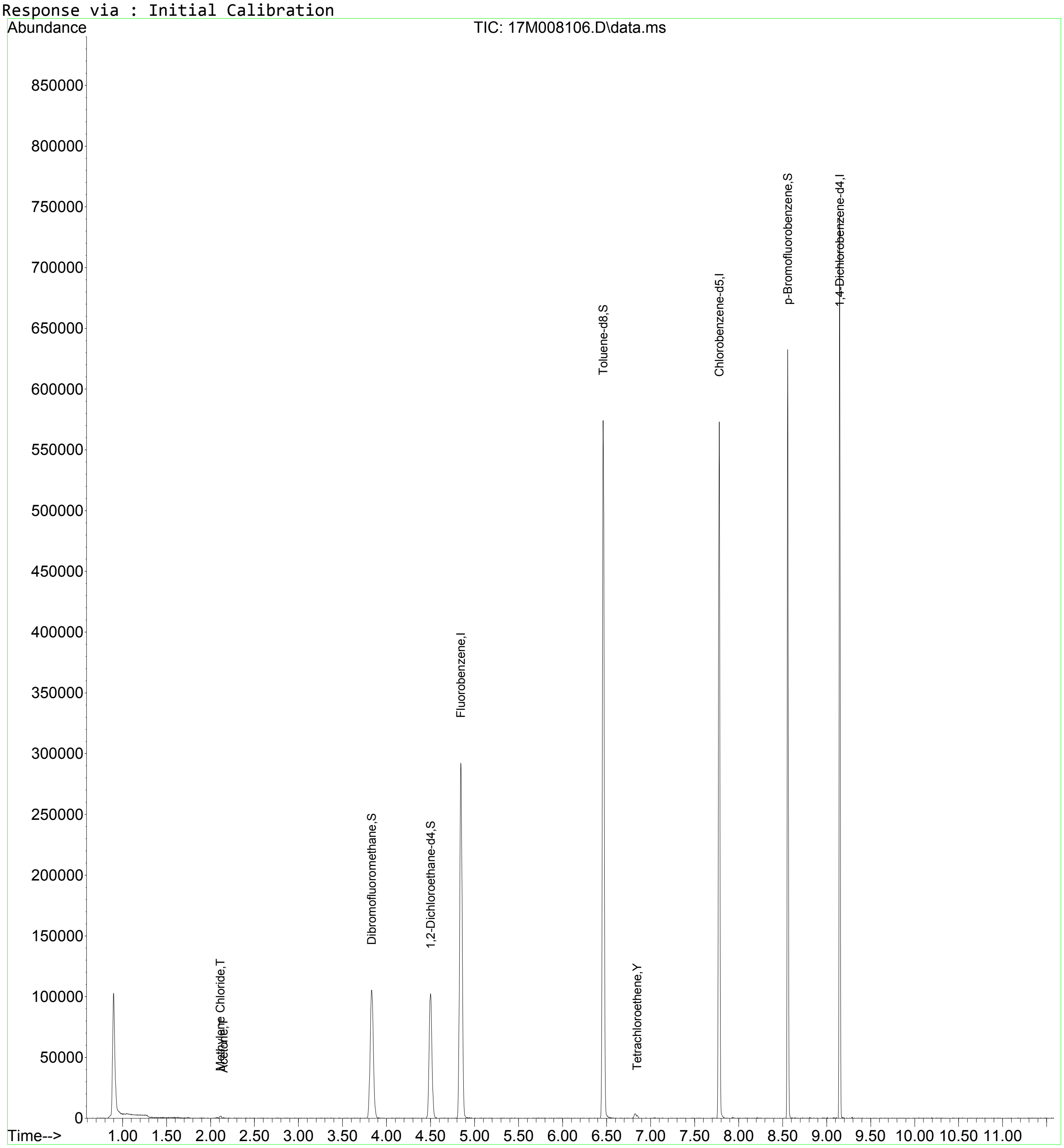


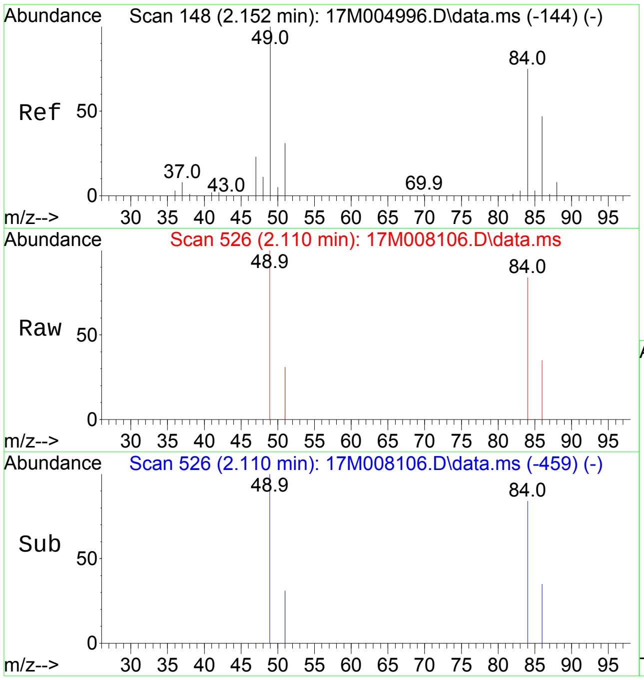
```
#75
1,4-Dichlorobenzene
Concen:    0.2930 ug/L
RT:   9.157 min  Scan# 2960
Delta R.T.  -0.003 min
Lab File:   17M008121.D
Acq: 10 Sep 2014  13:42

Tgt Ion:146 Resp:    2172
Ion  Ratio  Lower  Upper
146  100
148   85.6   51.4   77.0#
```



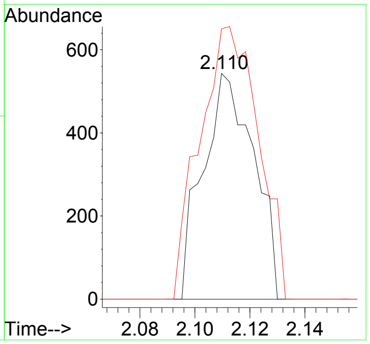
```
                              Quantitation Report    (Not Reviewed)

Data Path : D:\MassHunter\GCMS\1\data\090914\
Data File : 17M008106.D
Acq On    : 10 Sep 2014  00:08
Operator  : adc
Sample    : L14090460-02 A 826-LOW
Misc      : 1,1
ALS Vial  : 33   Sample Multiplier: 1

Quant Time: Sep 10 10:04:29 2014
Quant Method : D:\MassHunter\GCMS\1\methods\8260VMS.M
Quant Title  : 8260B/624 SOP:OVL MSV01 WATER 08/12/14 HPMS17
QLast Update : Fri Aug 15 15:53:53 2014
Response via : Initial Calibration

        Compound                   R.T. QIon  Response  Conc Units Dev(Min)
 ---------------------------------------------------------------------------
 Internal Standards
   1) Fluorobenzene              4.843   96   279748    25.00000 ug/L     0.0000
  43) Chlorobenzene-d5           7.779  117   203781    25.00000 ug/L     0.0000
  61) 1,4-Dichlorobenzene-d4     9.148  152    92275    25.00000 ug/L     0.0000

 System Monitoring Compounds
  27) Dibromofluoromethane       3.830  111    85330    23.2303 ug/L    0.0000
   Spiked Amount     25.000   Range  86 - 118    Recovery   =   92.921%
  32) 1,2-Dichloroethane-d4      4.498   65    86018    23.5139 ug/L    0.0000
   Spiked Amount     25.000   Range  80 - 120    Recovery   =   94.056%
  44) Toluene-d8                 6.461   98   319938    25.2072 ug/L    0.0000
   Spiked Amount     25.000   Range  88 - 110    Recovery   =  100.829%
  63) p-Bromofluorobenzene       8.558   95   104989    27.0996 ug/L    0.0000
   Spiked Amount     25.000   Range  86 - 115    Recovery   =  108.398%

 Target Compounds                                                Qvalue
  14) Methylene Chloride         2.110   84      698     0.2072 ug/L      84
  15) Acetone                    2.144   43      463     0.7415 ug/L #    43
  46) Tetrachloroethene          6.847  166      556     0.1465 ug/L      89
 ---------------------------------------------------------------------------

 (#) = qualifier out of range (m) = manual integration (+) = signals summed
```

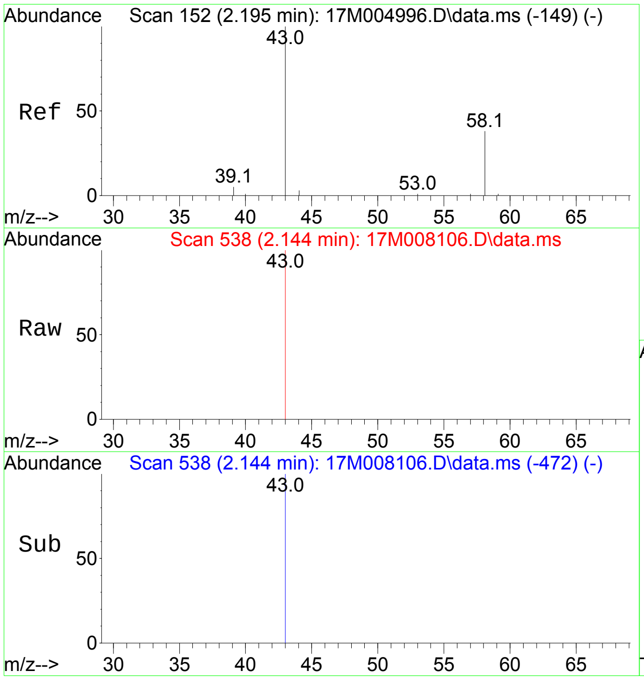
```
Data Path : D:\MassHunter\GCMS\1\data\090914\
Data File : 17M008106.D
Acq On    : 10 Sep 2014  00:08
Operator  : adc
Sample    : L14090460-02 A 826-LOW
Misc      : 1,1
ALS Vial  : 33   Sample Multiplier: 1

Quant Time: Sep 10 10:04:29 2014
Quant Method : D:\MassHunter\GCMS\1\methods\8260VMS.M
Quant Title  : 8260B/624 SOP:OVL MSV01 WATER 08/12/14 HPMS17
QLast Update : Fri Aug 15 15:53:53 2014
Response via : Initial Calibration
```



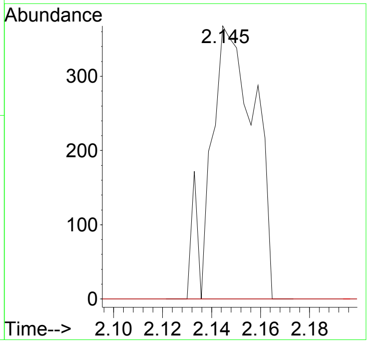


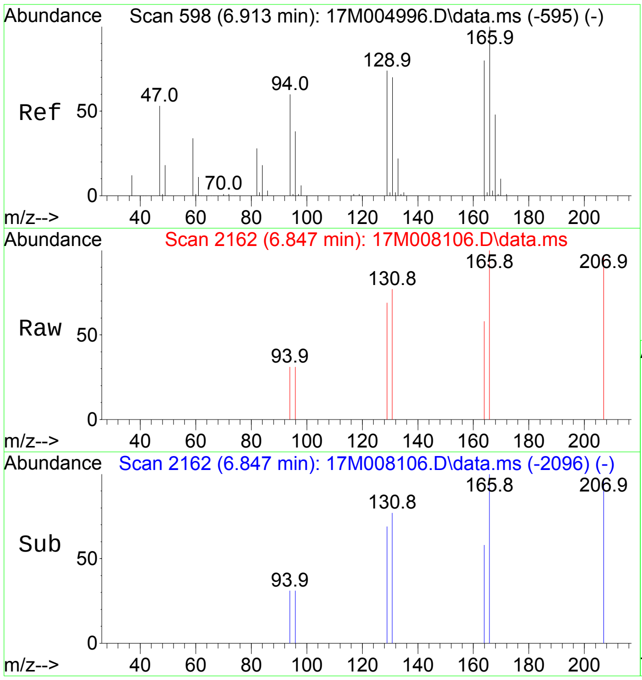
```
#14
Methylene Chloride
Concen:     0.2072 ug/L
RT:    2.110 min   Scan# 526
Delta R.T.   -0.006 min
Lab File:    17M008106.D
Acq: 10 Sep 2014   00:08

Tgt Ion: 84 Resp:      698
Ion   Ratio  Lower   Upper
 84   100
 49   139.5   97.1   145.7
```



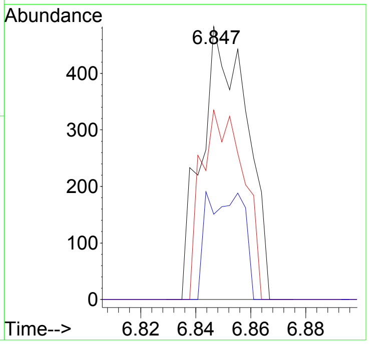


```
#15
Acetone
Concen:     0.7415 ug/L
RT:    2.144 min   Scan# 538
Delta R.T.   -0.009 min
Lab File:    17M008106.D
Acq: 10 Sep 2014   00:08

Tgt Ion: 43 Resp:      463
Ion   Ratio  Lower   Upper
 43   100
 58     0.0   18.7    43.7#
```





```
#46
Tetrachloroethene
Concen:    0.1465 ug/L
RT:   6.847 min  Scan# 2162
Delta R.T.  -0.008 min
Lab File:   17M008106.D
Acq: 10 Sep 2014  00:08

Tgt Ion:166 Resp:     556
Ion  Ratio  Lower  Upper
166  100
129   64.6   59.0   88.4
 94   32.0   31.3   46.9
```

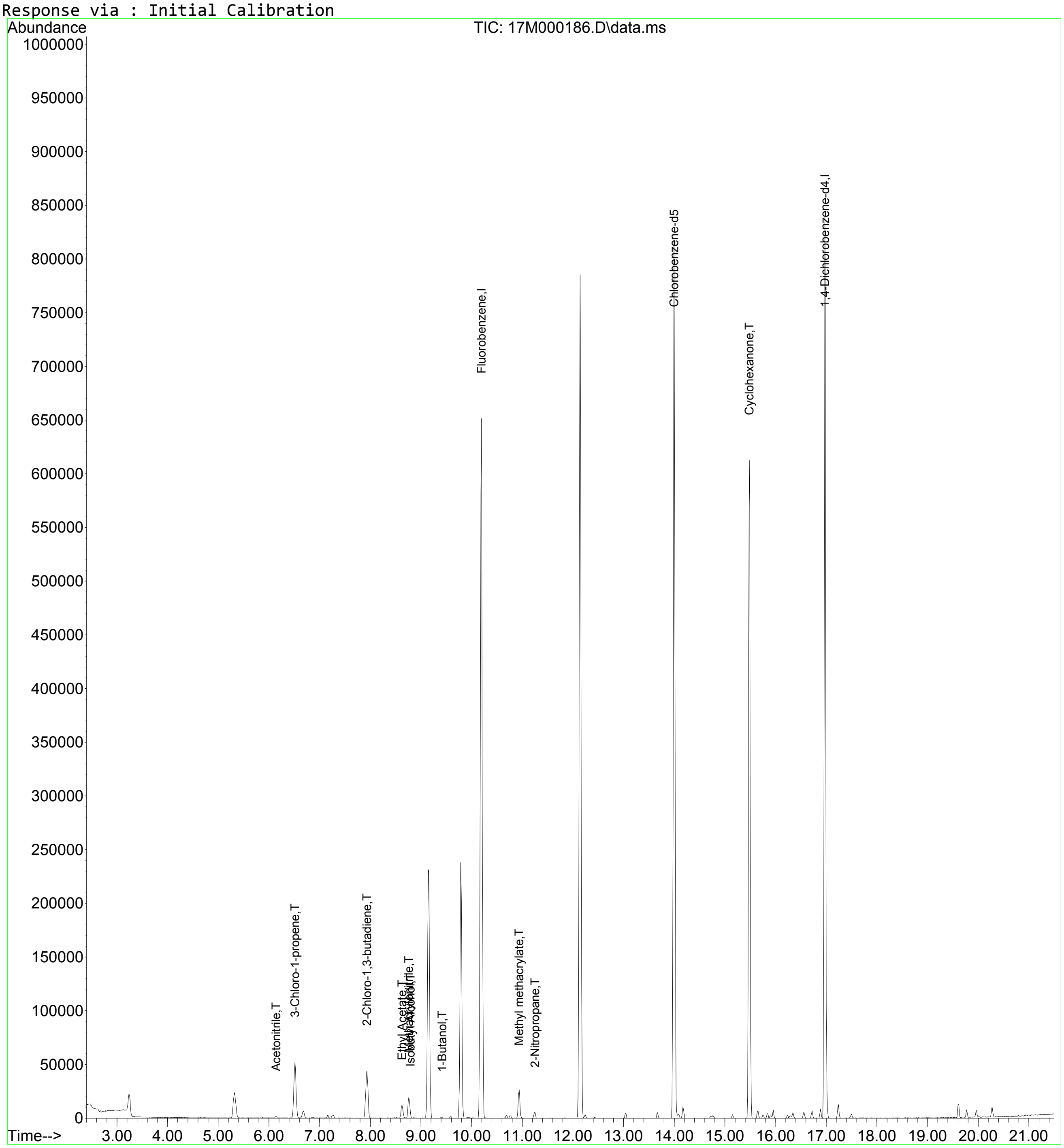


2.1.1.4 Standards Data

```
                                Quantitation Report    (Not Reviewed)

Data Path : D:\MassHunter\GCMS\1\data\101313\
Data File : 17M000186.D
Acq On    : 13 Oct 2013  17:48
Operator  : MES
Sample    : WG448462-02 5ug/L APPIX STD
Misc      : 1,1 STD60752
ALS Vial  : 3   Sample Multiplier: 1

Quant Time: Oct 17 17:42:57 2013
Quant Method : D:\MassHunter\GCMS\1\methods\A9FOOWT.M
Quant Title  : Appendix IX (SOP:OVL MSV01) WATER 10/13/13 HPMS17
QLast Update : Thu Oct 17 17:39:37 2013
Response via : Initial Calibration

        Compound                   R.T. QIon  Response  Conc Units Dev(Min)
 --------------------------------------------------------------------------
 Internal Standards
   1) Fluorobenzene              10.192   96   834735    25.0000 ug/L     0.00
  11) Chlorobenzene-d5           13.996  117   596678    25.0000 ug/L     0.00
  13) 1,4-Dichlorobenzene-d4     16.971  152   298748    25.0000 ug/L     0.00

 Target Compounds                                                   Qvalue
   2) Acetonitrile                6.139   41     2125     3.70 ug/L #    72
   3) 3-Chloro-1-propene          6.513   41    56439     4.88 ug/L #    87
   4) 2-Chloro-1,3-butadiene      7.933   53    47335     4.42 ug/L      98
   5) Methacrylonitrile           8.762   67     9230     4.25 ug/L      98
   6) Ethyl Acetate               8.627   43    20657     4.25 ug/L #    87
   7) Isobutyl Alcohol            8.793   43      984     6.08 ug/L #    48
   8) 1-Butanol                   9.415   56     1024    34.64 ug/L #    16
   9) Methyl methacrylate        10.939   41    18354     4.00 ug/L      99
  10) 2-Nitropropane             11.249   43     5280     3.08 ug/L      90
  12) Cyclohexanone              15.479   55      199    17.31 ug/L #    23
 --------------------------------------------------------------------------

 (#) = qualifier out of range (m) = manual integration (+) = signals summed
```

Data Path : D:\MassHunter\GCMS\1\data\101313\
Data File : 17M000186.D
Acq On   : 13 Oct 2013 17:48
Operator : MES
Sample   : WG448462-02 5ug/L APPIX STD
Misc   : 1,1 STD60752
ALS Vial : 3   Sample Multiplier: 1

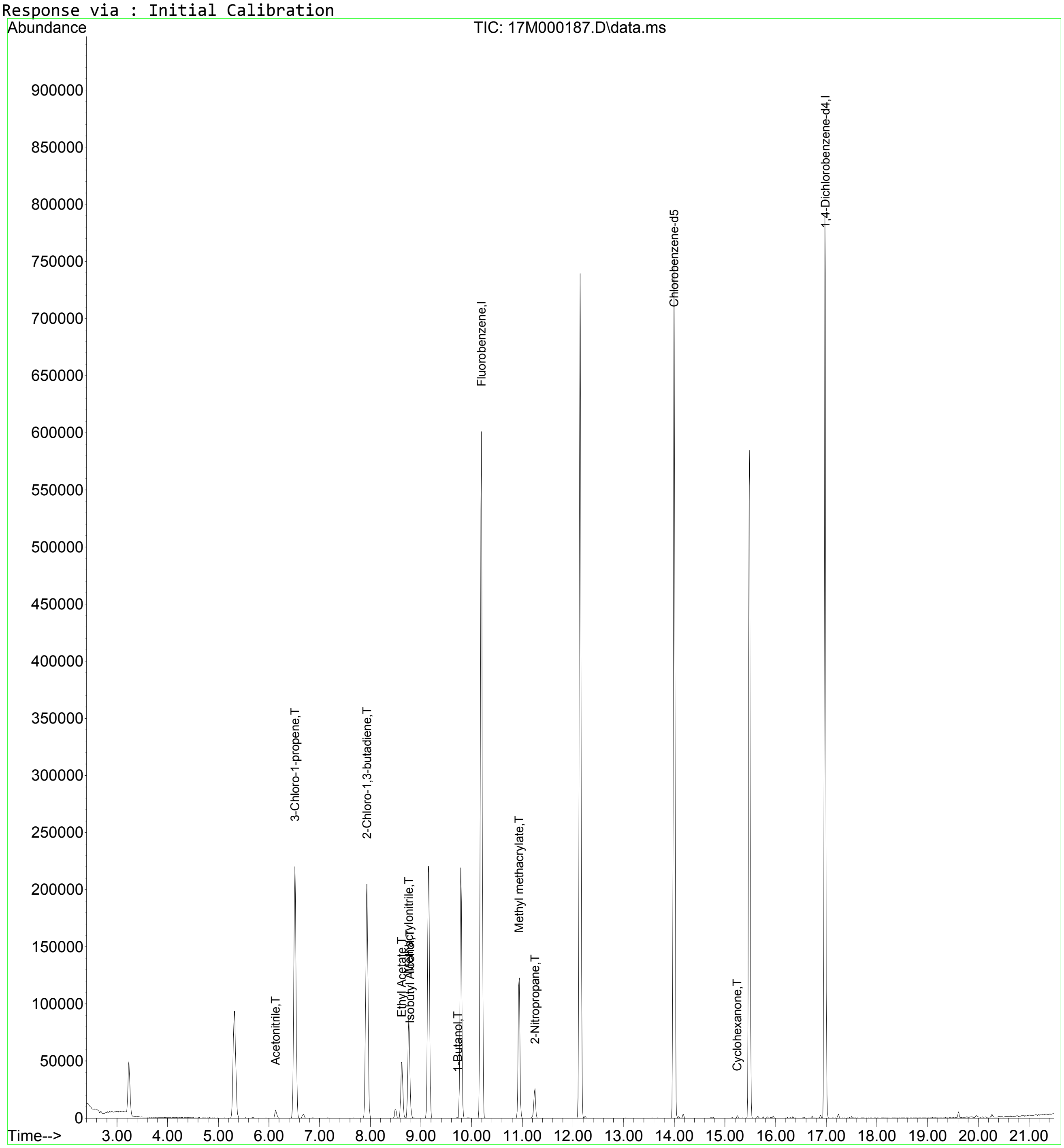
Quant Time: Oct 17 17:42:57 2013
Quant Method : D:\MassHunter\GCMS\1\methods\A9FOOWT.M
Quant Title : Appendix IX (SOP:OVL MSV01) WATER 10/13/13 HPMS17
QLast Update : Thu Oct 17 17:39:37 2013
Response via : Initial Calibration



```
                              Evaluate Continuing Calibration Report

  Data Path : D:\MassHunter\GCMS\1\data\101313\
  Data File : 17M000186.D
  Acq On    : 13 Oct 2013  17:48
  Operator  : MES
  Sample    : WG448462-02 5ug/L APPIX STD
  Misc      : 1,1 STD60752
  ALS Vial  : 3   Sample Multiplier: 1

  Quant Time: Oct 17 17:43:35 2013
  Quant Method : D:\MassHunter\GCMS\1\methods\A9FOOWT.M
  Quant Title  : Appendix IX (SOP:OVL MSV01) WATER 10/13/13 HPMS17
  QLast Update : Thu Oct 17 17:39:37 2013
  Response via : Initial Calibration


  Min. RRF     :   0.000  Min. Rel. Area :  50%  Max. R.T. Dev  0.50min
  Max. RRF Dev :  25%     Max. Rel. Area : 150%

         Compound                      Amount  Calc.     %Dev Area% Dev(min)
  ------------------------------------------------------------------------
  1 I    Fluorobenzene                25.000  25.000       0.0  100   0.00
  2 T    Acetonitrile                  5.000   3.703      25.9#   0   0.01
  3 T    3-Chloro-1-propene            5.000   4.880       2.4  100   0.00
  4 T    2-Chloro-1,3-butadiene        5.000   4.424      11.5  100   0.00
  5 T    Methacrylonitrile             5.000   4.254      14.9  100   0.00
  6 T    Ethyl Acetate                 5.000   4.247      15.1  100   0.01
  7 T    Isobutyl Alcohol              5.000   6.076     -21.5    0   0.01
  8 T    1-Butanol                    -1.000  34.643       0.0    0  -0.30
  9 T    Methyl methacrylate           5.000   4.002      20.0  100   0.01
 10 T    2-Nitropropane               -1.000   3.076       0.0    0   0.00

 11      Chlorobenzene-d5             25.000  25.000       0.0  100   0.00
 12 T    Cyclohexanone                -1.000  17.312       0.0    0   0.23

 13 I    1,4-Dichlorobenzene-d4       25.000  25.000       0.0  100   0.00
 -------------------------------------------------------------------------

    (#) = Out of Range               SPCC's out = 0  CCC's out = 0
```

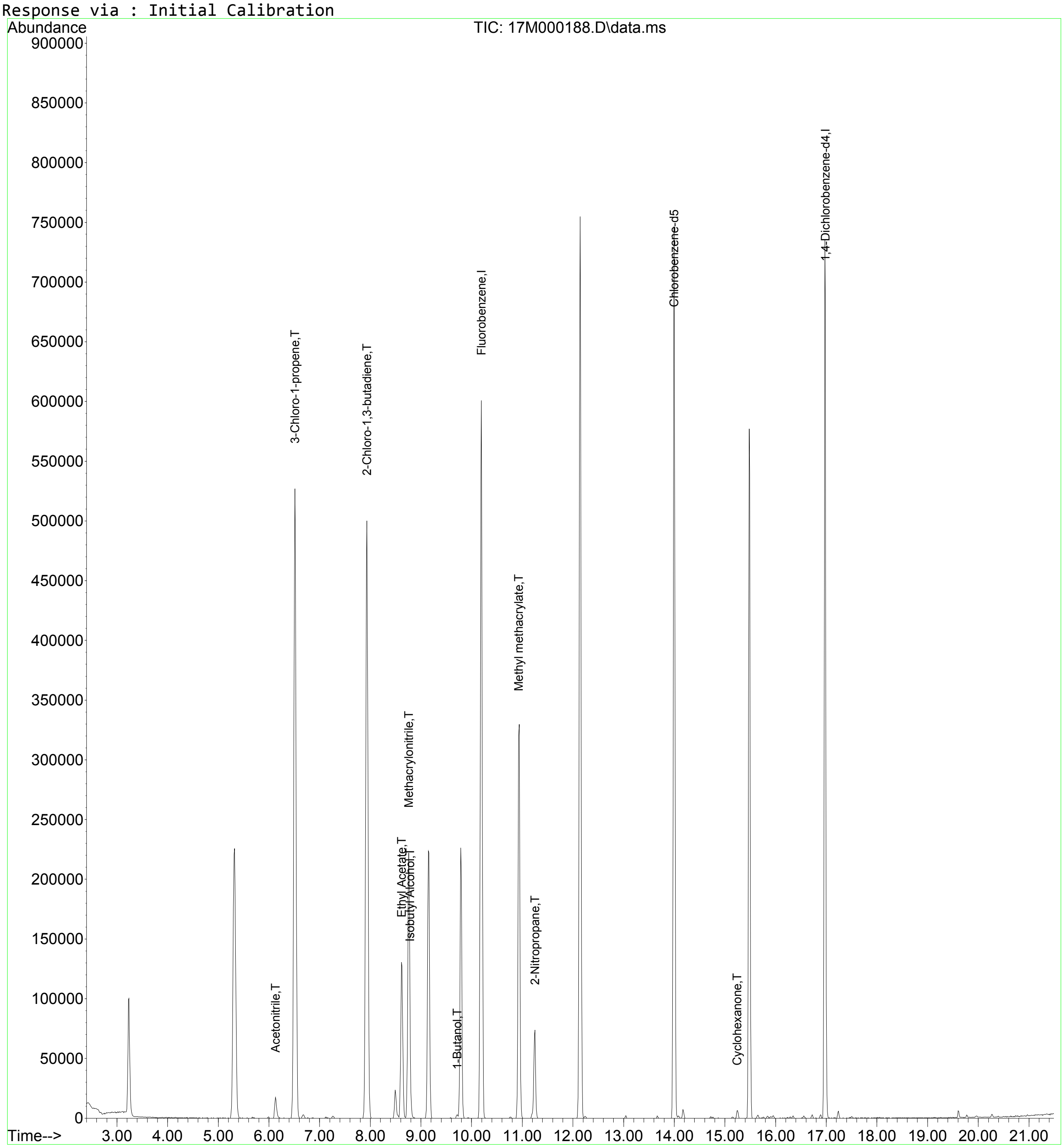
```
                           Quantitation Report    (Not Reviewed)

Data Path : D:\MassHunter\GCMS\1\data\101313\
Data File : 17M000187.D
Acq On    : 13 Oct 2013  18:15
Operator  : MES
Sample    : WG448462-03 20ug/L APPIX STD
Misc      : 1,1 STD60752
ALS Vial  : 4   Sample Multiplier: 1

Quant Time: Oct 17 17:43:00 2013
Quant Method : D:\MassHunter\GCMS\1\methods\A9FOOWT.M
Quant Title  : Appendix IX (SOP:OVL MSV01) WATER 10/13/13 HPMS17
QLast Update : Thu Oct 17 17:39:37 2013
Response via : Initial Calibration

        Compound                   R.T. QIon  Response  Conc Units Dev(Min)
 --------------------------------------------------------------------------
 Internal Standards
   1) Fluorobenzene               10.192   96   769796    25.0000 ug/L     0.00
  11) Chlorobenzene-d5            13.996  117   542862    25.0000 ug/L     0.00
  13) 1,4-Dichlorobenzene-d4      16.981  152   283988    25.0000 ug/L     0.01

 Target Compounds                                                   Qvalue
   2) Acetonitrile                 6.129   41     9431    17.82 ug/L #    91
   3) 3-Chloro-1-propene           6.512   41   236510    22.18 ug/L      99
   4) 2-Chloro-1,3-butadiene       7.932   53   212042    21.49 ug/L      99
   5) Methacrylonitrile            8.761   67    39753    19.87 ug/L      99
   6) Ethyl Acetate                8.616   43    87278    19.46 ug/L     100
   7) Isobutyl Alcohol             8.782   43     5450    36.49 ug/L #    97
   8) 1-Butanol                    9.725   56      885    33.83 ug/L #    48
   9) Methyl methacrylate         10.938   41    81246    19.21 ug/L     100
  10) 2-Nitropropane              11.249   43    24099    15.23 ug/L      93
  12) Cyclohexanone               15.240   55     1683    31.57 ug/L #    89
 --------------------------------------------------------------------------

 (#) = qualifier out of range (m) = manual integration (+) = signals summed
```

```
                         Quantitation Report    (Not Reviewed)

Data Path : D:\MassHunter\GCMS\1\data\101313\
Data File : 17M000187.D
Acq On    : 13 Oct 2013  18:15
Operator  : MES
Sample    : WG448462-03 20ug/L APPIX STD
Misc      : 1,1 STD60752
ALS Vial  : 4   Sample Multiplier: 1

Quant Time: Oct 17 17:43:00 2013
Quant Method : D:\MassHunter\GCMS\1\methods\A9FOOWT.M
Quant Title  : Appendix IX (SOP:OVL MSV01) WATER 10/13/13 HPMS17
QLast Update : Thu Oct 17 17:39:37 2013
Response via : Initial Calibration
```



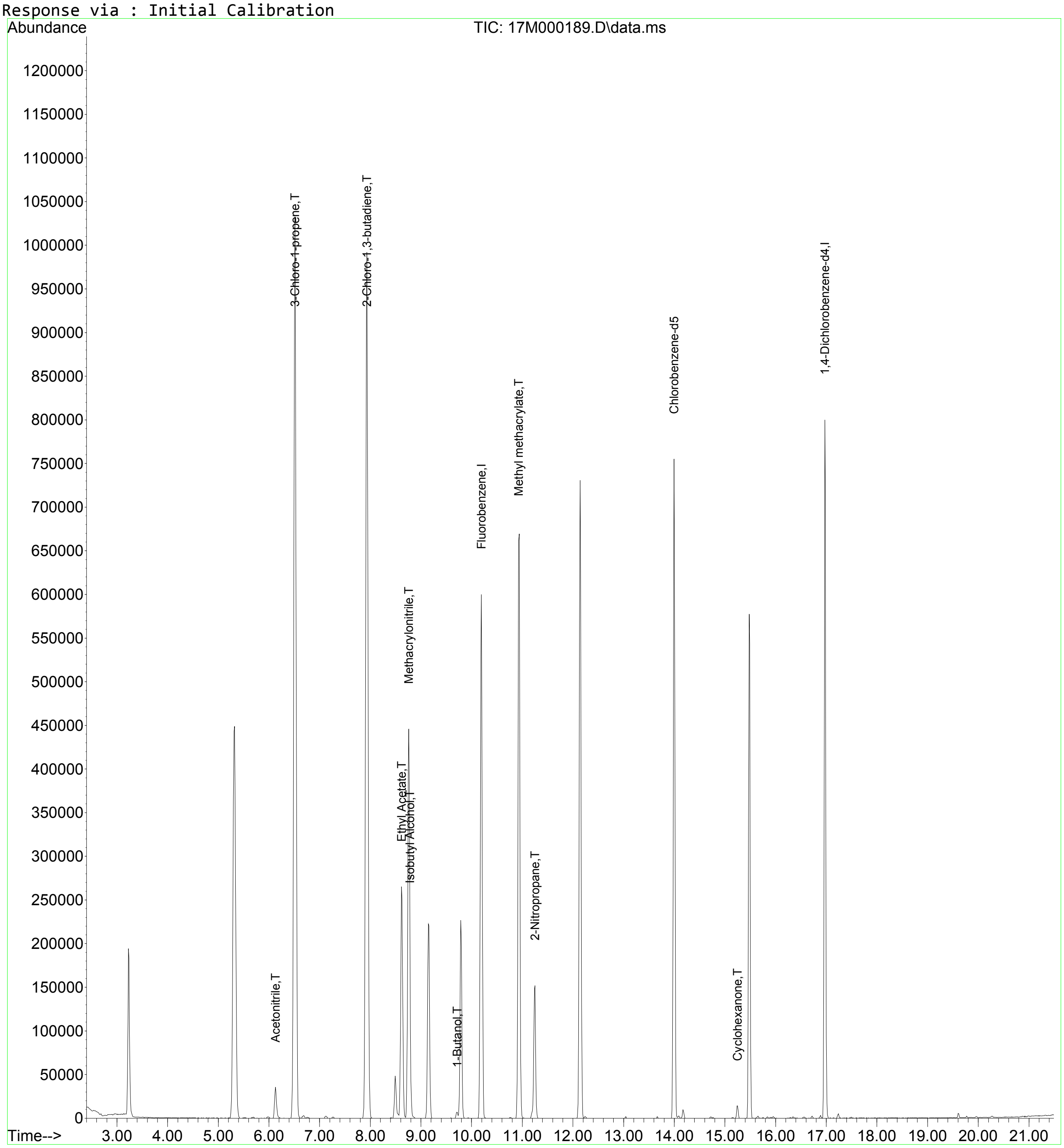
```
                         Quantitation Report    (Not Reviewed)

Data Path : D:\MassHunter\GCMS\1\data\101313\
Data File : 17M000188.D
Acq On    : 13 Oct 2013  18:43
Operator  : MES
Sample    : WG448462-04 50ug/L APPIX STD
Misc      : 1,1 STD60752
ALS Vial  : 5   Sample Multiplier: 1

Quant Time: Oct 17 17:43:02 2013
Quant Method : D:\MassHunter\GCMS\1\methods\A9FOOWT.M
Quant Title  : Appendix IX (SOP:OVL MSV01) WATER 10/13/13 HPMS17
QLast Update : Thu Oct 17 17:39:37 2013
Response via : Initial Calibration

        Compound                   R.T. QIon  Response  Conc Units Dev(Min)
 --------------------------------------------------------------------------
 Internal Standards
   1) Fluorobenzene              10.192   96   764083    25.0000 ug/L     0.00
  11) Chlorobenzene-d5           13.996  117   535993    25.0000 ug/L     0.00
  13) 1,4-Dichlorobenzene-d4     16.981  152   263764    25.0000 ug/L     0.01

 Target Compounds                                                   Qvalue
   2) Acetonitrile                6.129   41    25091    47.77 ug/L #    99
   3) 3-Chloro-1-propene          6.512   41   571105    53.95 ug/L     100
   4) 2-Chloro-1,3-butadiene      7.932   53   517543    52.84 ug/L     100
   5) Methacrylonitrile           8.762   67   103271    52.00 ug/L      99
   6) Ethyl Acetate               8.616   43   227233    51.04 ug/L     100
   7) Isobutyl Alcohol            8.782   43    14258    96.18 ug/L #    96
   8) 1-Butanol                   9.715   56     2582    56.98 ug/L      98
   9) Methyl methacrylate        10.928   41   217667    51.85 ug/L      99
  10) 2-Nitropropane             11.249   43    72850    46.37 ug/L      97
  12) Cyclohexanone              15.240   55     4463    57.76 ug/L      98
 --------------------------------------------------------------------------

 (#) = qualifier out of range (m) = manual integration (+) = signals summed
```

```
Data Path : D:\MassHunter\GCMS\1\data\101313\
Data File : 17M000188.D
Acq On    : 13 Oct 2013  18:43
Operator  : MES
Sample    : WG448462-04 50ug/L APPIX STD
Misc      : 1,1 STD60752
ALS Vial  : 5   Sample Multiplier: 1

Quant Time: Oct 17 17:43:02 2013
Quant Method : D:\MassHunter\GCMS\1\methods\A9FOOWT.M
Quant Title  : Appendix IX (SOP:OVL MSV01) WATER 10/13/13 HPMS17
QLast Update : Thu Oct 17 17:39:37 2013
Response via : Initial Calibration
```



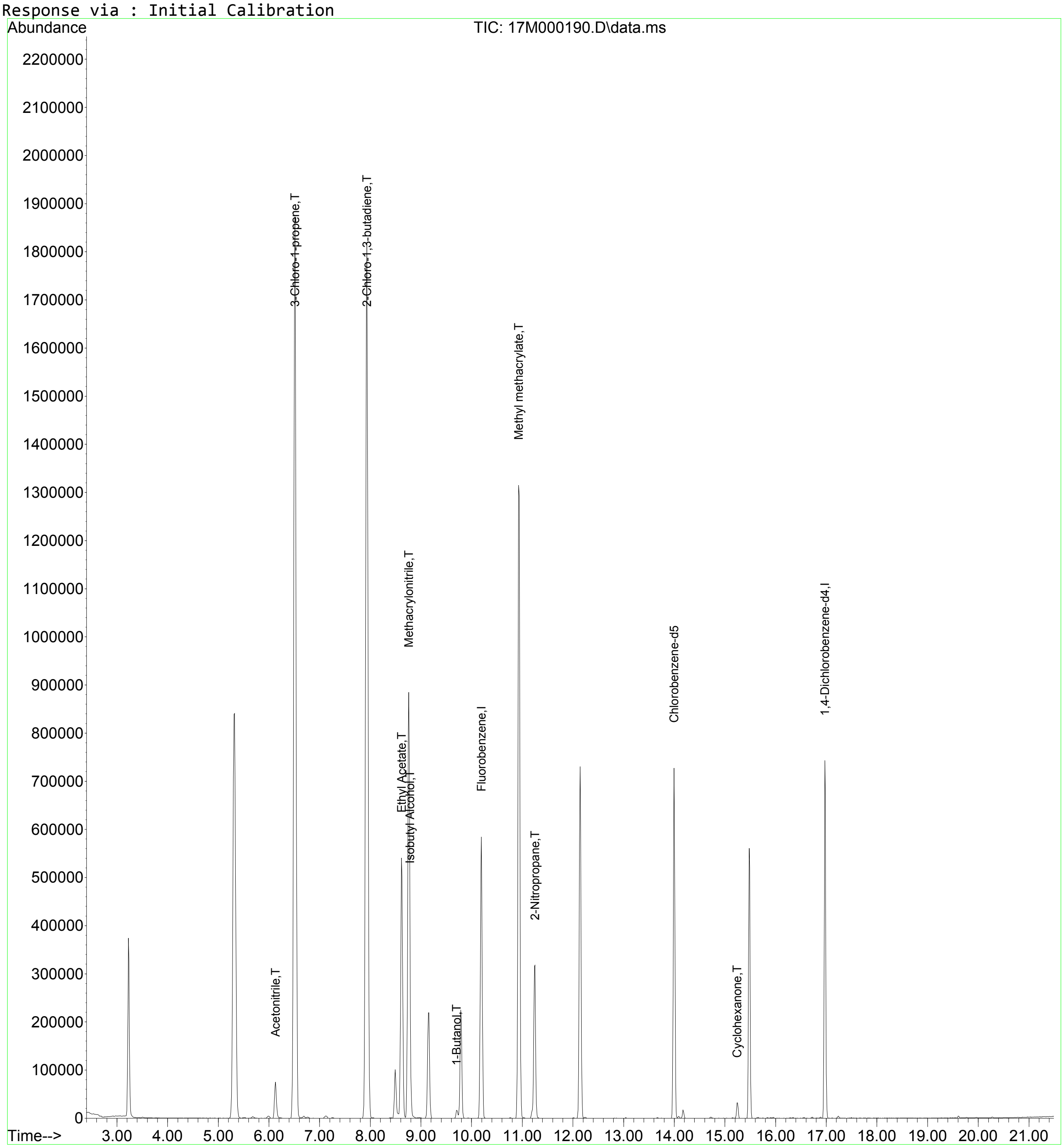
```
                         Quantitation Report    (Not Reviewed)

Data Path : D:\MassHunter\GCMS\1\data\101313\
Data File : 17M000189.D
Acq On    : 13 Oct 2013  19:11
Operator  : MES
Sample    : WG448462-05 100ug/L APPIX STD
Misc      : 1,1 STD60752
ALS Vial  : 6   Sample Multiplier: 1

Quant Time: Oct 17 17:43:04 2013
Quant Method : D:\MassHunter\GCMS\1\methods\A9FOOWT.M
Quant Title  : Appendix IX (SOP:OVL MSV01) WATER 10/13/13 HPMS17
QLast Update : Thu Oct 17 17:39:37 2013
Response via : Initial Calibration

        Compound                   R.T. QIon  Response  Conc Units Dev(Min)
 --------------------------------------------------------------------------
 Internal Standards
   1) Fluorobenzene              10.192   96   762819    25.0000 ug/L     0.00
  11) Chlorobenzene-d5           13.996  117   543994    25.0000 ug/L     0.00
  13) 1,4-Dichlorobenzene-d4     16.971  152   279020    25.0000 ug/L     0.00

 Target Compounds                                                   Qvalue
   2) Acetonitrile                6.129   41    49660    94.69 ug/L #   100
   3) 3-Chloro-1-propene          6.512   41  1123358   106.29 ug/L     100
   4) 2-Chloro-1,3-butadiene      7.932   53  1036798   106.03 ug/L     100
   5) Methacrylonitrile           8.762   67   205353   103.57 ug/L     100
   6) Ethyl Acetate               8.616   43   457591   102.95 ug/L     100
   7) Isobutyl Alcohol            8.782   43    27086   183.01 ug/L     100
   8) 1-Butanol                   9.715   56     5648    96.66 ug/L     100
   9) Methyl methacrylate        10.928   41   448267   106.96 ug/L     100
  10) 2-Nitropropane             11.249   43   155172    98.94 ug/L     100
  12) Cyclohexanone              15.250   55     9042    97.58 ug/L     100
 --------------------------------------------------------------------------

 (#) = qualifier out of range (m) = manual integration (+) = signals summed
```

```
Data Path : D:\MassHunter\GCMS\1\data\101313\
Data File : 17M000189.D
Acq On    : 13 Oct 2013  19:11
Operator  : MES
Sample    : WG448462-05 100ug/L APPIX STD
Misc      : 1,1 STD60752
ALS Vial  : 6   Sample Multiplier: 1

Quant Time: Oct 17 17:43:04 2013
Quant Method : D:\MassHunter\GCMS\1\methods\A9FOOWT.M
Quant Title  : Appendix IX (SOP:OVL MSV01) WATER 10/13/13 HPMS17
QLast Update : Thu Oct 17 17:39:37 2013
Response via : Initial Calibration
```



```
                         Quantitation Report    (Not Reviewed)

Data Path : D:\MassHunter\GCMS\1\data\101313\
Data File : 17M000190.D
Acq On    : 13 Oct 2013  19:39
Operator  : MES
Sample    : WG448462-06 200ug/L APPIX STD
Misc      : 1,1 STD60752
ALS Vial  : 7   Sample Multiplier: 1

Quant Time: Oct 17 17:43:06 2013
Quant Method : D:\MassHunter\GCMS\1\methods\A9FOOWT.M
Quant Title  : Appendix IX (SOP:OVL MSV01) WATER 10/13/13 HPMS17
QLast Update : Thu Oct 17 17:39:37 2013
Response via : Initial Calibration

        Compound                  R.T. QIon  Response  Conc Units Dev(Min)
 ------------------------------------------------------------------------
 Internal Standards
   1) Fluorobenzene             10.192   96   735626    25.0000 ug/L     0.00
  11) Chlorobenzene-d5          13.996  117   520486    25.0000 ug/L     0.00
  13) 1,4-Dichlorobenzene-d4    16.971  152   259787    25.0000 ug/L     0.00

 Target Compounds                                                  Qvalue
   2) Acetonitrile               6.129   41   104743   207.11 ug/L #    98
   3) 3-Chloro-1-propene         6.512   41  2062227   202.34 ug/L     100
   4) 2-Chloro-1,3-butadiene     7.932   53  1943243   206.08 ug/L     100
   5) Methacrylonitrile          8.762   67   410090   214.48 ug/L     100
   6) Ethyl Acetate              8.616   43   919702   214.56 ug/L     100
   7) Isobutyl Alcohol           8.782   43    57001   399.37 ug/L      98
   8) 1-Butanol                  9.705   56    13539   194.38 ug/L      98
   9) Methyl methacrylate       10.928   41   887601   219.62 ug/L     100
  10) 2-Nitropropane            11.249   43   329942   218.15 ug/L     100
  12) Cyclohexanone             15.240   55    19663   191.13 ug/L      98
 ------------------------------------------------------------------------

 (#) = qualifier out of range (m) = manual integration (+) = signals summed
```

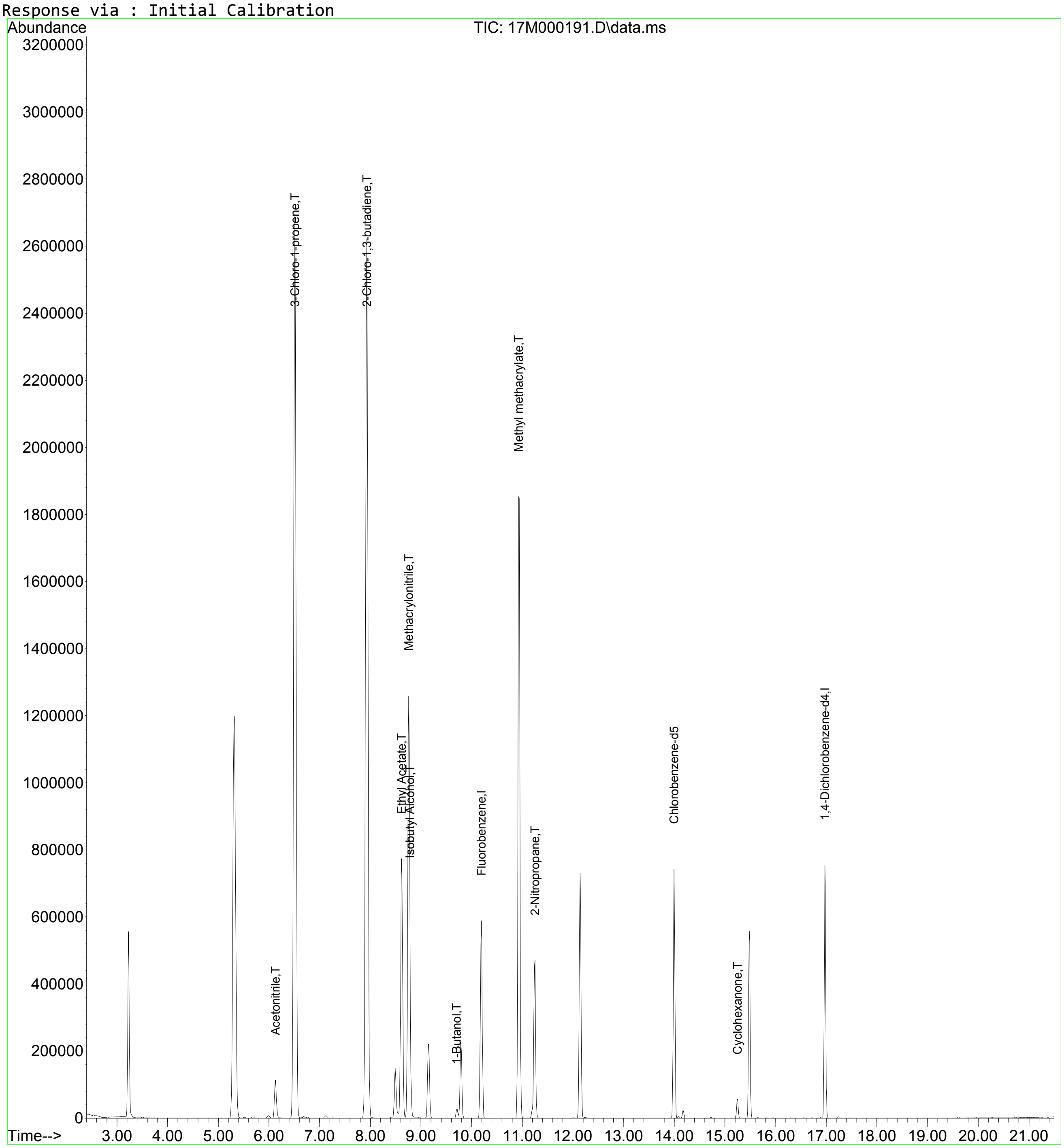
```
                    Quantitation Report    (Not Reviewed)

Data Path : D:\MassHunter\GCMS\1\data\101313\
Data File : 17M000190.D
Acq On    : 13 Oct 2013  19:39
Operator  : MES
Sample    : WG448462-06 200ug/L APPIX STD
Misc      : 1,1 STD60752
ALS Vial  : 7   Sample Multiplier: 1

Quant Time: Oct 17 17:43:06 2013
Quant Method : D:\MassHunter\GCMS\1\methods\A9FOOWT.M
Quant Title  : Appendix IX (SOP:OVL MSV01) WATER 10/13/13 HPMS17
QLast Update : Thu Oct 17 17:39:37 2013
Response via : Initial Calibration
```



```
                              Quantitation Report    (Not Reviewed)

Data Path : D:\MassHunter\GCMS\1\data\101313\
Data File : 17M000191.D
Acq On    : 13 Oct 2013  20:07
Operator  : MES
Sample    : WG448462-07 300ug/L APPIX STD
Misc      : 1,1 STD60752
ALS Vial  : 8   Sample Multiplier: 1

Quant Time: Oct 17 17:43:08 2013
Quant Method : D:\MassHunter\GCMS\1\methods\A9FOOWT.M
Quant Title  : Appendix IX (SOP:OVL MSV01) WATER 10/13/13 HPMS17
QLast Update : Thu Oct 17 17:39:37 2013
Response via : Initial Calibration

        Compound                   R.T. QIon  Response  Conc Units Dev(Min)
 ---------------------------------------------------------------------------
 Internal Standards
   1) Fluorobenzene              10.192   96   745118    25.0000 ug/L     0.00
  11) Chlorobenzene-d5           13.996  117   526334    25.0000 ug/L     0.00
  13) 1,4-Dichlorobenzene-d4     16.971  152   266080    25.0000 ug/L     0.00

 Target Compounds                                                  Qvalue
   2) Acetonitrile                6.129   41   157466   307.40 ug/L #    99
   3) 3-Chloro-1-propene          6.512   41  2977166   288.39 ug/L     100
   4) 2-Chloro-1,3-butadiene      7.932   53  2856242   299.04 ug/L     100
   5) Methacrylonitrile           8.762   67   587249   303.22 ug/L     100
   6) Ethyl Acetate               8.616   43  1333314   307.09 ug/L     100
   7) Isobutyl Alcohol            8.782   43    87294   603.83 ug/L      98
   8) 1-Butanol                   9.705   56    22963   291.08 ug/L      96
   9) Methyl methacrylate        10.928   41  1264197   308.82 ug/L      99
  10) 2-Nitropropane             11.249   43   491384   320.75 ug/L      99
  12) Cyclohexanone              15.250   55    32886   289.25 ug/L      99
 ---------------------------------------------------------------------------

 (#) = qualifier out of range (m) = manual integration (+) = signals summed
```

Quantitation Report (Not Reviewed)

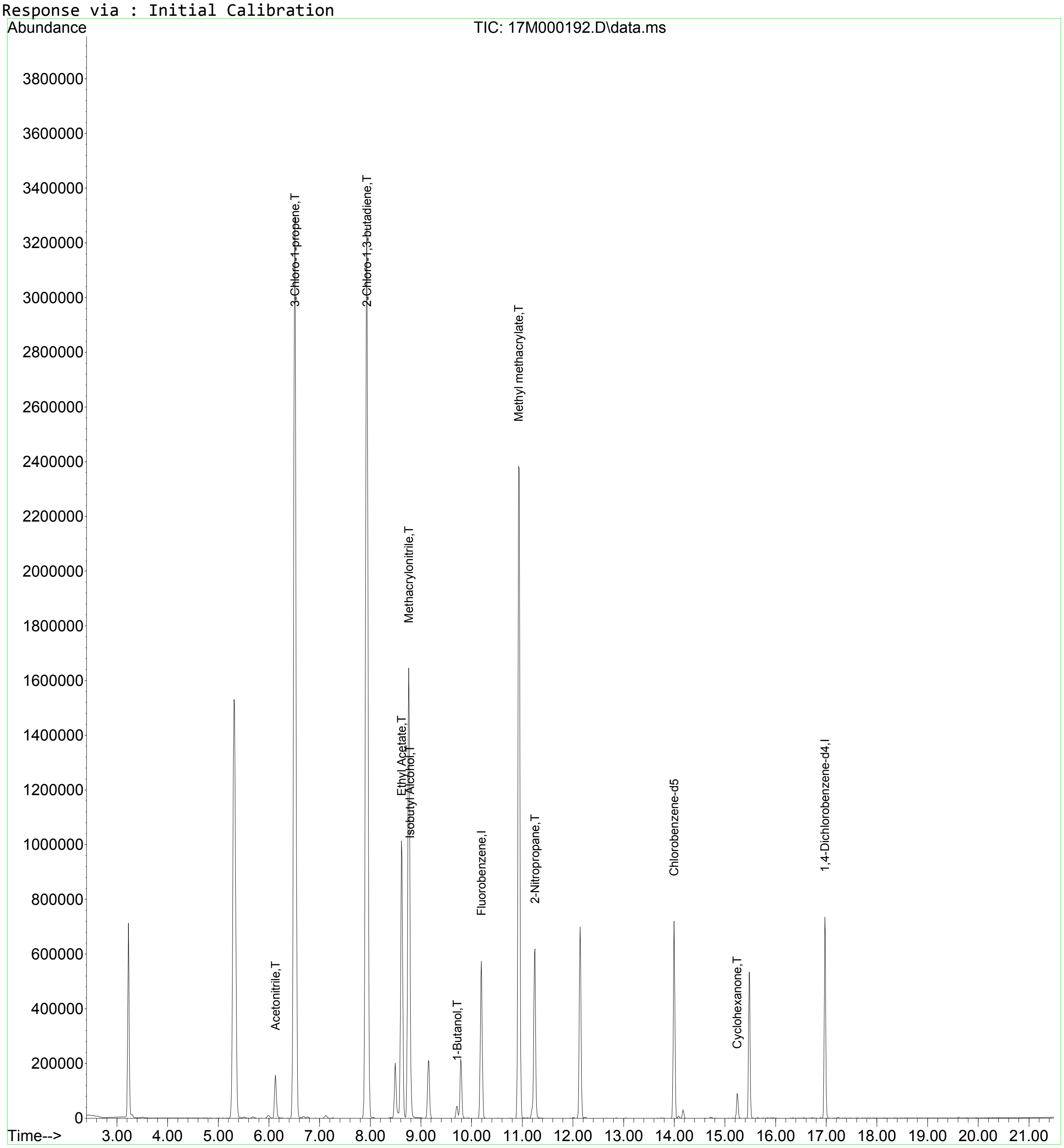
```
Data Path : D:\MassHunter\GCMS\1\data\101313\
Data File : 17M000191.D
Acq On    : 13 Oct 2013  20:07
Operator  : MES
Sample    : WG448462-07 300ug/L APPIX STD
Misc      : 1,1 STD60752
ALS Vial  : 8   Sample Multiplier: 1

Quant Time: Oct 17 17:43:08 2013
Quant Method : D:\MassHunter\GCMS\1\methods\A9FOOWT.M
Quant Title  : Appendix IX (SOP:OVL MSV01) WATER 10/13/13 HPMS17
QLast Update : Thu Oct 17 17:39:37 2013
Response via : Initial Calibration
```



```
                         Quantitation Report    (Not Reviewed)

Data Path : D:\MassHunter\GCMS\1\data\101313\
Data File : 17M000192.D
Acq On    : 13 Oct 2013  20:35
Operator  : MES
Sample    : WG448462-08 400ug/L APPIX STD
Misc      : 1,1 STD60752
ALS Vial  : 9   Sample Multiplier: 1

Quant Time: Oct 17 17:43:10 2013
Quant Method : D:\MassHunter\GCMS\1\methods\A9FOOWT.M
Quant Title  : Appendix IX (SOP:OVL MSV01) WATER 10/13/13 HPMS17
QLast Update : Thu Oct 17 17:39:37 2013
Response via : Initial Calibration

        Compound                   R.T. QIon  Response  Conc Units Dev(Min)
 --------------------------------------------------------------------------
 Internal Standards
   1) Fluorobenzene              10.192   96   728958    25.0000 ug/L     0.00
  11) Chlorobenzene-d5           13.996  117   513477    25.0000 ug/L     0.00
  13) 1,4-Dichlorobenzene-d4     16.971  152   258316    25.0000 ug/L     0.00

 Target Compounds                                                  Qvalue
   2) Acetonitrile                6.129   41   215922   430.86 ug/L #    98
   3) 3-Chloro-1-propene          6.512   41  3707052   367.06 ug/L     100
   4) 2-Chloro-1,3-butadiene      7.932   53  3605435   385.84 ug/L      99
   5) Methacrylonitrile           8.762   67   767786   405.22 ug/L      99
   6) Ethyl Acetate               8.616   43  1747197   411.34 ug/L     100
   7) Isobutyl Alcohol            8.782   43   125947   890.51 ug/L #    95
   8) 1-Butanol                   9.715   56    36038   418.14 ug/L      96
   9) Methyl methacrylate        10.928   41  1636030   408.51 ug/L      99
  10) 2-Nitropropane             11.249   43   653312   435.90 ug/L      99
  12) Cyclohexanone              15.240   55    51645   423.92 ug/L      98
 --------------------------------------------------------------------------

 (#) = qualifier out of range (m) = manual integration (+) = signals summed
```

Quantitation Report   (Not Reviewed)

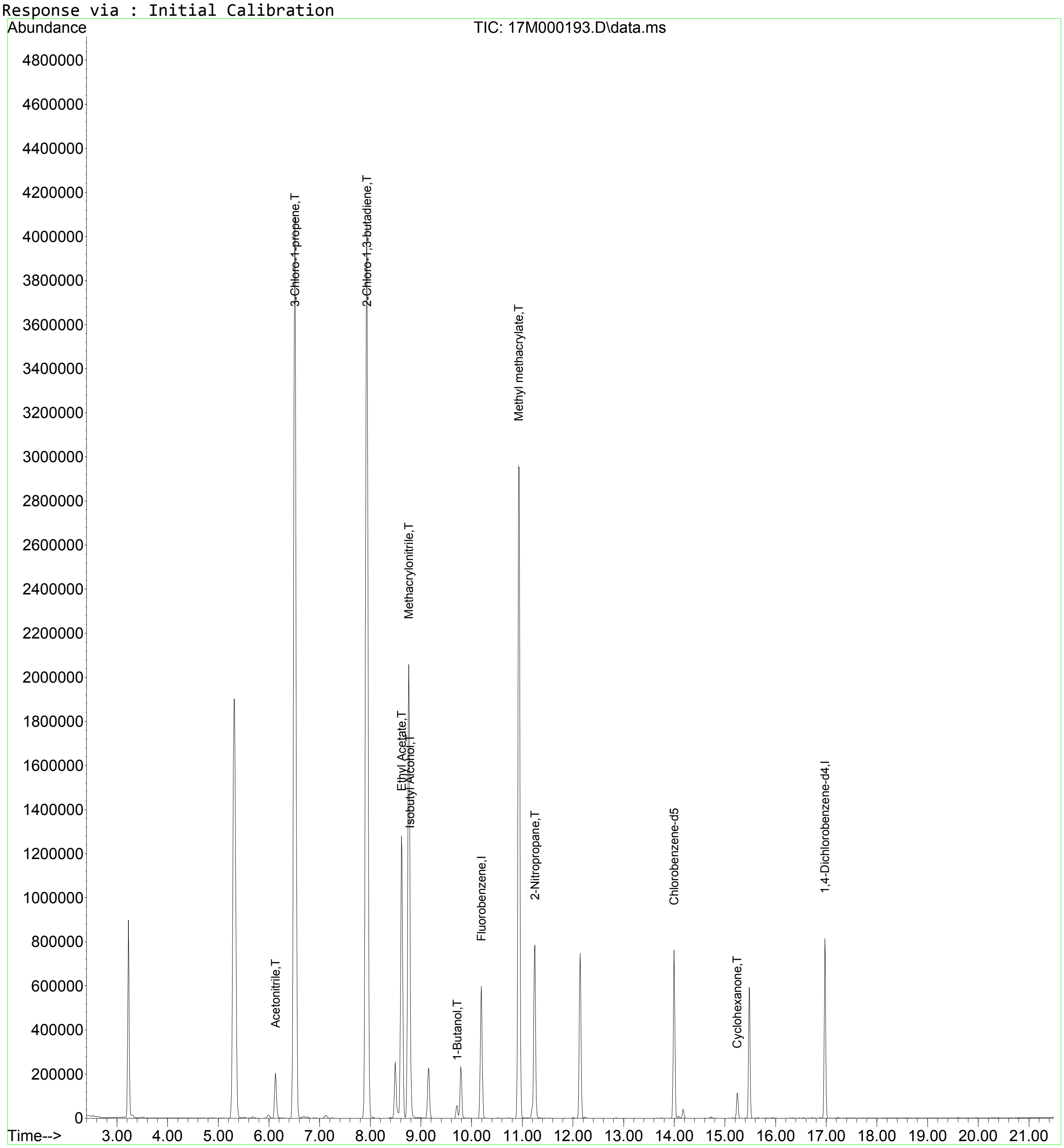
```
Data Path : D:\MassHunter\GCMS\1\data\101313\
Data File : 17M000192.D
Acq On    : 13 Oct 2013  20:35
Operator  : MES
Sample    : WG448462-08 400ug/L APPIX STD
Misc      : 1,1 STD60752
ALS Vial  : 9   Sample Multiplier: 1

Quant Time: Oct 17 17:43:10 2013
Quant Method : D:\MassHunter\GCMS\1\methods\A9FOOWT.M
Quant Title  : Appendix IX (SOP:OVL MSV01) WATER 10/13/13 HPMS17
QLast Update : Thu Oct 17 17:39:37 2013
Response via : Initial Calibration
```

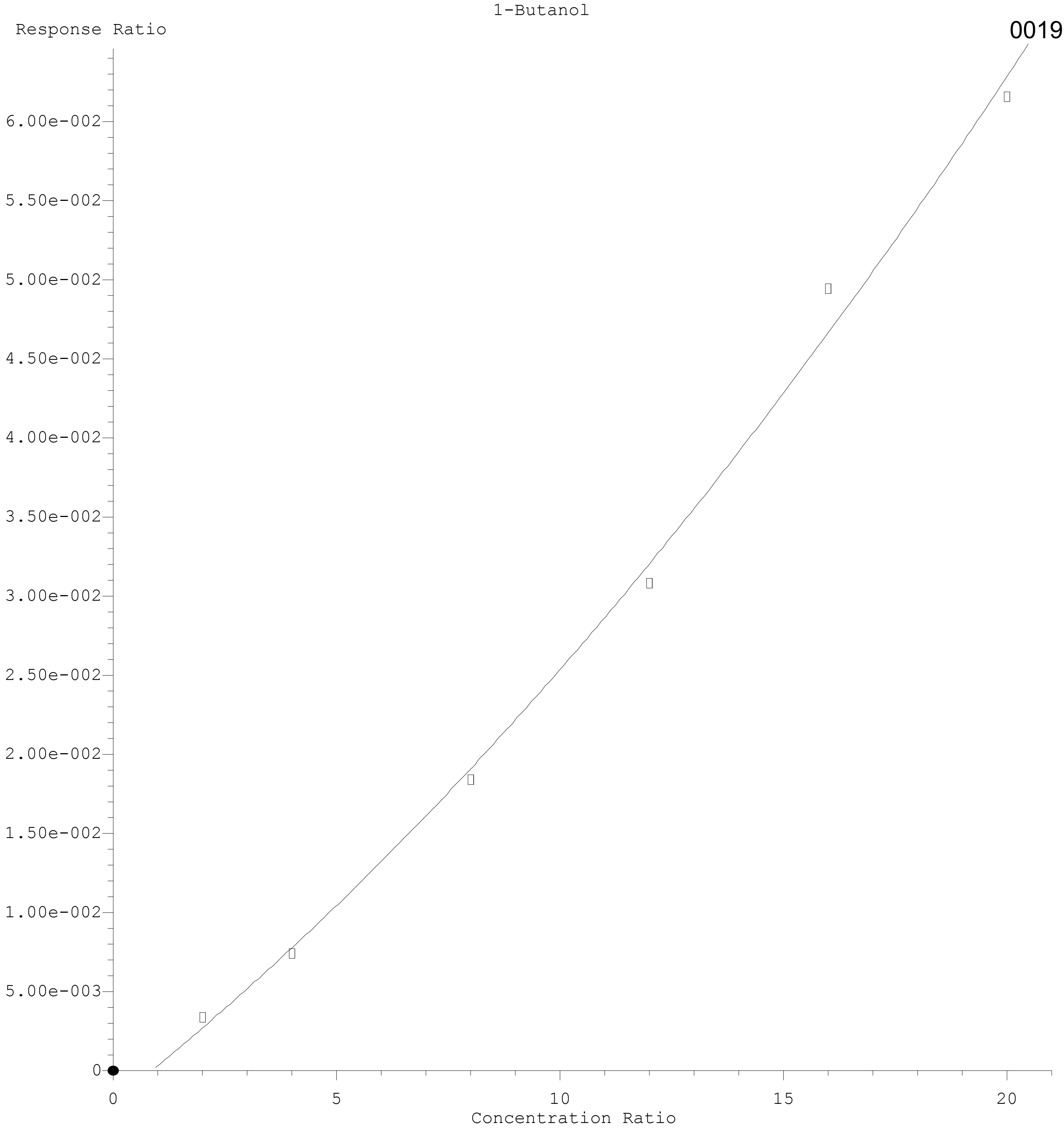


```
                           Quantitation Report    (Not Reviewed)

Data Path : D:\MassHunter\GCMS\1\data\101313\
Data File : 17M000193.D
Acq On    : 13 Oct 2013  21:03
Operator  : MES
Sample    : WG448462-09 500ug/L APPIX STD
Misc      : 1,1 STD60752
ALS Vial  : 10   Sample Multiplier: 1

Quant Time: Oct 17 17:43:12 2013
Quant Method : D:\MassHunter\GCMS\1\methods\A9FOOWT.M
Quant Title  : Appendix IX (SOP:OVL MSV01) WATER 10/13/13 HPMS17
QLast Update : Thu Oct 17 17:39:37 2013
Response via : Initial Calibration

        Compound                   R.T. QIon  Response  Conc Units Dev(Min)
 --------------------------------------------------------------------------
 Internal Standards
   1) Fluorobenzene              10.192   96   759233    25.0000 ug/L     0.00
  11) Chlorobenzene-d5           13.996  117   544729    25.0000 ug/L     0.00
  13) 1,4-Dichlorobenzene-d4     16.971  152   285472    25.0000 ug/L     0.00

 Target Compounds                                                  Qvalue
   2) Acetonitrile                6.129   41   279066   534.65 ug/L #    99
   3) 3-Chloro-1-propene          6.512   41  4641883   441.29 ug/L      99
   4) 2-Chloro-1,3-butadiene      7.932   53  4534980   465.97 ug/L     100
   5) Methacrylonitrile           8.761   67   970860   491.97 ug/L     100
   6) Ethyl Acetate               8.616   43  2217784   501.31 ug/L     100
   7) Isobutyl Alcohol            8.782   43   161004  1092.99 ug/L #    96
   8) 1-Butanol                   9.715   56    46748   492.64 ug/L      96
   9) Methyl methacrylate        10.928   41  2051591   491.84 ug/L      98
  10) 2-Nitropropane             11.249   43   836858   536.10 ug/L      99
  12) Cyclohexanone              15.240   55    65947   490.06 ug/L      99
 --------------------------------------------------------------------------

 (#) = qualifier out of range (m) = manual integration (+) = signals summed
```

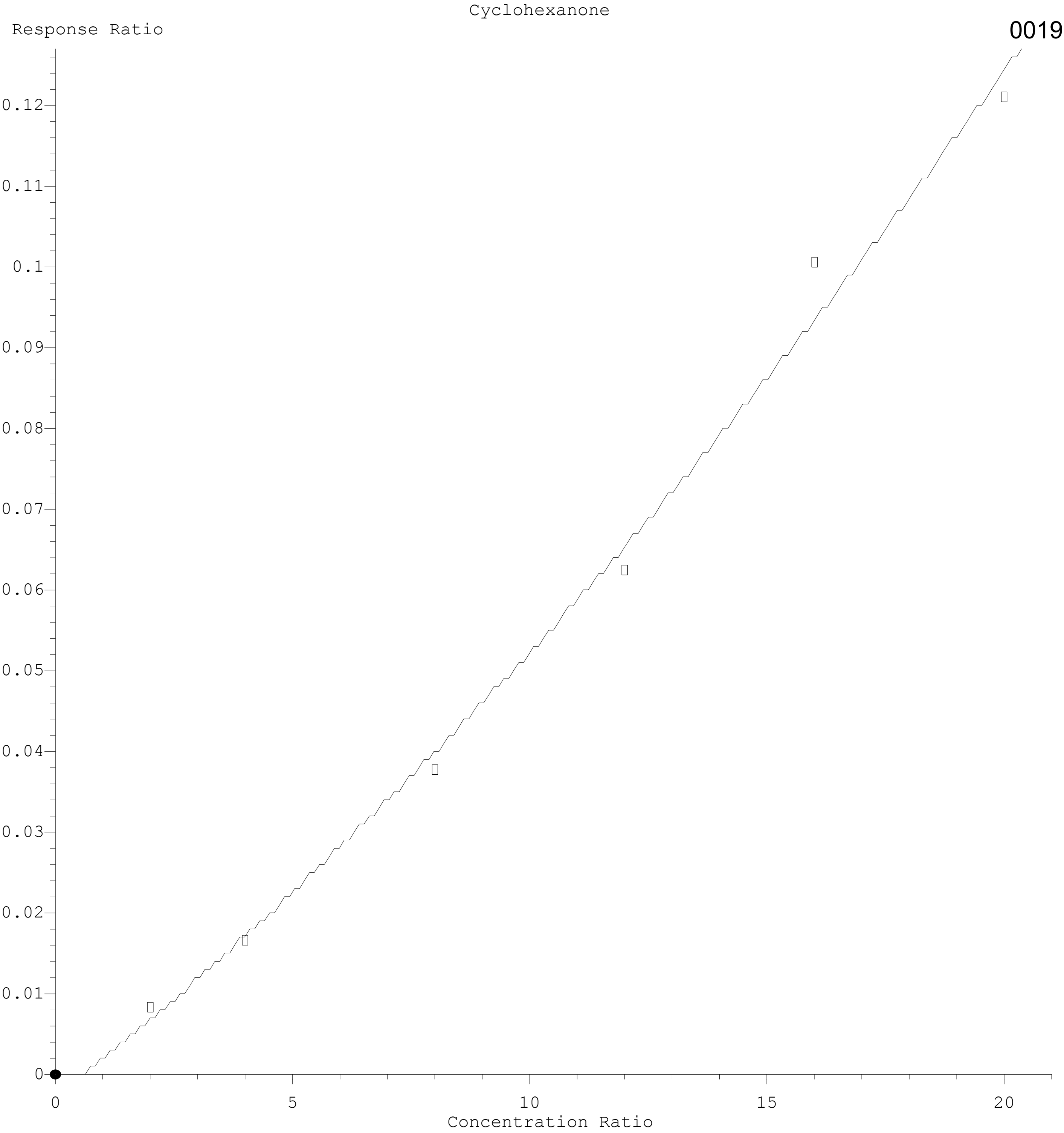
Quantitation Report (Not Reviewed)

```
Data Path : D:\MassHunter\GCMS\1\data\101313\
Data File : 17M000193.D
Acq On    : 13 Oct 2013  21:03
Operator  : MES
Sample    : WG448462-09 500ug/L APPIX STD
Misc      : 1,1 STD60752
ALS Vial  : 10   Sample Multiplier: 1

Quant Time: Oct 17 17:43:12 2013
Quant Method : D:\MassHunter\GCMS\1\methods\A9FOOWT.M
Quant Title  : Appendix IX (SOP:OVL MSV01) WATER 10/13/13 HPMS17
QLast Update : Thu Oct 17 17:39:37 2013
Response via : Initial Calibration
```





R = 5.08e-005 A*A + 2.22e-003 A - 1.95e-003
Coef of Det (r^2) = 0.995563   Curve Fit: Quadratic
Method Name: D:\MassHunter\GCMS\1\methods\A9FOOWT.M
Calibration Table Last Updated: Thu Oct 17 17:48:22 2013

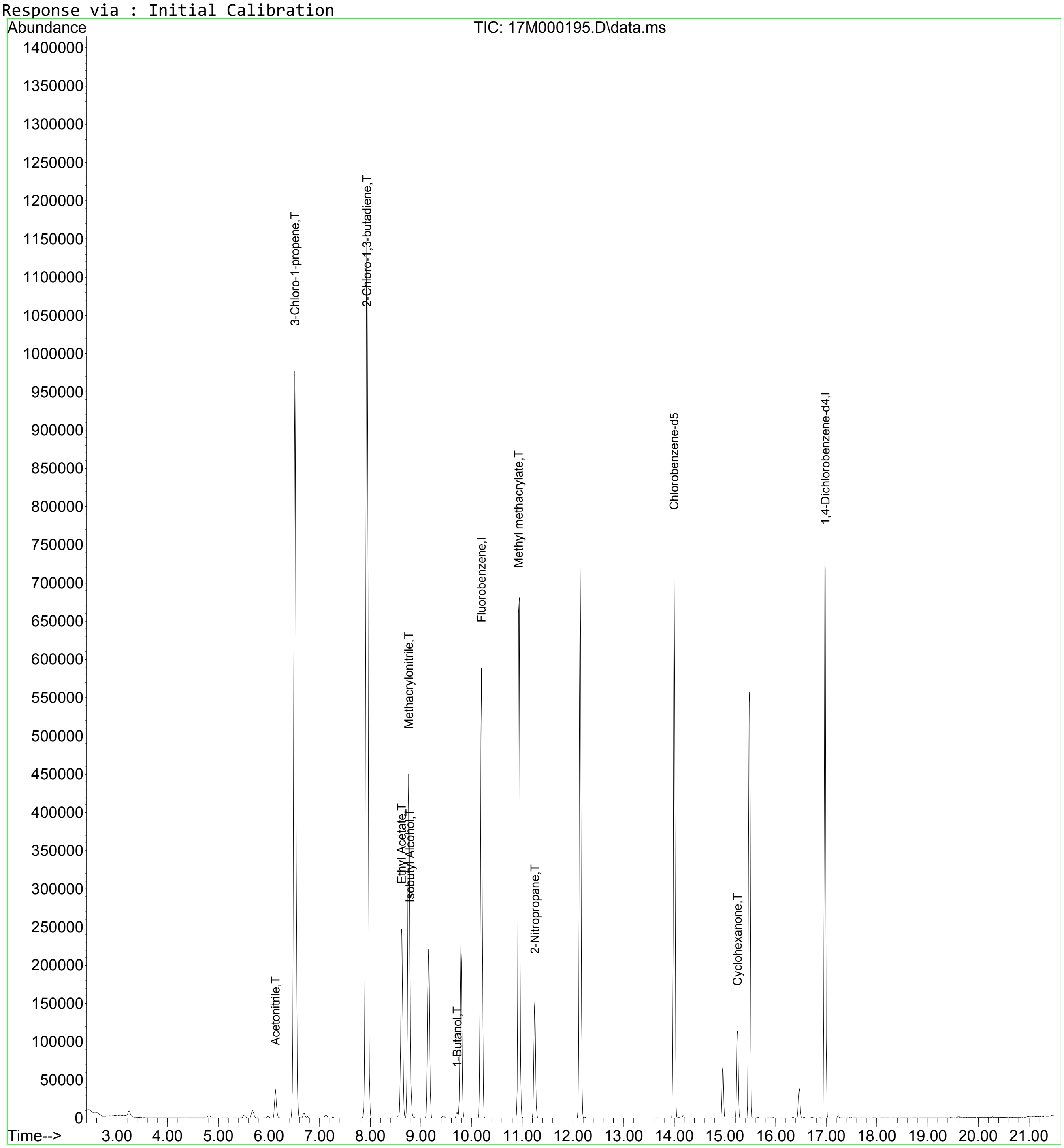


R = 8.36e-005 A*A + 4.69e-003 A - 2.95e-003
Coef of Det (r^2) = 0.992665   Curve Fit: Quadratic
Method Name: D:\MassHunter\GCMS\1\methods\A9FOOWT.M
Calibration Table Last Updated: Thu Oct 17 17:48:22 2013

```
                             Quantitation Report    (Not Reviewed)

Data Path : D:\MassHunter\GCMS\1\data\101313\
Data File : 17M000195.D
Acq On    : 13 Oct 2013  22:00
Operator  : MES
Sample    : WG448462-10 100ug/L APPIX ALT SRC
Misc      : 1,1 STD60749
ALS Vial  : 12   Sample Multiplier: 1

Quant Time: Oct 17 17:44:26 2013
Quant Method : D:\MassHunter\GCMS\1\methods\A9FOOWT.M
Quant Title  : Appendix IX (SOP:OVL MSV01) WATER 10/13/13 HPMS17
QLast Update : Thu Oct 17 17:39:37 2013
Response via : Initial Calibration

        Compound                   R.T. QIon  Response  Conc Units Dev(Min)
 --------------------------------------------------------------------------
 Internal Standards
   1) Fluorobenzene              10.192   96   737303    25.0000 ug/L     0.00
  11) Chlorobenzene-d5           13.996  117   523223    25.0000 ug/L     0.00
  13) 1,4-Dichlorobenzene-d4     16.981  152   266615    25.0000 ug/L     0.01

 Target Compounds                                                   Qvalue
   2) Acetonitrile                6.129   41    50664    99.95 ug/L #   100
   3) 3-Chloro-1-propene          6.512   41  1059147   103.69 ug/L     100
   4) 2-Chloro-1,3-butadiene      7.932   53  1242553   131.47 ug/L      99
   5) Methacrylonitrile           8.761   67   206460   107.73 ug/L     100
   6) Ethyl Acetate               8.616   43   431934   100.54 ug/L     100
   7) Isobutyl Alcohol            8.782   43    27315   190.94 ug/L      99
   8) 1-Butanol                   9.715   56     5884   102.15 ug/L      97
   9) Methyl methacrylate        10.928   41   453602   111.98 ug/L      99
  10) 2-Nitropropane             11.249   43   153443   101.22 ug/L      99
  12) Cyclohexanone              15.250   55    65010   500.01 ug/L      98
 --------------------------------------------------------------------------

 (#) = qualifier out of range (m) = manual integration (+) = signals summed
```

Quantitation Report (Not Reviewed)

```
Data Path : D:\MassHunter\GCMS\1\data\101313\
Data File : 17M000195.D
Acq On    : 13 Oct 2013  22:00
Operator  : MES
Sample    : WG448462-10 100ug/L APPIX ALT SRC
Misc      : 1,1 STD60749
ALS Vial  : 12   Sample Multiplier: 1

Quant Time: Oct 17 17:44:26 2013
Quant Method : D:\MassHunter\GCMS\1\methods\A9FOOWT.M
Quant Title  : Appendix IX (SOP:OVL MSV01) WATER 10/13/13 HPMS17
QLast Update : Thu Oct 17 17:39:37 2013
Response via : Initial Calibration
```

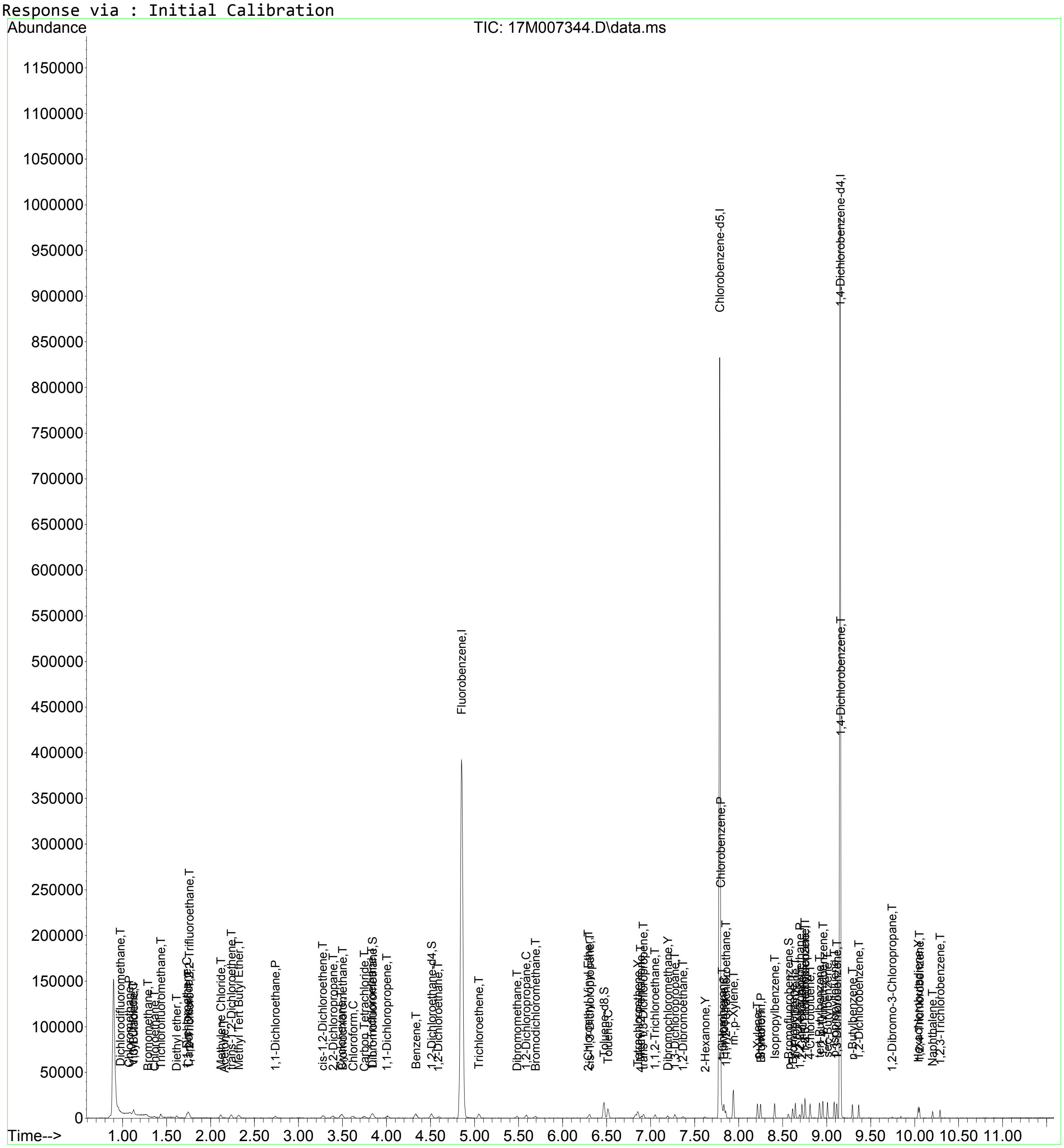


```
                         Evaluate Continuing Calibration Report

  Data Path : D:\MassHunter\GCMS\1\data\101313\
  Data File : 17M000195.D
  Acq On    : 13 Oct 2013  22:00
  Operator  : MES
  Sample    : WG448462-10 100ug/L APPIX ALT SRC
  Misc      : 1,1 STD60749
  ALS Vial  : 12   Sample Multiplier: 1

  Quant Time: Oct 17 17:44:26 2013
  Quant Method : D:\MassHunter\GCMS\1\methods\A9FOOWT.M
  Quant Title  : Appendix IX (SOP:OVL MSV01) WATER 10/13/13 HPMS17
  QLast Update : Thu Oct 17 17:39:37 2013
  Response via : Initial Calibration


  Min. RRF     :   0.000  Min. Rel. Area :  50%  Max. R.T. Dev  0.50min
  Max. RRF Dev :  25%     Max. Rel. Area : 150%

         Compound                      Amount  Calc.     %Dev Area% Dev(min)
  ------------------------------------------------------------------------
  1 I    Fluorobenzene                25.000  25.000       0.0   97   0.00
  2 T    Acetonitrile                100.000  99.953       0.0  102   0.00
  3 T    3-Chloro-1-propene          100.000 103.685      -3.7   94   0.00
  4 T    2-Chloro-1,3-butadiene      100.000 131.470     -31.5# 120   0.00
  5 T    Methacrylonitrile           100.000 107.732      -7.7  101   0.00
  6 T    Ethyl Acetate               100.000 100.539      -0.5   94   0.00
  7 T    Isobutyl Alcohol            200.000 190.945       4.5  101   0.00
  8 T    1-Butanol                   100.000 102.146      -2.1  104   0.00
  9 T    Methyl methacrylate         100.000 111.979     -12.0  101   0.00
 10 T    2-Nitropropane              100.000 101.221      -1.2   99   0.00

 11      Chlorobenzene-d5             25.000  25.000       0.0   96   0.00
 12 T    Cyclohexanone               100.000 500.013    -400.0# 719   0.00

 13 I    1,4-Dichlorobenzene-d4       25.000  25.000       0.0   96   0.01
 -------------------------------------------------------------------------

   (#) = Out of Range               SPCC's out = 0  CCC's out = 0
```

```
                             Quantitation Report    (Not Reviewed)

  Data Path : D:\MassHunter\GCMS\1\data\081214\
  Data File : 17M007344.D
  Acq On    : 12 Aug 2014  14:53
  Operator  : ADC
  Sample    : WG487972-02 0.3ug/L STD 8260
  Misc      : 1,1 STD65747
  ALS Vial  : 3   Sample Multiplier: 1

  Quant Time: Aug 13 09:32:21 2014
  Quant Method : D:\MassHunter\GCMS\1\methods\8260VMS.M
  Quant Title  : 8260B/624 SOP:OVL MSV01 WATER 08/12/14 HPMS17
  QLast Update : Wed Aug 13 09:32:02 2014
  Response via : Initial Calibration

          Compound                   R.T. QIon  Response  Conc Units Dev(Min)
   --------------------------------------------------------------------------
   Internal Standards
     1) Fluorobenzene               4.852   96   375367   25.00000 ug/L      0.0000
    43) Chlorobenzene-d5            7.785  117   290016   25.00000 ug/L      0.0000
    61) 1,4-Dichlorobenzene-d4      9.154  152   138694   25.00000 ug/L      0.0000

   System Monitoring Compounds
    27) Dibromofluoromethane        3.838  111     3039     0.6166 ug/L    0.0000
     Spiked Amount     25.000   Range  86 - 118    Recovery   =    2.466%#
    32) 1,2-Dichloroethane-d4       4.513   65     3765     0.7670 ug/L    0.0000
     Spiked Amount     25.000   Range  80 - 120    Recovery   =    3.068%#
    44) Toluene-d8                  6.470   98    10096     0.5589 ug/L    0.0000
     Spiked Amount     25.000   Range  88 - 110    Recovery   =    2.236%#
    63) p-Bromofluorobenzene        8.566   95      912     0.1566 ug/L    0.0000
     Spiked Amount     25.000   Range  86 - 115    Recovery   =    0.626%#

   Target Compounds                                                   Qvalue
     2) Dichlorodifluoromethane     0.975   85      870     0.2477 ug/L #    71
     3) Chloromethane               1.076   50     1301     0.2903 ug/L      94
     4) Vinyl Chloride              1.117   62     1338     0.2801 ug/L      92
     5) 1,3-Butadiene               1.125   54     1012     0.3129 ug/L      91
     6) Bromomethane                1.287   94      571     0.5664 ug/L      98
     7) Chloroethane                1.363   64      756     0.2827 ug/L      93
     8) Trichlorofluoromethane      1.435  101     1884     0.3050 ug/L      97
     9) Diethyl ether               1.612   59      717     0.2712 ug/L #    66
    10) 1,1-Dichloroethene          1.730   61     1916     0.2992 ug/L      98
    11) Carbon Disulfide            1.748   76     4310     0.3937 ug/L #    94
    12) 1,1,2-Trichloro-1,2,2-...   1.759  101     1238     0.3095 ug/L      94
    14) Methylene Chloride          2.118   84     1605     0.3551 ug/L      95
    15) Acetone                     2.156   43      563     0.6720 ug/L #    43
    16) trans-1,2-Dichloroethene    2.234   96     1387     0.3295 ug/L      95
    17) Methyl Tert Butyl Ether     2.321   73     3299     0.2976 ug/L      97
    18) 1,1-Dichloroethane          2.735   63     2275     0.2827 ug/L      91
    21) cis-1,2-Dichloroethene      3.274   96     1480     0.3130 ug/L      93
    22) 2,2-Dichloropropane         3.392   77     2041     0.3127 ug/L      95
    23) Cyclohexane                 3.485   56     2001     0.3067 ug/L      95
    24) Bromochloromethane          3.500  130      698     0.2350 ug/L      96
    25) Chloroform                  3.618   83     2401     0.3035 ug/L      91
    26) Carbon Tetrachloride        3.746  117     1618     0.2564 ug/L #    90
    28) 1,1,1-Trichloroethane       3.830   97     1970     0.2759 ug/L      95
    29) 1,1-Dichloropropene         4.003   75     1754     0.2950 ug/L      96
    31) Benzene                     4.333   78     5075     0.2857 ug/L      98
    33) 1,2-Dichloroethane          4.585   62     1596     0.3012 ug/L #    76
    34) Trichloroethene             5.049  130     1566     0.3050 ug/L      97
    35) Dibromomethane              5.480   93      652     0.2529 ug/L      92
    36) 1,2-Dichloropropane         5.584   63     1483     0.3055 ug/L      86
    37) Bromodichloromethane        5.691   83     1588     0.2629 ug/L      99
    39) 2-Chloroethyl Vinyl Ether   6.291   63      547     0.2259 ug/L #    43
    40) cis-1,3-Dichloropropene     6.308   75     2180     0.3022 ug/L      91
    41) 4-Methyl-2-Pentanone        6.887   58      294     0.2411 ug/L #    25
    42) trans-1,3-Dichloropropene   6.916   75     1929     0.3069 ug/L      94
    45) Toluene                     6.516   91     6737     0.3409 ug/L     100
    46) Tetrachloroethene           6.855  166     1782     0.3298 ug/L      97
    47) 1,1,2-Trichloroethane       7.049   97     1018     0.2797 ug/L      97
    48) Dibromochloromethane        7.194  129     1304     0.2720 ug/L      88
    49) 1,3-Dichloropropane         7.275   76     1769     0.2939 ug/L      99
    50) 1,2-Dibromoethane           7.368  107     1022     0.2841 ug/L      94
    51) 2-Hexanone                  7.620   43      652     0.2896 ug/L #    85
    52) Chlorobenzene               7.796  112     4188     0.3264 ug/L #    20
    53) 1-Chlorohexane              7.814   69      300     0.2605 ug/L #    34
    54) Ethylbenzene                7.834  106     2131     0.3079 ug/L      96

8260VMS.M Wed Aug 13 09:36:38 2014                                                   Page:  1
```

```
                              Quantitation Report    (Not Reviewed)

Data Path : D:\MassHunter\GCMS\1\data\081214\
Data File : 17M007344.D
Acq On    : 12 Aug 2014  14:53
Operator  : ADC
Sample    : WG487972-02 0.3ug/L STD 8260
Misc      : 1,1 STD65747
ALS Vial  : 3   Sample Multiplier: 1

Quant Time: Aug 13 09:32:21 2014
Quant Method : D:\MassHunter\GCMS\1\methods\8260VMS.M
Quant Title  : 8260B/624 SOP:OVL MSV01 WATER 08/12/14 HPMS17
QLast Update : Wed Aug 13 09:32:02 2014
Response via : Initial Calibration

        Compound                   R.T. QIon  Response  Conc Units Dev(Min)
 --------------------------------------------------------------------------
  55) 1,1,1,2-Tetrachloroethane   7.854  131     1400     0.2904 ug/L      83
  56) m-,p-Xylene                 7.941  106     5174     0.6267 ug/L      98
  57) o-Xylene                    8.213  106     2536     0.3111 ug/L      99
  58) Styrene                     8.248  104     3749     0.2891 ug/L      99
  59) Bromoform                   8.254  173      800     0.2362 ug/L #    88
  60) Isopropylbenzene            8.410  105     6289     0.3004 ug/L      99
  62) 1,3,5-Trimethylbenzene      8.755  105     5412     0.3175 ug/L      98
  64) Bromobenzene                8.616  156     1705     0.3137 ug/L      99
  65) n-Propylbenzene             8.645   91     7130     0.3123 ug/L      98
  66) 1,1,2,2-Tetrachloroethane   8.694   83     1263     0.3132 ug/L      91
  67) 2-Chlorotoluene             8.720   91     4442     0.3252 ug/L      99
  68) 1,2,3-Trichloropropane      8.755  110      287     0.2604 ug/L      76
  69) 1,2,4-Trimethylbenzene      8.957  105     5643     0.3318 ug/L     100
  70) 4-Chlorotoluene             8.812   91     4621     0.3298 ug/L      99
  71) tert-Butylbenzene           8.920  134      930     0.2882 ug/L      91
  72) sec-Butylbenzene            9.009  105     6418     0.3033 ug/L      99
  73) p-Isopropyltoluene          9.085  119     5201     0.2912 ug/L      96
  74) 1,3-Dichlorobenzene         9.116  146     3406     0.3474 ug/L      97
  75) 1,4-Dichlorobenzene         9.160  146     3653     0.3596 ug/L      91
  76) n-Butylbenzene              9.293   91     4562     0.2964 ug/L      99
  77) 1,2-Dichlorobenzene         9.365  146     3048     0.3189 ug/L      97
  78) 1,2-Dibromo-3-Chloropr...   9.745   75      183     0.2516 ug/L      84
  79) Hexachlorobutadiene        10.040  225     1266     0.3000 ug/L      98
  80) 1,2,4-Trichlorobenzene     10.055  180     1917     0.2822 ug/L      97
  81) Naphthalene                10.202  128     2937     0.2403 ug/L     100
  82) 1,2,3-Trichlorobenzene     10.289  180     1653     0.2679 ug/L     100
 --------------------------------------------------------------------------

 (#) = qualifier out of range (m) = manual integration (+) = signals summed
```

```
                         Quantitation Report    (Not Reviewed)

Data Path : D:\MassHunter\GCMS\1\data\081214\
Data File : 17M007344.D
Acq On    : 12 Aug 2014  14:53
Operator  : ADC
Sample    : WG487972-02 0.3ug/L STD 8260
Misc      : 1,1 STD65747
ALS Vial  : 3   Sample Multiplier: 1

Quant Time: Aug 13 09:32:21 2014
Quant Method : D:\MassHunter\GCMS\1\methods\8260VMS.M
Quant Title  : 8260B/624 SOP:OVL MSV01 WATER 08/12/14 HPMS17
QLast Update : Wed Aug 13 09:32:02 2014
Response via : Initial Calibration
```



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8260VMS.M Wed Aug 13 09:36:39 2014                                    Page: 3
```

```
                         Quantitation Report    (Not Reviewed)

Data Path : D:\MassHunter\GCMS\1\data\081214\
Data File : 17M007345.D
Acq On    : 12 Aug 2014  15:13
Operator  : ADC
Sample    : WG487972-03 0.4ug/L STD 8260
Misc      : 1,1 STD65747
ALS Vial  : 4   Sample Multiplier: 1

Quant Time: Aug 13 09:38:21 2014
Quant Method : D:\MassHunter\GCMS\1\methods\8260VMS.M
Quant Title  : 8260B/624 SOP:OVL MSV01 WATER 08/12/14 HPMS17
QLast Update : Wed Aug 13 09:38:18 2014
Response via : Initial Calibration

        Compound                   R.T. QIon  Response  Conc Units Dev(Min)
 --------------------------------------------------------------------------
 Internal Standards
   1) Fluorobenzene              4.852   96   369765    25.00000 ug/L     0.0000
  43) Chlorobenzene-d5           7.785  117   280841    25.00000 ug/L     0.0000
  61) 1,4-Dichlorobenzene-d4     9.154  152   136044    25.00000 ug/L     0.0000

 System Monitoring Compounds
  27) Dibromofluoromethane       3.841  111     2781     0.5728 ug/L    0.0000
   Spiked Amount     25.000   Range  86 - 118    Recovery   =    2.291%#
  32) 1,2-Dichloroethane-d4      4.507   65     3638     0.7524 ug/L    0.0000
   Spiked Amount     25.000   Range  80 - 120    Recovery   =    3.010%#
  44) Toluene-d8                 6.473   98     9486     0.5423 ug/L    0.0000
   Spiked Amount     25.000   Range  88 - 110    Recovery   =    2.169%#
  63) p-Bromofluorobenzene       8.563   95      883     0.1546 ug/L    0.0000
   Spiked Amount     25.000   Range  86 - 115    Recovery   =    0.618%#

 Target Compounds                                                 Qvalue
   2) Dichlorodifluoromethane    0.975   85     1192     0.3446 ug/L #    71
   3) Chloromethane              1.076   50     1852     0.4196 ug/L      88
   4) Vinyl Chloride             1.122   62     1879     0.3993 ug/L      99
   5) 1,3-Butadiene              1.128   54     1321     0.4146 ug/L      89
   6) Bromomethane               1.290   94      764     0.3301 ug/L      97
   7) Chloroethane               1.360   64     1116     0.4236 ug/L     100
   8) Trichlorofluoromethane     1.438  101     2692     0.4424 ug/L      98
   9) Diethyl ether              1.615   59     1105     0.4244 ug/L #    72
  10) 1,1-Dichloroethene         1.733   61     2659     0.4215 ug/L      99
  11) Carbon Disulfide           1.745   76     5597     0.5190 ug/L #    94
  12) 1,1,2-Trichloro-1,2,2-...  1.759  101     1799     0.4565 ug/L      92
  14) Methylene Chloride         2.118   84     2074     0.4658 ug/L      96
  15) Acetone                    2.159   43      625     0.7573 ug/L #    43
  16) trans-1,2-Dichloroethene   2.237   96     1773     0.4276 ug/L      95
  17) Methyl Tert Butyl Ether    2.318   73     4413     0.4041 ug/L      98
  18) 1,1-Dichloroethane         2.735   63     3281     0.4139 ug/L      97
  19) Acrylonitrile              2.793   53      314     0.3167 ug/L      91
  21) cis-1,2-Dichloroethene     3.274   96     2048     0.4396 ug/L      98
  22) 2,2-Dichloropropane        3.384   77     2832     0.4405 ug/L     100
  23) Cyclohexane                3.485   56     2843     0.4424 ug/L      97
  24) Bromochloromethane         3.499  130     1060     0.3622 ug/L      93
  25) Chloroform                 3.615   83     3336     0.4280 ug/L      95
  26) Carbon Tetrachloride       3.745  117     2321     0.3734 ug/L #    96
  28) 1,1,1-Trichloroethane      3.838   97     2866     0.4074 ug/L      97
  29) 1,1-Dichloropropene        4.006   75     2610     0.4457 ug/L      94
  30) 2-Butanone                 4.018   43      416     0.3111 ug/L #    40
  31) Benzene                    4.333   78     7551     0.4316 ug/L      97
  33) 1,2-Dichloroethane         4.591   62     2091     0.4007 ug/L #    91
  34) Trichloroethene            5.051  130     2184     0.4318 ug/L      97
  35) Dibromomethane             5.488   93      975     0.3840 ug/L      93
  36) 1,2-Dichloropropane        5.590   63     1803     0.3771 ug/L      99
  37) Bromodichloromethane       5.691   83     2329     0.3914 ug/L      99
  39) 2-Chloroethyl Vinyl Ether  6.285   63      781     0.3275 ug/L #    43
  40) cis-1,3-Dichloropropene    6.305   75     2738     0.3853 ug/L      94
  41) 4-Methyl-2-Pentanone       6.890   58      465     0.3871 ug/L      71
  42) trans-1,3-Dichloropropene  6.919   75     2527     0.4082 ug/L      93
  45) Toluene                    6.513   91     8328     0.4352 ug/L     100
  46) Tetrachloroethene          6.855  166     2324     0.4442 ug/L      98
  47) 1,1,2-Trichloroethane      7.049   97     1529     0.4338 ug/L      93
  48) Dibromochloromethane       7.191  129     1725     0.3715 ug/L     100
  49) 1,3-Dichloropropane        7.275   76     2426     0.4162 ug/L     100
  50) 1,2-Dibromoethane          7.368  107     1309     0.3758 ug/L      97
  51) 2-Hexanone                 7.617   43      926     0.4247 ug/L #    77
  52) Chlorobenzene              7.796  112     5522     0.4445 ug/L #    40

8260VMS.M Wed Aug 13 09:38:22 2014                                         Page:  1
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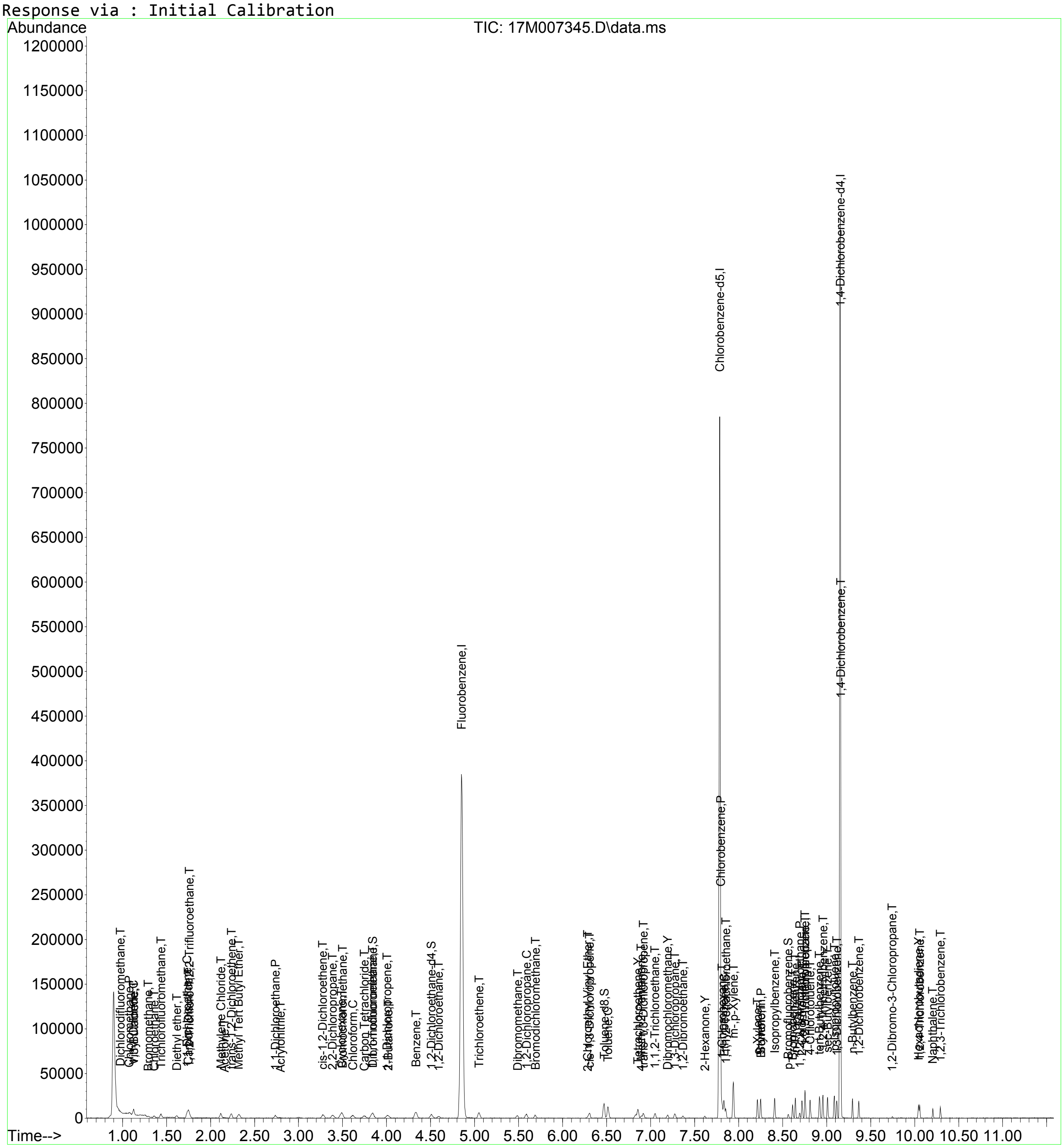
```
                              Quantitation Report    (Not Reviewed)

  Data Path : D:\MassHunter\GCMS\1\data\081214\
  Data File : 17M007345.D
  Acq On    : 12 Aug 2014  15:13
  Operator  : ADC
  Sample    : WG487972-03 0.4ug/L STD 8260
  Misc      : 1,1 STD65747
  ALS Vial  : 4   Sample Multiplier: 1

  Quant Time: Aug 13 09:38:21 2014
  Quant Method : D:\MassHunter\GCMS\1\methods\8260VMS.M
  Quant Title  : 8260B/624 SOP:OVL MSV01 WATER 08/12/14 HPMS17
  QLast Update : Wed Aug 13 09:38:18 2014
  Response via : Initial Calibration

          Compound                   R.T. QIon  Response  Conc Units Dev(Min)
   --------------------------------------------------------------------------
    53) 1-Chlorohexane              7.811   69      431     0.3865 ug/L      58
    54) Ethylbenzene                7.837  106     2987     0.4456 ug/L      94
    55) 1,1,1,2-Tetrachloroethane   7.854  131     1894     0.4057 ug/L      77
    56) m-,p-Xylene                 7.941  106     6845     0.8562 ug/L      96
    57) o-Xylene                    8.213  106     3328     0.4216 ug/L      96
    58) Styrene                     8.251  104     4975     0.3962 ug/L     100
    59) Bromoform                   8.254  173     1214     0.3701 ug/L      97
    60) Isopropylbenzene            8.410  105     8585     0.4234 ug/L      99
    62) 1,3,5-Trimethylbenzene      8.754  105     7238     0.4329 ug/L      99
    64) Bromobenzene                8.613  156     2301     0.4317 ug/L      97
    65) n-Propylbenzene             8.644   91     9769     0.4362 ug/L      98
    66) 1,1,2,2-Tetrachloroethane   8.694   83     1703     0.4305 ug/L      94
    67) 2-Chlorotoluene             8.720   91     5893     0.4399 ug/L      98
    68) 1,2,3-Trichloropropane      8.754  110      412     0.3810 ug/L      78
    69) 1,2,4-Trimethylbenzene      8.957  105     7228     0.4332 ug/L     100
    70) 4-Chlorotoluene             8.812   91     6126     0.4457 ug/L      98
    71) tert-Butylbenzene           8.917  134     1292     0.4082 ug/L      84
    72) sec-Butylbenzene            9.009  105     8915     0.4295 ug/L      98
    73) p-Isopropyltoluene          9.087  119     7421     0.4237 ug/L      99
    74) 1,3-Dichlorobenzene         9.116  146     4192     0.4359 ug/L      99
    75) 1,4-Dichlorobenzene         9.160  146     4494     0.4510 ug/L      89
    76) n-Butylbenzene              9.293   91     6243     0.4135 ug/L      99
    77) 1,2-Dichlorobenzene         9.365  146     3969     0.4233 ug/L      99
    78) 1,2-Dibromo-3-Chloropr...   9.745   75      258     0.3617 ug/L      92
    79) Hexachlorobutadiene        10.043  225     1666     0.4025 ug/L      99
    80) 1,2,4-Trichlorobenzene     10.057  180     2507     0.3762 ug/L      99
    81) Naphthalene                10.205  128     4075     0.3399 ug/L      98
    82) 1,2,3-Trichlorobenzene     10.292  180     2086     0.3446 ug/L      95
   --------------------------------------------------------------------------

   (#) = qualifier out of range (m) = manual integration (+) = signals summed
```

```
Data Path : D:\MassHunter\GCMS\1\data\081214\
Data File : 17M007345.D
Acq On    : 12 Aug 2014  15:13
Operator  : ADC
Sample    : WG487972-03 0.4ug/L STD 8260
Misc      : 1,1 STD65747
ALS Vial  : 4   Sample Multiplier: 1

Quant Time: Aug 13 09:38:21 2014
Quant Method : D:\MassHunter\GCMS\1\methods\8260VMS.M
Quant Title  : 8260B/624 SOP:OVL MSV01 WATER 08/12/14 HPMS17
QLast Update : Wed Aug 13 09:38:18 2014
Response via : Initial Calibration
```



```
                          Quantitation Report    (Not Reviewed)

     Data Path : D:\MassHunter\GCMS\1\data\081214\
     Data File : 17M007346.D
     Acq On    : 12 Aug 2014  15:33
     Operator  : ADC
     Sample    : WG487972-04 1.0ug/L STD 8260
     Misc      : 1,1 STD65747
     ALS Vial  : 5   Sample Multiplier: 1

     Quant Time: Aug 13 09:38:55 2014
     Quant Method : D:\MassHunter\GCMS\1\methods\8260VMS.M
     Quant Title  : 8260B/624 SOP:OVL MSV01 WATER 08/12/14 HPMS17
     QLast Update : Wed Aug 13 09:38:18 2014
     Response via : Initial Calibration

             Compound                   R.T. QIon  Response  Conc Units Dev(Min)
      ------------------------------------------------------------------------
      Internal Standards
        1) Fluorobenzene               4.855   96   374792    25.00000 ug/L     0.0000
       43) Chlorobenzene-d5            7.785  117   280812    25.00000 ug/L     0.0000
       61) 1,4-Dichlorobenzene-d4      9.154  152   136873    25.00000 ug/L     0.0000

      System Monitoring Compounds
       27) Dibromofluoromethane        3.838  111     5026     1.0213 ug/L    0.0000
        Spiked Amount     25.000   Range  86 - 118    Recovery   =    4.085%#
       32) 1,2-Dichloroethane-d4       4.513   65     5977     1.2195 ug/L    0.0000
        Spiked Amount     25.000   Range  80 - 120    Recovery   =    4.878%#
       44) Toluene-d8                  6.470   98    17123     0.9790 ug/L    0.0000
        Spiked Amount     25.000   Range  88 - 110    Recovery   =    3.916%#
       63) p-Bromofluorobenzene        8.564   95     3624     0.6306 ug/L    0.0000
        Spiked Amount     25.000   Range  86 - 115    Recovery   =    2.522%#

      Target Compounds                                                 Qvalue
        2) Dichlorodifluoromethane     0.975   85     3123     0.8907 ug/L      92
        3) Chloromethane               1.082   50     4288     0.9584 ug/L      96
        4) Vinyl Chloride              1.117   62     4423     0.9274 ug/L      99
        5) 1,3-Butadiene               1.128   54     2922     0.9048 ug/L      95
        6) Bromomethane                1.293   94     1816     0.7742 ug/L      99
        7) Chloroethane                1.363   64     2720     1.0186 ug/L      97
        8) Trichlorofluoromethane      1.438  101     6142     0.9958 ug/L      97
        9) Diethyl ether               1.618   59     2489     0.9431 ug/L      84
       10) 1,1-Dichloroethene          1.731   61     5941     0.9291 ug/L      98
       11) Carbon Disulfide            1.748   76    10126     0.9264 ug/L      99
       12) 1,1,2-Trichloro-1,2,2-...   1.754  101     3653     0.9145 ug/L      99
       13) Acrolein                    1.948   56      210     0.5459 ug/L      92
       14) Methylene Chloride          2.116   84     4216     0.9341 ug/L      96
       15) Acetone                     2.153   43      958     1.1452 ug/L #    43
       16) trans-1,2-Dichloroethene    2.234   96     4039     0.9611 ug/L      97
       17) Methyl Tert Butyl Ether     2.321   73    10850     0.9802 ug/L      99
       18) 1,1-Dichloroethane          2.741   63     7834     0.9750 ug/L      97
       19) Acrylonitrile               2.787   53      833     0.8289 ug/L      95
       21) cis-1,2-Dichloroethene      3.285   96     4557     0.9651 ug/L      98
       22) 2,2-Dichloropropane         3.384   77     6188     0.9496 ug/L      96
       23) Cyclohexane                 3.488   56     6264     0.9617 ug/L      99
       24) Bromochloromethane          3.497  130     2582     0.8705 ug/L      99
       25) Chloroform                  3.615   83     7608     0.9631 ug/L      98
       26) Carbon Tetrachloride        3.746  117     5648     0.8964 ug/L     100
       28) 1,1,1-Trichloroethane       3.836   97     6813     0.9556 ug/L      98
       29) 1,1-Dichloropropene         4.009   75     5585     0.9409 ug/L      95
       30) 2-Butanone                  4.024   43     1321     0.9745 ug/L #    72
       31) Benzene                     4.331   78    17185     0.9690 ug/L     100
       33) 1,2-Dichloroethane          4.594   62     4979     0.9412 ug/L #    95
       34) Trichloroethene             5.049  130     4930     0.9617 ug/L      96
       35) Dibromomethane              5.483   93     2445     0.9500 ug/L      93
       36) 1,2-Dichloropropane         5.587   63     4821     0.9948 ug/L      93
       37) Bromodichloromethane        5.689   83     5649     0.9366 ug/L      99
       39) 2-Chloroethyl Vinyl Ether   6.285   63     2012     0.8323 ug/L      99
       40) cis-1,3-Dichloropropene     6.305   75     6688     0.9286 ug/L      99
       41) 4-Methyl-2-Pentanone        6.896   58      997     0.8188 ug/L      86
       42) trans-1,3-Dichloropropene   6.919   75     5533     0.8817 ug/L      98
       45) Toluene                     6.514   91    18147     0.9484 ug/L     100
       46) Tetrachloroethene           6.858  166     4798     0.9172 ug/L      99
       47) 1,1,2-Trichloroethane       7.052   97     3245     0.9207 ug/L      97
       48) Dibromochloromethane        7.191  129     4134     0.8904 ug/L      99
       49) 1,3-Dichloropropane         7.275   76     5614     0.9633 ug/L      99
       50) 1,2-Dibromoethane           7.365  107     3297     0.9467 ug/L      96
       51) 2-Hexanone                  7.617   43     1982     0.9091 ug/L      93

   8260VMS.M Wed Aug 13 09:38:56 2014                                          Page:  1
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                             Quantitation Report    (Not Reviewed)

Data Path : D:\MassHunter\GCMS\1\data\081214\
Data File : 17M007346.D
Acq On    : 12 Aug 2014  15:33
Operator  : ADC
Sample    : WG487972-04 1.0ug/L STD 8260
Misc      : 1,1 STD65747
ALS Vial  : 5   Sample Multiplier: 1

Quant Time: Aug 13 09:38:55 2014
Quant Method : D:\MassHunter\GCMS\1\methods\8260VMS.M
Quant Title  : 8260B/624 SOP:OVL MSV01 WATER 08/12/14 HPMS17
QLast Update : Wed Aug 13 09:38:18 2014
Response via : Initial Calibration

        Compound                  R.T. QIon  Response  Conc Units Dev(Min)
 -------------------------------------------------------------------------
  52) Chlorobenzene              7.796  112    12264     0.9873 ug/L      74
  53) 1-Chlorohexane             7.814   69     1087     0.9750 ug/L      90
  54) Ethylbenzene               7.834  106     6398     0.9546 ug/L      98
  55) 1,1,1,2-Tetrachloroethane  7.854  131     4397     0.9419 ug/L      89
  56) m-,p-Xylene                7.941  106    15139     1.8938 ug/L      99
  57) o-Xylene                   8.213  106     7743     0.9811 ug/L      98
  58) Styrene                    8.248  104    11526     0.9180 ug/L      99
  59) Bromoform                  8.254  173     2986     0.9104 ug/L      97
  60) Isopropylbenzene           8.407  105    19981     0.9856 ug/L      98
  62) 1,3,5-Trimethylbenzene     8.755  105    16479     0.9796 ug/L      99
  64) Bromobenzene               8.613  156     5216     0.9726 ug/L      99
  65) n-Propylbenzene            8.645   91    22013     0.9770 ug/L      99
  66) 1,1,2,2-Tetrachloroethane  8.694   83     3851     0.9676 ug/L     100
  67) 2-Chlorotoluene            8.720   91    13367     0.9917 ug/L      98
  68) 1,2,3-Trichloropropane     8.752  110     1061     0.9753 ug/L      98
  69) 1,2,4-Trimethylbenzene     8.957  105    16389     0.9764 ug/L     100
  70) 4-Chlorotoluene            8.813   91    13238     0.9573 ug/L      99
  71) tert-Butylbenzene          8.920  134     3218     1.0105 ug/L      96
  72) sec-Butylbenzene           9.009  105    20530     0.9831 ug/L      99
  73) p-Isopropyltoluene         9.085  119    17017     0.9656 ug/L      97
  74) 1,3-Dichlorobenzene        9.114  146     9226     0.9536 ug/L      97
  75) 1,4-Dichlorobenzene        9.160  146     9504     0.9479 ug/L      96
  76) n-Butylbenzene             9.293   91    13544     0.8916 ug/L      99
  77) 1,2-Dichlorobenzene        9.366  146     9231     0.9785 ug/L      99
  78) 1,2-Dibromo-3-Chloropr...  9.745   75      609     0.8485 ug/L      89
  79) Hexachlorobutadiene       10.043  225     3921     0.9416 ug/L      96
  80) 1,2,4-Trichlorobenzene    10.055  180     5737     0.8557 ug/L      97
  81) Naphthalene               10.205  128     9398     0.7791 ug/L     100
  82) 1,2,3-Trichlorobenzene    10.292  180     5062     0.8312 ug/L      99
 -------------------------------------------------------------------------

 (#) = qualifier out of range (m) = manual integration (+) = signals summed
```

Quantitation Report (Not Reviewed)

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Data Path : D:\MassHunter\GCMS\1\data\081214\
Data File : 17M007346.D
Acq On    : 12 Aug 2014  15:33
Operator  : ADC
Sample    : WG487972-04 1.0ug/L STD 8260
Misc      : 1,1 STD65747
ALS Vial  : 5   Sample Multiplier: 1

Quant Time: Aug 13 09:38:55 2014
Quant Method : D:\MassHunter\GCMS\1\methods\8260VMS.M
Quant Title  : 8260B/624 SOP:OVL MSV01 WATER 08/12/14 HPMS17
QLast Update : Wed Aug 13 09:38:18 2014
Response via : Initial Calibration
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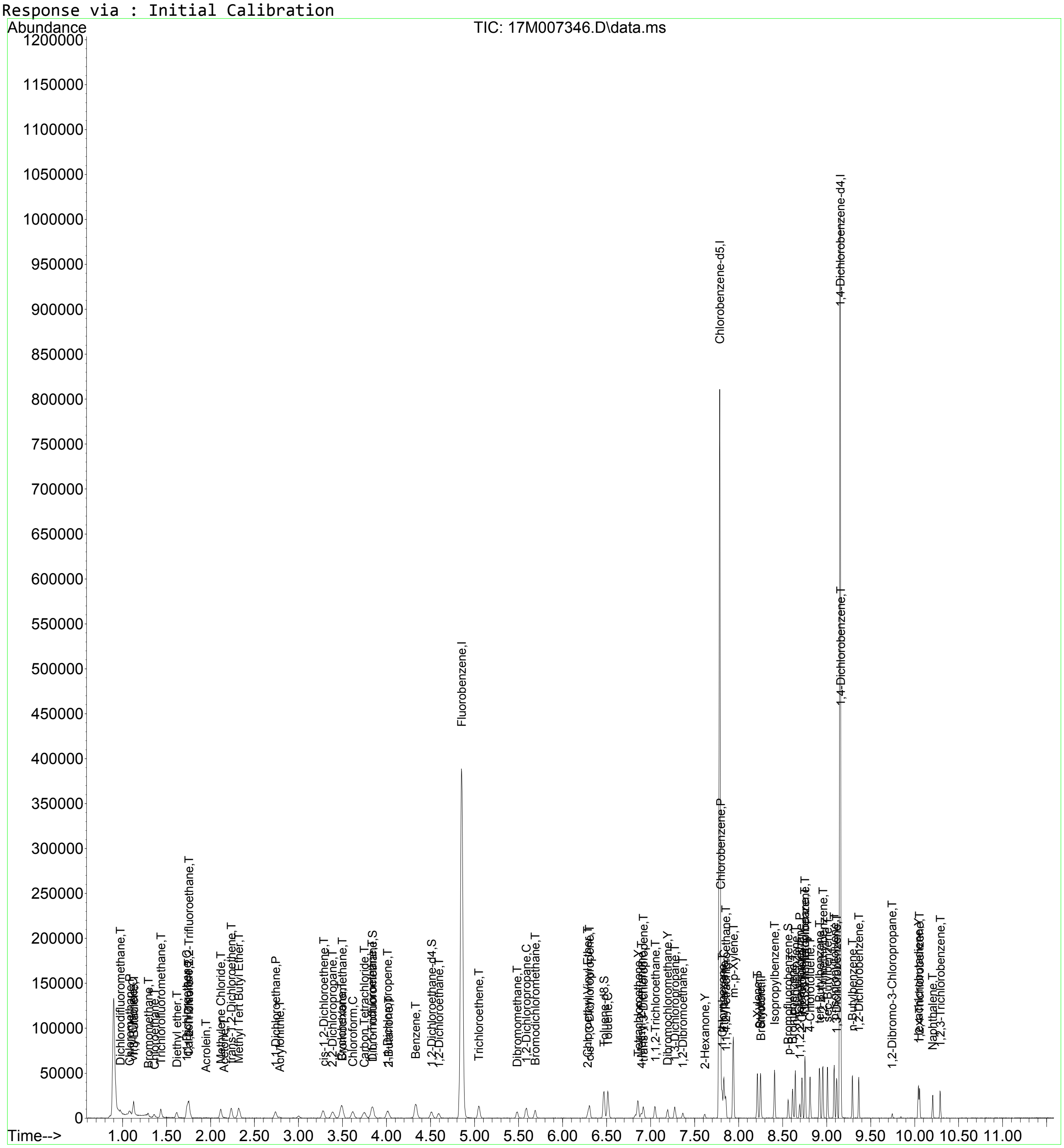

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                       Quantitation Report    (Not Reviewed)

Data Path : D:\MassHunter\GCMS\1\data\081214\
Data File : 17M007347.D
Acq On    : 12 Aug 2014  15:52
Operator  : ADC
Sample    : WG487972-05 2.0ug/L STD 8260
Misc      : 1,1 STD65747
ALS Vial  : 6   Sample Multiplier: 1

Quant Time: Aug 13 09:38:58 2014
Quant Method : D:\MassHunter\GCMS\1\methods\8260VMS.M
Quant Title  : 8260B/624 SOP:OVL MSV01 WATER 08/12/14 HPMS17
QLast Update : Wed Aug 13 09:38:18 2014
Response via : Initial Calibration

        Compound                   R.T. QIon  Response  Conc Units Dev(Min)
 -------------------------------------------------------------------------
 Internal Standards
   1) Fluorobenzene              4.854   96   370631    25.00000 ug/L     0.0000
  43) Chlorobenzene-d5           7.785  117   273561    25.00000 ug/L     0.0000
  61) 1,4-Dichlorobenzene-d4     9.154  152   130626    25.00000 ug/L     0.0000

 System Monitoring Compounds
  27) Dibromofluoromethane       3.841  111     7084     1.4556 ug/L    0.0000
   Spiked Amount     25.000   Range  86 - 118    Recovery   =    5.822%#
  32) 1,2-Dichloroethane-d4      4.510   65     8063     1.6636 ug/L    0.0000
   Spiked Amount     25.000   Range  80 - 120    Recovery   =    6.654%#
  44) Toluene-d8                 6.470   98    25717     1.5093 ug/L    0.0000
   Spiked Amount     25.000   Range  88 - 110    Recovery   =    6.037%#
  63) p-Bromofluorobenzene       8.563   95     5837     1.0643 ug/L    0.0000
   Spiked Amount     25.000   Range  86 - 115    Recovery   =    4.257%#

 Target Compounds                                                 Qvalue
   2) Dichlorodifluoromethane    0.975   85     6244     1.8008 ug/L      94
   3) Chloromethane              1.079   50     8200     1.8533 ug/L      95
   4) Vinyl Chloride             1.119   62     8838     1.8739 ug/L      98
   5) 1,3-Butadiene              1.128   54     5775     1.8083 ug/L      96
   6) Bromomethane               1.290   94     3832     1.6520 ug/L      98
   7) Chloroethane               1.360   64     5182     1.9623 ug/L      98
   8) Trichlorofluoromethane     1.435  101    11948     1.9589 ug/L      99
   9) Diethyl ether              1.615   59     5016     1.9219 ug/L      88
  10) 1,1-Dichloroethene         1.730   61    12023     1.9013 ug/L      98
  11) Carbon Disulfide           1.748   76    19953     1.8460 ug/L     100
  12) 1,1,2-Trichloro-1,2,2-...  1.756  101     7571     1.9167 ug/L      98
  13) Acrolein                   1.953   56      716     1.8820 ug/L      88
  14) Methylene Chloride         2.115   84     8942     2.0035 ug/L      99
  15) Acetone                    2.150   43     1832     2.2147 ug/L      98
  16) trans-1,2-Dichloroethene   2.234   96     8208     1.9750 ug/L      98
  17) Methyl Tert Butyl Ether    2.318   73    21525     1.9664 ug/L     100
  18) 1,1-Dichloroethane         2.738   63    15581     1.9609 ug/L      98
  19) Acrylonitrile              2.784   53     1822     1.8334 ug/L     100
  20) Vinyl Acetate              2.998   86      477     1.2170 ug/L #    12
  21) cis-1,2-Dichloroethene     3.279   96     9004     1.9283 ug/L      98
  22) 2,2-Dichloropropane        3.386   77    12374     1.9202 ug/L     100
  23) Cyclohexane                3.491   56    12472     1.9362 ug/L     100
  24) Bromochloromethane         3.502  130     5607     1.9115 ug/L      99
  25) Chloroform                 3.615   83    15063     1.9282 ug/L      98
  26) Carbon Tetrachloride       3.745  117    11775     1.8897 ug/L      99
  28) 1,1,1-Trichloroethane      3.838   97    13513     1.9166 ug/L      99
  29) 1,1-Dichloropropene        4.006   75    11223     1.9119 ug/L      97
  30) 2-Butanone                 4.015   43     2584     1.9276 ug/L #    86
  31) Benzene                    4.333   78    34017     1.9396 ug/L     100
  33) 1,2-Dichloroethane         4.591   62    10045     1.9202 ug/L      98
  34) Trichloroethene            5.048  130     9708     1.9150 ug/L      99
  35) Dibromomethane             5.486   93     4748     1.8655 ug/L      99
  36) 1,2-Dichloropropane        5.587   63     9324     1.9456 ug/L      98
  37) Bromodichloromethane       5.688   83    11201     1.8780 ug/L      97
  39) 2-Chloroethyl Vinyl Ether  6.285   63     4209     1.7607 ug/L      97
  40) cis-1,3-Dichloropropene    6.305   75    13336     1.8724 ug/L     100
  41) 4-Methyl-2-Pentanone       6.893   58     2193     1.8213 ug/L      93
  42) trans-1,3-Dichloropropene  6.916   75    11174     1.8006 ug/L      99
  45) Toluene                    6.513   91    36898     1.9794 ug/L      99
  46) Tetrachloroethene          6.855  166     9833     1.9295 ug/L     100
  47) 1,1,2-Trichloroethane      7.049   97     6477     1.8864 ug/L     100
  48) Dibromochloromethane       7.191  129     8334     1.8427 ug/L      99
  49) 1,3-Dichloropropane        7.275   76    10811     1.9042 ug/L      95
  50) 1,2-Dibromoethane          7.365  107     6363     1.8754 ug/L     100
```

```
                          Quantitation Report    (Not Reviewed)

Data Path : D:\MassHunter\GCMS\1\data\081214\
Data File : 17M007347.D
Acq On    : 12 Aug 2014  15:52
Operator  : ADC
Sample    : WG487972-05 2.0ug/L STD 8260
Misc      : 1,1 STD65747
ALS Vial  : 6   Sample Multiplier: 1

Quant Time: Aug 13 09:38:58 2014
Quant Method : D:\MassHunter\GCMS\1\methods\8260VMS.M
Quant Title  : 8260B/624 SOP:OVL MSV01 WATER 08/12/14 HPMS17
QLast Update : Wed Aug 13 09:38:18 2014
Response via : Initial Calibration

        Compound                   R.T. QIon  Response  Conc Units Dev(Min)
 --------------------------------------------------------------------------
  51) 2-Hexanone                  7.614   43     4139     1.9488 ug/L      97
  52) Chlorobenzene               7.796  112    23288     1.9244 ug/L      87
  53) 1-Chlorohexane              7.811   69     1968     1.8120 ug/L      81
  54) Ethylbenzene                7.834  106    12078     1.8498 ug/L      98
  55) 1,1,1,2-Tetrachloroethane   7.851  131     8727     1.9189 ug/L      95
  56) m-,p-Xylene                 7.938  106    29329     3.7662 ug/L      97
  57) o-Xylene                    8.213  106    14198     1.8467 ug/L      94
  58) Styrene                     8.248  104    21906     1.7910 ug/L      97
  59) Bromoform                   8.254  173     5699     1.7836 ug/L      99
  60) Isopropylbenzene            8.407  105    36191     1.8326 ug/L     100
  62) 1,3,5-Trimethylbenzene      8.754  105    30765     1.9162 ug/L     100
  64) Bromobenzene                8.613  156     9628     1.8811 ug/L      98
  65) n-Propylbenzene             8.644   91    40349     1.8765 ug/L      99
  66) 1,1,2,2-Tetrachloroethane   8.694   83     7223     1.9016 ug/L      99
  67) 2-Chlorotoluene             8.720   91    24549     1.9084 ug/L      99
  68) 1,2,3-Trichloropropane      8.754  110     1987     1.9139 ug/L      93
  69) 1,2,4-Trimethylbenzene      8.957  105    30599     1.9101 ug/L     100
  70) 4-Chlorotoluene             8.812   91    25007     1.8949 ug/L      99
  71) tert-Butylbenzene           8.919  134     5944     1.9558 ug/L      99
  72) sec-Butylbenzene            9.009  105    38379     1.9257 ug/L      99
  73) p-Isopropyltoluene          9.085  119    31538     1.8751 ug/L      99
  74) 1,3-Dichlorobenzene         9.116  146    17310     1.8746 ug/L     100
  75) 1,4-Dichlorobenzene         9.160  146    17447     1.8234 ug/L      98
  76) n-Butylbenzene              9.293   91    25561     1.7632 ug/L      98
  77) 1,2-Dichlorobenzene         9.365  146    17283     1.9197 ug/L     100
  78) 1,2-Dibromo-3-Chloropr...   9.745   75     1289     1.8818 ug/L      99
  79) Hexachlorobutadiene        10.040  225     7295     1.8357 ug/L      99
  80) 1,2,4-Trichlorobenzene     10.054  180    11037     1.7249 ug/L      97
  81) Naphthalene                10.205  128    20200     1.7546 ug/L      98
  82) 1,2,3-Trichlorobenzene     10.289  180    10387     1.7872 ug/L      98
 --------------------------------------------------------------------------

 (#) = qualifier out of range (m) = manual integration (+) = signals summed
```

Quantitation Report (Not Reviewed)

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Data Path : D:\MassHunter\GCMS\1\data\081214\
Data File : 17M007347.D
Acq On    : 12 Aug 2014  15:52
Operator  : ADC
Sample    : WG487972-05 2.0ug/L STD 8260
Misc      : 1,1 STD65747
ALS Vial  : 6   Sample Multiplier: 1

Quant Time: Aug 13 09:38:58 2014
Quant Method : D:\MassHunter\GCMS\1\methods\8260VMS.M
Quant Title  : 8260B/624 SOP:OVL MSV01 WATER 08/12/14 HPMS17
QLast Update : Wed Aug 13 09:38:18 2014
Response via : Initial Calibration
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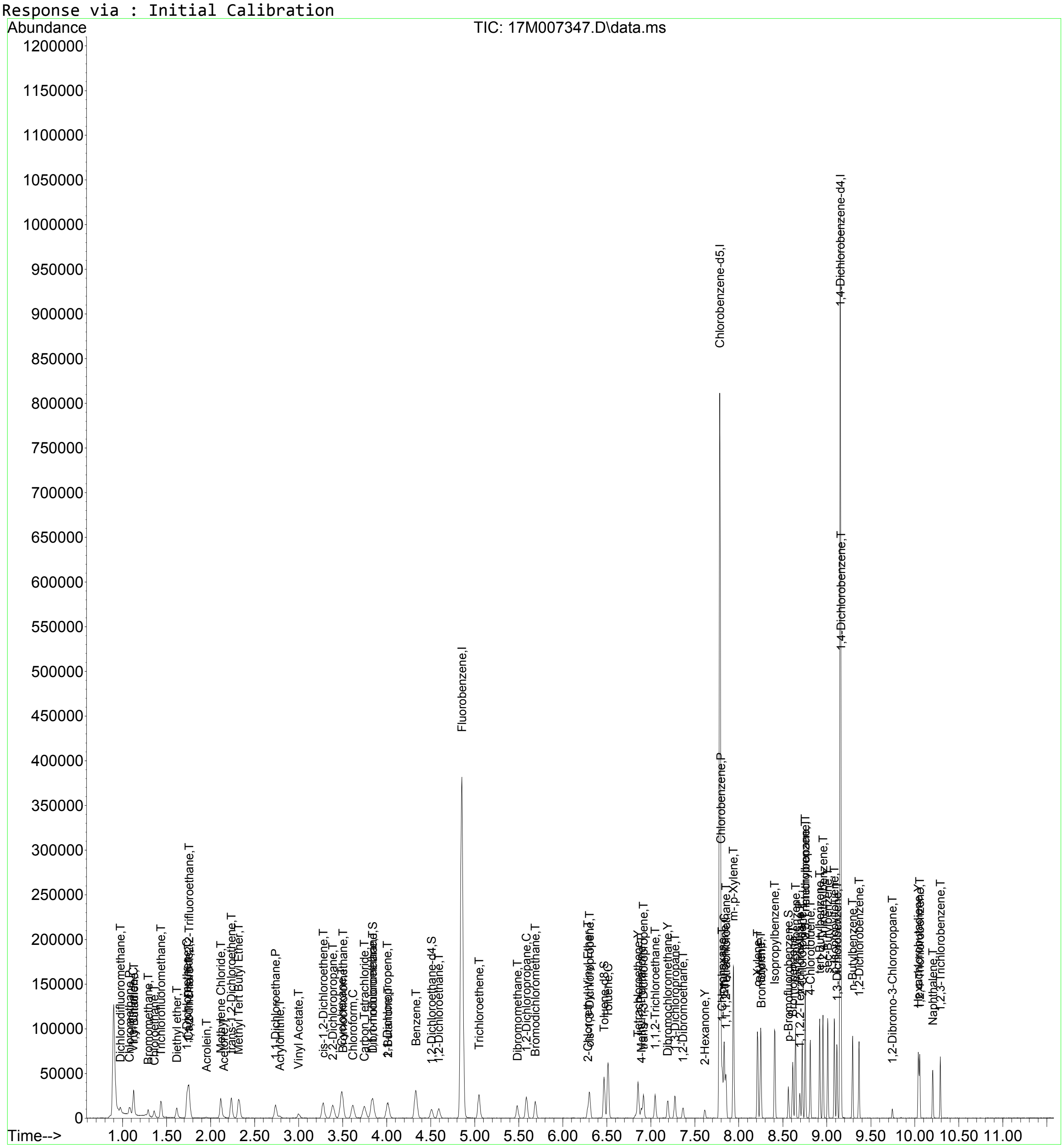

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8260VMS.M Wed Aug 13 09:38:59 2014                                    Page: 3
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                              Quantitation Report    (Not Reviewed)

  Data Path : D:\MassHunter\GCMS\1\data\081214\
  Data File : 17M007348.D
  Acq On    : 12 Aug 2014  16:12
  Operator  : ADC
  Sample    : WG487972-06 5.0ug/L STD 8260
  Misc      : 1,1 STD65747
  ALS Vial  : 6   Sample Multiplier: 1

  Quant Time: Aug 13 09:39:01 2014
  Quant Method : D:\MassHunter\GCMS\1\methods\8260VMS.M
  Quant Title  : 8260B/624 SOP:OVL MSV01 WATER 08/12/14 HPMS17
  QLast Update : Wed Aug 13 09:38:18 2014
  Response via : Initial Calibration

          Compound                    R.T. QIon  Response  Conc Units Dev(Min)
   -----------------------------------------------------------------------------
   Internal Standards
     1) Fluorobenzene               4.852   96   362140    25.00000 ug/L     0.0000
    43) Chlorobenzene-d5            7.785  117   255340    25.00000 ug/L     0.0000
    61) 1,4-Dichlorobenzene-d4      9.154  152   135370    25.00000 ug/L     0.0000

   System Monitoring Compounds
    27) Dibromofluoromethane        3.838  111    14058     2.9564 ug/L    0.0000
     Spiked Amount     25.000   Range  86 - 118    Recovery   =   11.826%#
    32) 1,2-Dichloroethane-d4       4.510   65    14917     3.1500 ug/L    0.0000
     Spiked Amount     25.000   Range  80 - 120    Recovery   =   12.600%#
    44) Toluene-d8                  6.470   98    51302     3.2258 ug/L    0.0000
     Spiked Amount     25.000   Range  88 - 110    Recovery   =   12.903%#
    63) p-Bromofluorobenzene        8.563   95    14954     2.6311 ug/L    0.0000
     Spiked Amount     25.000   Range  86 - 115    Recovery   =   10.524%#

   Target Compounds                                                Qvalue
     2) Dichlorodifluoromethane     0.975   85    15386     4.5414 ug/L      98
     3) Chloromethane               1.079   50    20678     4.7831 ug/L     100
     4) Vinyl Chloride              1.119   62    22227     4.8232 ug/L      99
     5) 1,3-Butadiene               1.128   54    14821     4.7498 ug/L      99
     6) Bromomethane                1.290   94     9796     4.3221 ug/L      98
     7) Chloroethane                1.357   64    13412     5.1980 ug/L      94
     8) Trichlorofluoromethane      1.432  101    30267     5.0788 ug/L     100
     9) Diethyl ether               1.617   59    12321     4.8314 ug/L      93
    10) 1,1-Dichloroethene          1.730   61    29817     4.8258 ug/L      99
    11) Carbon Disulfide            1.748   76    47722     4.5186 ug/L      99
    12) 1,1,2-Trichloro-1,2,2-...   1.756  101    18573     4.8122 ug/L      98
    13) Acrolein                    1.956   56     1806     4.8584 ug/L      96
    14) Methylene Chloride          2.115   84    20905     4.7937 ug/L      97
    15) Acetone                     2.153   43     4297     5.3163 ug/L      95
    16) trans-1,2-Dichloroethene    2.237   96    19368     4.7696 ug/L      99
    17) Methyl Tert Butyl Ether     2.321   73    52825     4.9389 ug/L     100
    18) 1,1-Dichloroethane          2.738   63    39397     5.0746 ug/L      99
    19) Acrylonitrile               2.784   53     5119     5.2719 ug/L      99
    20) Vinyl Acetate               3.007   86     1799     4.6973 ug/L      78
    21) cis-1,2-Dichloroethene      3.277   96    23283     5.1033 ug/L      99
    22) 2,2-Dichloropropane         3.387   77    32118     5.1008 ug/L      98
    23) Cyclohexane                 3.491   56    31424     4.9928 ug/L     100
    24) Bromochloromethane          3.497  130    14556     5.0788 ug/L      99
    25) Chloroform                  3.612   83    38210     5.0060 ug/L      99
    26) Carbon Tetrachloride        3.748  117    30435     4.9989 ug/L      99
    28) 1,1,1-Trichloroethane       3.841   97    34746     5.0437 ug/L      99
    29) 1,1-Dichloropropene         4.015   75    28666     4.9980 ug/L      99
    30) 2-Butanone                  4.021   43     6900     5.2680 ug/L #    93
    31) Benzene                     4.330   78    86650     5.0565 ug/L     100
    33) 1,2-Dichloroethane          4.591   62    26445     5.1739 ug/L      98
    34) Trichloroethene             5.046  130    24300     4.9057 ug/L      98
    35) Dibromomethane              5.486   93    12418     4.9934 ug/L     100
    36) 1,2-Dichloropropane         5.587   63    24673     5.2692 ug/L      96
    37) Bromodichloromethane        5.688   83    29082     4.9904 ug/L      99
    38) 1,4-Dioxane                 5.894   88      256     8.3490 ug/L #    17
    39) 2-Chloroethyl Vinyl Ether   6.285   63    11065     4.7373 ug/L      98
    40) cis-1,3-Dichloropropene     6.305   75    35091     5.0424 ug/L     100
    41) 4-Methyl-2-Pentanone        6.896   58     5951     5.0583 ug/L      94
    42) trans-1,3-Dichloropropene   6.919   75    30553     5.0388 ug/L      98
    45) Toluene                     6.514   91    95392     5.4825 ug/L     100
    46) Tetrachloroethene           6.855  166    25465     5.3534 ug/L     100
    47) 1,1,2-Trichloroethane       7.049   97    17666     5.5124 ug/L      99
    48) Dibromochloromethane        7.194  129    22622     5.3588 ug/L      99
    49) 1,3-Dichloropropane         7.275   76    28454     5.3694 ug/L      98

8260VMS.M Wed Aug 13 09:39:01 2014                                           Page:  1
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                           Quantitation Report    (Not Reviewed)

Data Path : D:\MassHunter\GCMS\1\data\081214\
Data File : 17M007348.D
Acq On    : 12 Aug 2014  16:12
Operator  : ADC
Sample    : WG487972-06 5.0ug/L STD 8260
Misc      : 1,1 STD65747
ALS Vial  : 6   Sample Multiplier: 1

Quant Time: Aug 13 09:39:01 2014
Quant Method : D:\MassHunter\GCMS\1\methods\8260VMS.M
Quant Title  : 8260B/624 SOP:OVL MSV01 WATER 08/12/14 HPMS17
QLast Update : Wed Aug 13 09:38:18 2014
Response via : Initial Calibration

        Compound                   R.T. QIon  Response  Conc Units Dev(Min)
 --------------------------------------------------------------------------
  50) 1,2-Dibromoethane           7.365  107    16971     5.3589 ug/L     100
  51) 2-Hexanone                  7.614   43    10554     5.3238 ug/L      97
  52) Chlorobenzene               7.796  112    55978     4.9558 ug/L      94
  53) 1-Chlorohexane              7.811   69     5025     4.9567 ug/L      85
  54) Ethylbenzene                7.834  106    30367     4.9827 ug/L      99
  55) 1,1,1,2-Tetrachloroethane   7.854  131    22208     5.2316 ug/L      99
  56) m-,p-Xylene                 7.938  106    74452    10.2428 ug/L      98
  57) o-Xylene                    8.213  106    38696     5.3921 ug/L      98
  58) Styrene                     8.248  104    60290     5.2809 ug/L      99
  59) Bromoform                   8.254  173    15940     5.3446 ug/L     100
  60) Isopropylbenzene            8.410  105   101702     5.5173 ug/L      99
  62) 1,3,5-Trimethylbenzene      8.755  105    85091     5.1143 ug/L     100
  64) Bromobenzene                8.613  156    25906     4.8840 ug/L      98
  65) n-Propylbenzene             8.644   91   112900     5.0666 ug/L      99
  66) 1,1,2,2-Tetrachloroethane   8.694   83    20836     5.2932 ug/L     100
  67) 2-Chlorotoluene             8.720   91    68368     5.1285 ug/L      98
  68) 1,2,3-Trichloropropane      8.755  110     5632     5.2346 ug/L      99
  69) 1,2,4-Trimethylbenzene      8.957  105    87338     5.2610 ug/L      99
  70) 4-Chlorotoluene             8.812   91    69444     5.0778 ug/L      99
  71) tert-Butylbenzene           8.920  134    16211     5.1470 ug/L      99
  72) sec-Butylbenzene            9.009  105   108546     5.2554 ug/L     100
  73) p-Isopropyltoluene          9.085  119    90582     5.1969 ug/L      99
  74) 1,3-Dichlorobenzene         9.116  146    48461     5.0643 ug/L      99
  75) 1,4-Dichlorobenzene         9.160  146    49163     4.9579 ug/L     100
  76) n-Butylbenzene              9.293   91    74751     4.9755 ug/L     100
  77) 1,2-Dichlorobenzene         9.365  146    48179     5.1640 ug/L     100
  78) 1,2-Dibromo-3-Chloropr...   9.745   75     3753     5.2870 ug/L      99
  79) Hexachlorobutadiene        10.043  225    20438     4.9627 ug/L      99
  80) 1,2,4-Trichlorobenzene     10.057  180    31381     4.7324 ug/L      99
  81) Naphthalene                10.205  128    58679     4.9184 ug/L     100
  82) 1,2,3-Trichlorobenzene     10.292  180    29998     4.9807 ug/L      99
 --------------------------------------------------------------------------

 (#) = qualifier out of range (m) = manual integration (+) = signals summed
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Quantitation Report   (Not Reviewed)

00193437

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Data Path : D:\MassHunter\GCMS\1\data\081214\
Data File : 17M007348.D
Acq On    : 12 Aug 2014  16:12
Operator  : ADC
Sample    : WG487972-06 5.0ug/L STD 8260
Misc      : 1,1 STD65747
ALS Vial  : 6   Sample Multiplier: 1

Quant Time: Aug 13 09:39:01 2014
Quant Method : D:\MassHunter\GCMS\1\methods\8260VMS.M
Quant Title  : 8260B/624 SOP:OVL MSV01 WATER 08/12/14 HPMS17
QLast Update : Wed Aug 13 09:38:18 2014
Response via : Initial Calibration
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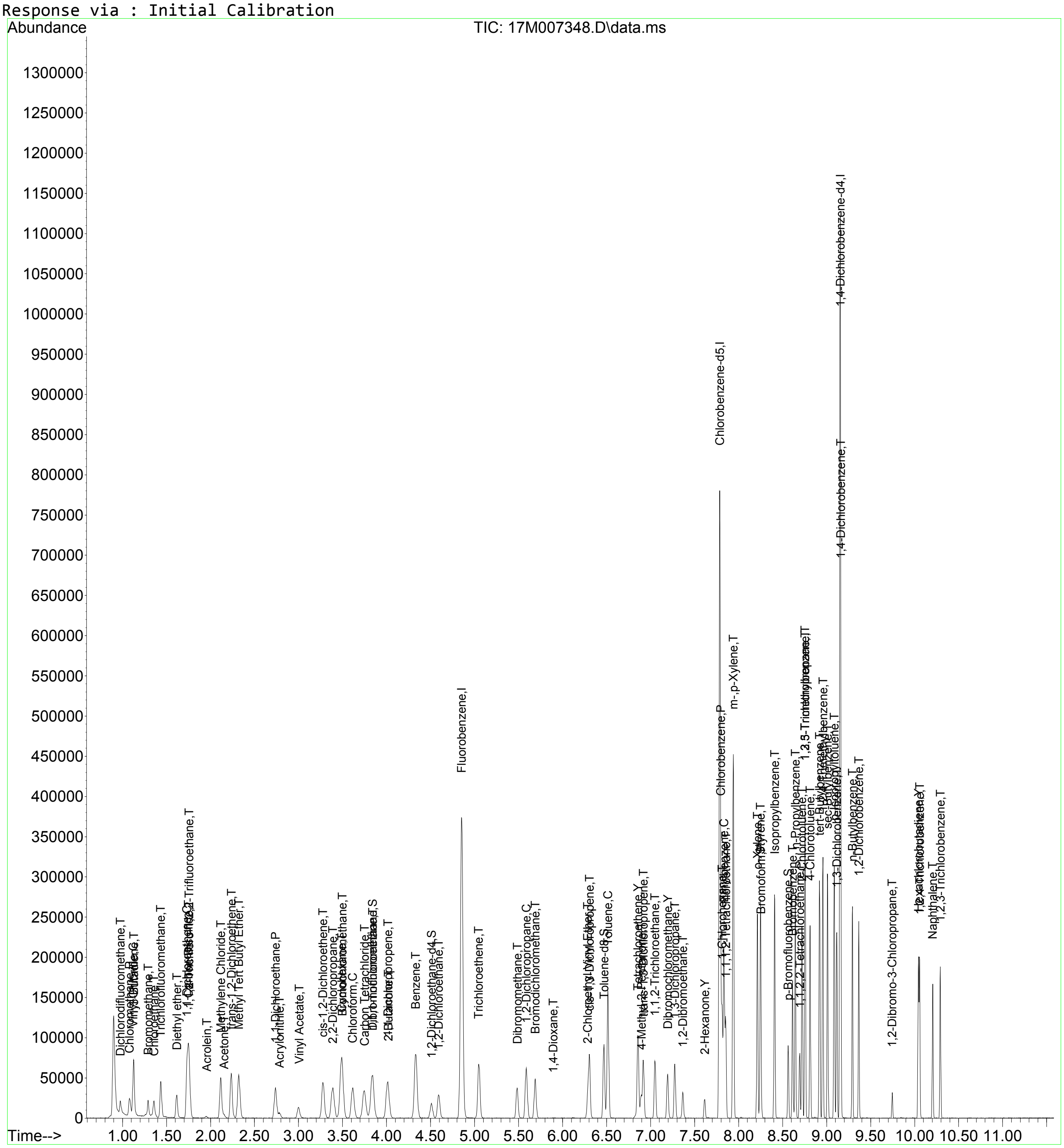

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                             Quantitation Report    (Not Reviewed)

  Data Path : D:\MassHunter\GCMS\1\data\081214\
  Data File : 17M007349.D
  Acq On    : 12 Aug 2014  16:32
  Operator  : ADC
  Sample    : WG487972-07 20.0ug/L STD 8260
  Misc      : 1,1 STD65747
  ALS Vial  : 7   Sample Multiplier: 1

  Quant Time: Aug 13 09:39:04 2014
  Quant Method : D:\MassHunter\GCMS\1\methods\8260VMS.M
  Quant Title  : 8260B/624 SOP:OVL MSV01 WATER 08/12/14 HPMS17
  QLast Update : Wed Aug 13 09:38:18 2014
  Response via : Initial Calibration

          Compound                   R.T. QIon  Response  Conc Units Dev(Min)
   --------------------------------------------------------------------------
   Internal Standards
     1) Fluorobenzene               4.852  96   361155    25.00000 ug/L      0.0000
    43) Chlorobenzene-d5            7.785 117   277106    25.00000 ug/L      0.0000
    61) 1,4-Dichlorobenzene-d4      9.154 152   133662    25.00000 ug/L      0.0000

   System Monitoring Compounds
    27) Dibromofluoromethane        3.841 111    47852    10.0908 ug/L    0.0000
     Spiked Amount     25.000   Range  86 - 118    Recovery   =   40.363%#
    32) 1,2-Dichloroethane-d4       4.507  65    48408    10.2500 ug/L    0.0000
     Spiked Amount     25.000   Range  80 - 120    Recovery   =   41.000%#
    44) Toluene-d8                  6.467  98   175878    10.1903 ug/L    0.0000
     Spiked Amount     25.000   Range  88 - 110    Recovery   =   40.761%#
    63) p-Bromofluorobenzene        8.564  95    56670    10.0983 ug/L    0.0000
     Spiked Amount     25.000   Range  86 - 115    Recovery   =   40.393%#

   Target Compounds                                                   Qvalue
     2) Dichlorodifluoromethane     0.975  85    73794    21.8407 ug/L      99
     3) Chloromethane               1.082  50    87514    20.2985 ug/L     100
     4) Vinyl Chloride              1.120  62    93510    20.3466 ug/L     100
     5) 1,3-Butadiene               1.128  54    64811    20.8270 ug/L     100
     6) Bromomethane                1.291  94    43571    19.2764 ug/L     100
     7) Chloroethane                1.357  64    53696    20.8672 ug/L      99
     8) Trichlorofluoromethane      1.435 101   124280    20.9111 ug/L     100
     9) Diethyl ether               1.615  59    52955    20.8218 ug/L      99
    10) 1,1-Dichloroethene          1.731  61   125065    20.2968 ug/L     100
    11) Carbon Disulfide            1.748  76   209040    19.8471 ug/L     100
    12) 1,1,2-Trichloro-1,2,2-...   1.760 101    77958    20.2536 ug/L      99
    13) Acrolein                    1.948  56     7509    20.2555 ug/L     100
    14) Methylene Chloride          2.116  84    86639    19.9212 ug/L      98
    15) Acetone                     2.150  43    16466    20.4276 ug/L     100
    16) trans-1,2-Dichloroethene    2.234  96    81863    20.2146 ug/L     100
    17) Methyl Tert Butyl Ether     2.318  73   219511    20.5792 ug/L     100
    18) 1,1-Dichloroethane          2.735  63   156143    20.1670 ug/L      99
    19) Acrylonitrile               2.785  53    20694    21.3703 ug/L      99
    20) Vinyl Acetate               2.996  86     7735    20.2518 ug/L      98
    21) cis-1,2-Dichloroethene      3.280  96    87366    19.2014 ug/L     100
    22) 2,2-Dichloropropane         3.384  77   123760    19.7086 ug/L      99
    23) Cyclohexane                 3.482  56   126022    20.0775 ug/L      99
    24) Bromochloromethane          3.494 130    59062    20.6637 ug/L      99
    25) Chloroform                  3.615  83   151335    19.8807 ug/L     100
    26) Carbon Tetrachloride        3.746 117   124375    20.4841 ug/L      99
    28) 1,1,1-Trichloroethane       3.833  97   138671    20.1842 ug/L     100
    29) 1,1-Dichloropropene         4.006  75   113383    19.8225 ug/L      98
    30) 2-Butanone                  4.018  43    25730    19.6977 ug/L     100
    31) Benzene                     4.331  78   341318    19.9722 ug/L     100
    33) 1,2-Dichloroethane          4.591  62   101599    19.9317 ug/L      99
    34) Trichloroethene             5.049 130    97599    19.7573 ug/L      99
    35) Dibromomethane              5.480  93    49653    20.0202 ug/L     100
    36) 1,2-Dichloropropane         5.587  63    95162    20.3782 ug/L      97
    37) Bromodichloromethane        5.689  83   117641    20.2422 ug/L     100
    38) 1,4-Dioxane                 5.888  88     1153    37.7055 ug/L      96
    39) 2-Chloroethyl Vinyl Ether   6.285  63    45992    19.7444 ug/L      99
    40) cis-1,3-Dichloropropene     6.305  75   140894    20.3010 ug/L     100
    41) 4-Methyl-2-Pentanone        6.890  58    23959    20.4206 ug/L      98
    42) trans-1,3-Dichloropropene   6.916  75   122489    20.2560 ug/L     100
    45) Toluene                     6.514  91   377782    20.0069 ug/L     100
    46) Tetrachloroethene           6.855 166   101995    19.7577 ug/L      99
    47) 1,1,2-Trichloroethane       7.049  97    70146    20.1688 ug/L      99
    48) Dibromochloromethane        7.191 129    93251    20.3546 ug/L     100
    49) 1,3-Dichloropropane         7.275  76   115976    20.1661 ug/L      99

8260VMS.M Wed Aug 13 09:39:04 2014                                                   Page:  1
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                              Quantitation Report    (Not Reviewed)

Data Path : D:\MassHunter\GCMS\1\data\081214\
Data File : 17M007349.D
Acq On    : 12 Aug 2014  16:32
Operator  : ADC
Sample    : WG487972-07 20.0ug/L STD 8260
Misc      : 1,1 STD65747
ALS Vial  : 7   Sample Multiplier: 1

Quant Time: Aug 13 09:39:04 2014
Quant Method : D:\MassHunter\GCMS\1\methods\8260VMS.M
Quant Title  : 8260B/624 SOP:OVL MSV01 WATER 08/12/14 HPMS17
QLast Update : Wed Aug 13 09:38:18 2014
Response via : Initial Calibration

        Compound                   R.T. QIon  Response  Conc Units Dev(Min)
 --------------------------------------------------------------------------
  50) 1,2-Dibromoethane           7.365  107    69715    20.2847 ug/L      99
  51) 2-Hexanone                  7.614   43    43225    20.0914 ug/L     100
  52) Chlorobenzene               7.796  112   242868    19.8125 ug/L      99
  53) 1-Chlorohexane              7.814   69    22731    20.6609 ug/L      98
  54) Ethylbenzene                7.834  106   131454    19.8752 ug/L      99
  55) 1,1,1,2-Tetrachloroethane   7.854  131    92968    20.1805 ug/L     100
  56) m-,p-Xylene                 7.938  106   316034    40.0634 ug/L      99
  57) o-Xylene                    8.213  106   146733    18.8406 ug/L      98
  58) Styrene                     8.248  104   235957    19.0445 ug/L      99
  59) Bromoform                   8.254  173    62613    19.3448 ug/L      99
  60) Isopropylbenzene            8.407  105   385868    19.2889 ug/L     100
  62) 1,3,5-Trimethylbenzene      8.755  105   332217    20.2225 ug/L      99
  64) Bromobenzene                8.613  156   101427    19.3663 ug/L      99
  65) n-Propylbenzene             8.645   91   449302    20.4211 ug/L      99
  66) 1,1,2,2-Tetrachloroethane   8.694   83    77866    20.0341 ug/L      99
  67) 2-Chlorotoluene             8.720   91   263817    20.0428 ug/L      99
  68) 1,2,3-Trichloropropane      8.755  110    21591    20.3238 ug/L      99
  69) 1,2,4-Trimethylbenzene      8.957  105   332259    20.2699 ug/L     100
  70) 4-Chlorotoluene             8.813   91   268953    19.9173 ug/L      99
  71) tert-Butylbenzene           8.920  134    61386    19.7391 ug/L      99
  72) sec-Butylbenzene            9.009  105   418286    20.5106 ug/L     100
  73) p-Isopropyltoluene          9.085  119   352481    20.4810 ug/L      99
  74) 1,3-Dichlorobenzene         9.114  146   185255    19.6069 ug/L     100
  75) 1,4-Dichlorobenzene         9.160  146   183958    18.7885 ug/L     100
  76) n-Butylbenzene              9.293   91   306603    20.6687 ug/L      99
  77) 1,2-Dichlorobenzene         9.366  146   182883    19.8524 ug/L      99
  78) 1,2-Dibromo-3-Chloropr...   9.745   75    14827    21.1545 ug/L      98
  79) Hexachlorobutadiene        10.043  225    81917    20.1450 ug/L     100
  80) 1,2,4-Trichlorobenzene     10.055  180   134432    20.5319 ug/L      99
  81) Naphthalene                10.202  128   263000    22.3262 ug/L     100
  82) 1,2,3-Trichlorobenzene     10.289  180   131897    22.1792 ug/L     100
 --------------------------------------------------------------------------

 (#) = qualifier out of range (m) = manual integration (+) = signals summed
```

Quantitation Report   (Not Reviewed)

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Data Path : D:\MassHunter\GCMS\1\data\081214\
Data File : 17M007349.D
Acq On    : 12 Aug 2014  16:32
Operator  : ADC
Sample    : WG487972-07 20.0ug/L STD 8260
Misc      : 1,1 STD65747
ALS Vial  : 7   Sample Multiplier: 1

Quant Time: Aug 13 09:39:04 2014
Quant Method : D:\MassHunter\GCMS\1\methods\8260VMS.M
Quant Title  : 8260B/624 SOP:OVL MSV01 WATER 08/12/14 HPMS17
QLast Update : Wed Aug 13 09:38:18 2014
Response via : Initial Calibration
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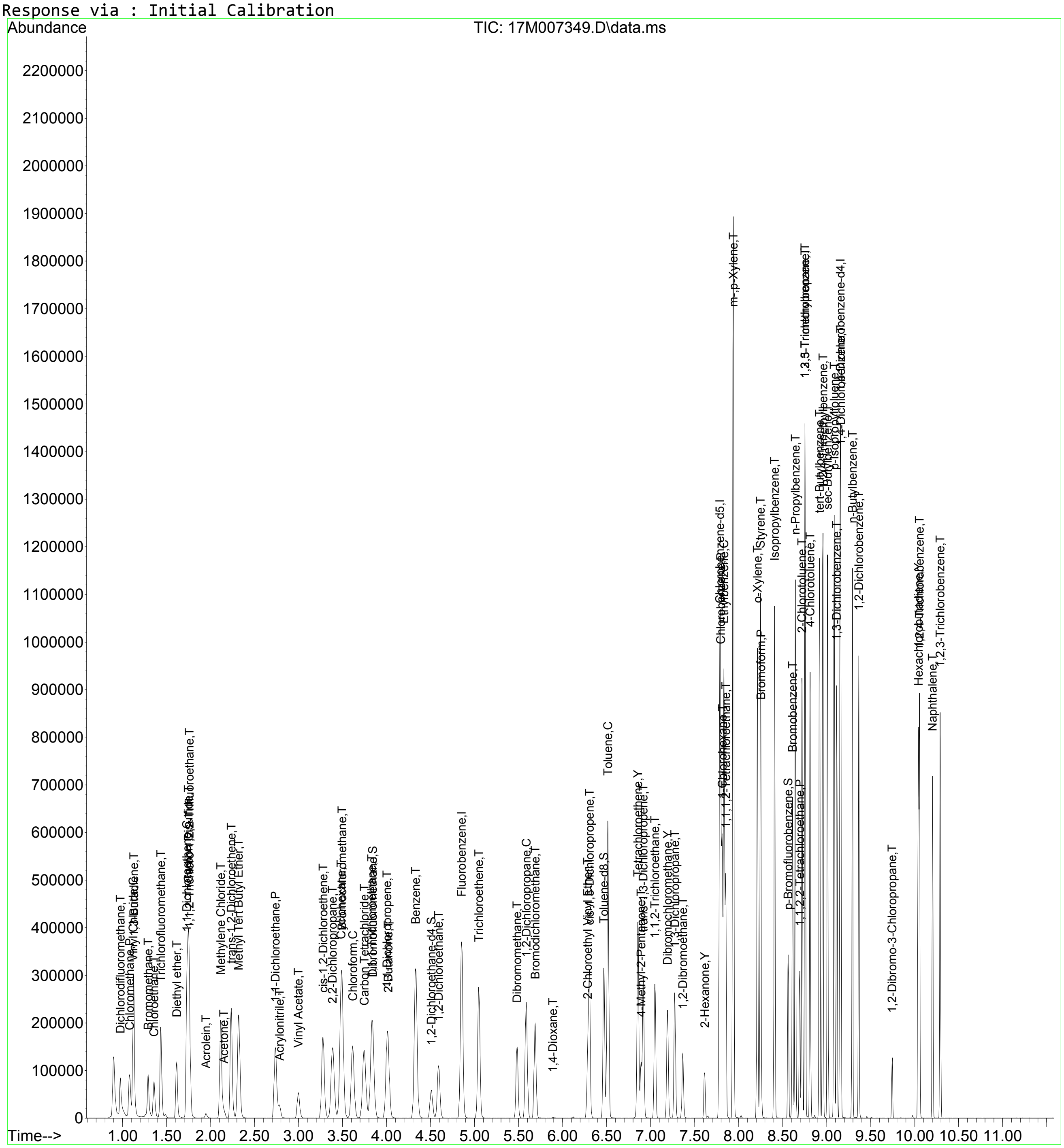

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                           Quantitation Report    (Not Reviewed)

Data Path : D:\MassHunter\GCMS\1\data\081214\
Data File : 17M007350.D
Acq On    : 12 Aug 2014  16:51
Operator  : ADC
Sample    : WG487972-08 50.0ug/L STD 8260
Misc      : 1,1 STD65747
ALS Vial  : 8   Sample Multiplier: 1

Quant Time: Aug 13 09:39:07 2014
Quant Method : D:\MassHunter\GCMS\1\methods\8260VMS.M
Quant Title  : 8260B/624 SOP:OVL MSV01 WATER 08/12/14 HPMS17
QLast Update : Wed Aug 13 09:38:18 2014
Response via : Initial Calibration

        Compound                   R.T. QIon  Response  Conc Units Dev(Min)
 ---------------------------------------------------------------------------
 Internal Standards
   1) Fluorobenzene              4.852   96   358634    25.00000 ug/L     0.0000
  43) Chlorobenzene-d5           7.785  117   275864    25.00000 ug/L     0.0000
  61) 1,4-Dichlorobenzene-d4     9.154  152   139515    25.00000 ug/L     0.0000

 System Monitoring Compounds
  27) Dibromofluoromethane       3.838  111   111385    23.6535 ug/L    0.0000
   Spiked Amount     25.000   Range  86 - 118    Recovery   =   94.614%
  32) 1,2-Dichloroethane-d4      4.507   65   109866    23.4269 ug/L    0.0000
   Spiked Amount     25.000   Range  80 - 120    Recovery   =   93.708%
  44) Toluene-d8                 6.470   98   408038    23.7480 ug/L    0.0000
   Spiked Amount     25.000   Range  88 - 110    Recovery   =   94.992%
  63) p-Bromofluorobenzene       8.564   95   142203    24.2768 ug/L    0.0000
   Spiked Amount     25.000   Range  86 - 115    Recovery   =   97.107%

 Target Compounds                                                Qvalue
   2) Dichlorodifluoromethane    0.975   85   177049    52.7692 ug/L     100
   3) Chloromethane              1.079   50   212928    49.7348 ug/L     100
   4) Vinyl Chloride             1.120   62   226965    49.7318 ug/L     100
   5) 1,3-Butadiene              1.128   54   158375    51.2514 ug/L     100
   6) Bromomethane               1.290   94   115174    51.3127 ug/L     100
   7) Chloroethane               1.351   64   132749    51.9512 ug/L     100
   8) Trichlorofluoromethane     1.432  101   301422    51.0732 ug/L     100
   9) Diethyl ether              1.615   59   125586    49.7272 ug/L     100
  10) 1,1-Dichloroethene         1.731   61   303538    49.6074 ug/L     100
  11) Carbon Disulfide           1.745   76   511211    48.8777 ug/L     100
  12) 1,1,2-Trichloro-1,2,2-...  1.754  101   187851    49.1471 ug/L     100
  13) Acrolein                   1.948   56    18931    51.4253 ug/L     100
  14) Methylene Chloride         2.116   84   211474    48.9667 ug/L     100
  15) Acetone                    2.153   43    38903    48.6019 ug/L     100
  16) trans-1,2-Dichloroethene   2.234   96   199187    49.5313 ug/L     100
  17) Methyl Tert Butyl Ether    2.318   73   526287    49.6862 ug/L     100
  18) 1,1-Dichloroethane         2.735   63   377622    49.1155 ug/L     100
  19) Acrylonitrile              2.782   53    50104    52.1051 ug/L     100
  20) Vinyl Acetate              2.996   86    19010    50.1220 ug/L     100
  21) cis-1,2-Dichloroethene     3.277   96   215260    47.6428 ug/L     100
  22) 2,2-Dichloropropane        3.387   77   306438    49.1429 ug/L     100
  23) Cyclohexane                3.485   56   313382    50.2783 ug/L     100
  24) Bromochloromethane         3.497  130   146170    51.4991 ug/L     100
  25) Chloroform                 3.613   83   371306    49.1210 ug/L     100
  26) Carbon Tetrachloride       3.746  117   307964    51.0771 ug/L     100
  28) 1,1,1-Trichloroethane      3.833   97   337378    49.4522 ug/L     100
  29) 1,1-Dichloropropene        4.012   75   267976    47.1789 ug/L     100
  30) 2-Butanone                 4.015   43    60254    46.4520 ug/L     100
  31) Benzene                    4.331   78   822491    48.4663 ug/L     100
  33) 1,2-Dichloroethane         4.591   62   252035    49.7917 ug/L     100
  34) Trichloroethene            5.049  130   239319    48.7866 ug/L     100
  35) Dibromomethane             5.483   93   122438    49.7144 ug/L     100
  36) 1,2-Dichloropropane        5.587   63   218136    47.0405 ug/L     100
  37) Bromodichloromethane       5.689   83   283602    49.1416 ug/L     100
  38) 1,4-Dioxane                5.891   88     2803    92.3083 ug/L     100
  39) 2-Chloroethyl Vinyl Ether  6.285   63   115403    49.8909 ug/L     100
  40) cis-1,3-Dichloropropene    6.305   75   347430    50.4121 ug/L     100
  41) 4-Methyl-2-Pentanone       6.893   58    56934    48.8667 ug/L     100
  42) trans-1,3-Dichloropropene  6.919   75   302663    50.4031 ug/L     100
  45) Toluene                    6.514   91   916978    48.7808 ug/L     100
  46) Tetrachloroethene          6.855  166   249625    48.5732 ug/L     100
  47) 1,1,2-Trichloroethane      7.049   97   168403    48.6382 ug/L     100
  48) Dibromochloromethane       7.194  129   232483    50.9742 ug/L     100
  49) 1,3-Dichloropropane        7.275   76   281255    49.1252 ug/L     100

8260VMS.M Wed Aug 13 09:39:07 2014                                       Page:  1
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                         Quantitation Report    (Not Reviewed)

Data Path : D:\MassHunter\GCMS\1\data\081214\
Data File : 17M007350.D
Acq On    : 12 Aug 2014  16:51
Operator  : ADC
Sample    : WG487972-08 50.0ug/L STD 8260
Misc      : 1,1 STD65747
ALS Vial  : 8   Sample Multiplier: 1

Quant Time: Aug 13 09:39:07 2014
Quant Method : D:\MassHunter\GCMS\1\methods\8260VMS.M
Quant Title  : 8260B/624 SOP:OVL MSV01 WATER 08/12/14 HPMS17
QLast Update : Wed Aug 13 09:38:18 2014
Response via : Initial Calibration

        Compound                   R.T. QIon  Response  Conc Units Dev(Min)
 -------------------------------------------------------------------------
  50) 1,2-Dibromoethane           7.365  107   169776    49.6216 ug/L     100
  51) 2-Hexanone                  7.614   43   103905    48.5134 ug/L     100
  52) Chlorobenzene               7.796  112   597474    48.9598 ug/L     100
  53) 1-Chlorohexane              7.814   69    56299    51.4021 ug/L     100
  54) Ethylbenzene                7.834  106   324925    49.3482 ug/L     100
  55) 1,1,1,2-Tetrachloroethane   7.854  131   229781    50.1030 ug/L     100
  56) m-,p-Xylene                 7.941  106   788873   100.4552 ug/L     100
  57) o-Xylene                    8.213  106   386388    49.8358 ug/L      99
  58) Styrene                     8.248  104   634291    51.4251 ug/L     100
  59) Bromoform                   8.254  173   166374    51.6341 ug/L     100
  60) Isopropylbenzene            8.407  105  1010415    50.7363 ug/L     100
  62) 1,3,5-Trimethylbenzene      8.755  105   849473    49.5393 ug/L     100
  64) Bromobenzene                8.613  156   268142    49.0506 ug/L     100
  65) n-Propylbenzene             8.645   91  1170636    50.9742 ug/L     100
  66) 1,1,2,2-Tetrachloroethane   8.694   83   197206    48.6104 ug/L     100
  67) 2-Chlorotoluene             8.720   91   666231    48.4918 ug/L      99
  68) 1,2,3-Trichloropropane      8.755  110    54321    48.9877 ug/L     100
  69) 1,2,4-Trimethylbenzene      8.957  105   848540    49.5947 ug/L     100
  70) 4-Chlorotoluene             8.813   91   689645    48.9290 ug/L     100
  71) tert-Butylbenzene           8.920  134   156281    48.1450 ug/L     100
  72) sec-Butylbenzene            9.012  105  1077203    50.6047 ug/L     100
  73) p-Isopropyltoluene          9.085  119   917974    51.1015 ug/L     100
  74) 1,3-Dichlorobenzene         9.117  146   489207    49.6044 ug/L     100
  75) 1,4-Dichlorobenzene         9.160  146   489008    47.8493 ug/L     100
  76) n-Butylbenzene              9.293   91   814979    52.6344 ug/L     100
  77) 1,2-Dichlorobenzene         9.366  146   456609    47.4865 ug/L     100
  78) 1,2-Dibromo-3-Chloropr...   9.742   75    37864    51.7562 ug/L     100
  79) Hexachlorobutadiene        10.040  225   211049    49.7237 ug/L     100
  80) 1,2,4-Trichlorobenzene     10.055  180   360088    52.6893 ug/L     100
  81) Naphthalene                10.202  128   670276    54.5130 ug/L     100
  82) 1,2,3-Trichlorobenzene     10.289  180   332397    53.5493 ug/L     100
 -------------------------------------------------------------------------

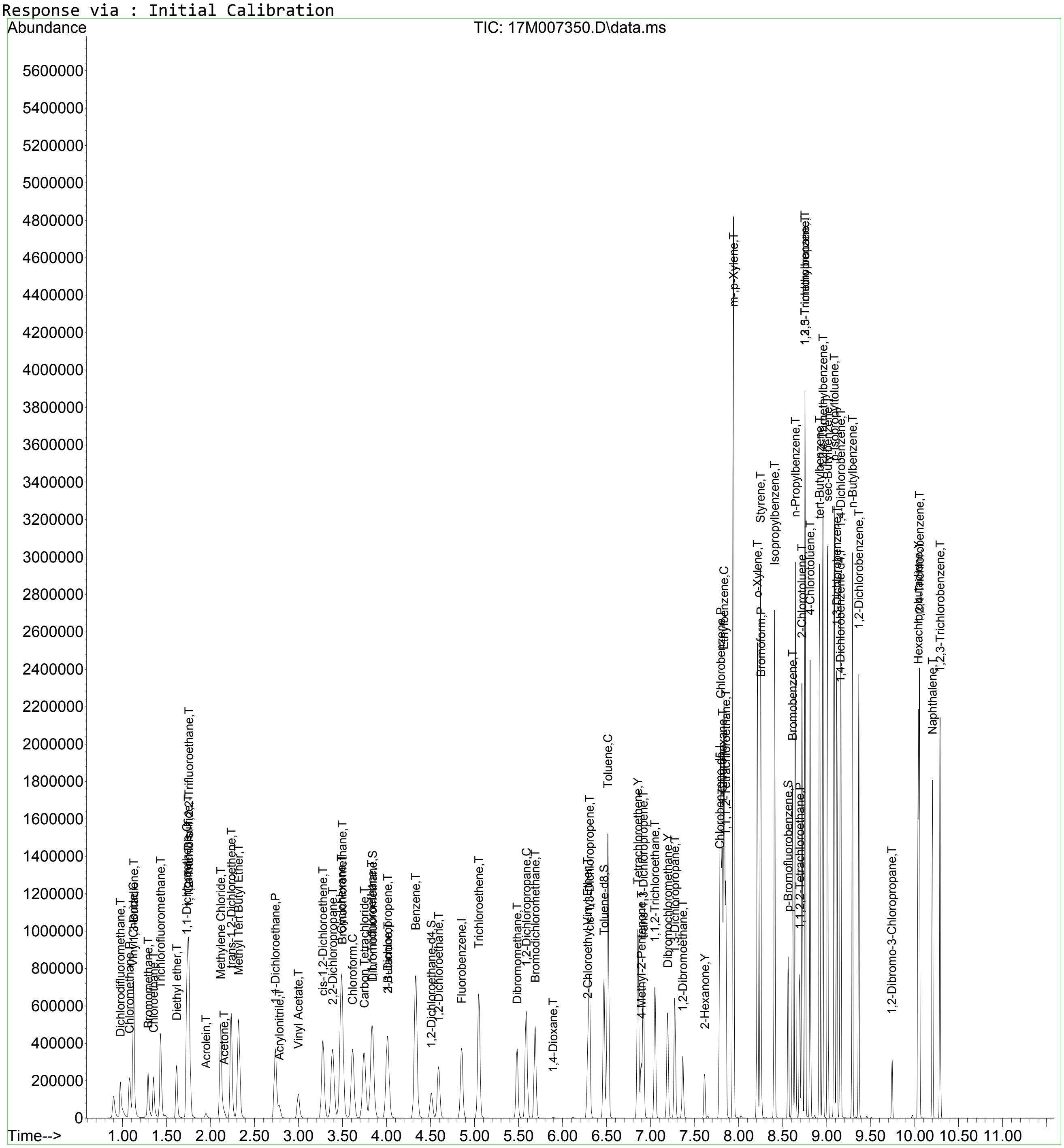
 (#) = qualifier out of range (m) = manual integration (+) = signals summed
```

Quantitation Report   (Not Reviewed)

00193443

Data Path : D:\MassHunter\GCMS\1\data\081214\
Data File : 17M007350.D
Acq On   : 12 Aug 2014 16:51
Operator : ADC
Sample   : WG487972-08 50.0ug/L STD 8260
Misc   : 1,1 STD65747
ALS Vial : 8   Sample Multiplier: 1

Quant Time: Aug 13 09:39:07 2014
Quant Method : D:\MassHunter\GCMS\1\methods\8260VMS.M
Quant Title : 8260B/624 SOP:OVL MSV01 WATER 08/12/14 HPMS17
QLast Update : Wed Aug 13 09:38:18 2014
Response via : Initial Calibration



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                         Quantitation Report    (Not Reviewed)

Data Path : D:\MassHunter\GCMS\1\data\081214\
Data File : 17M007351.D
Acq On    : 12 Aug 2014  17:11
Operator  : ADC
Sample    : WG487972-09 100.0ug/L STD 8260
Misc      : 1,1 STD65747
ALS Vial  : 9   Sample Multiplier: 1

Quant Time: Aug 13 09:39:10 2014
Quant Method : D:\MassHunter\GCMS\1\methods\8260VMS.M
Quant Title  : 8260B/624 SOP:OVL MSV01 WATER 08/12/14 HPMS17
QLast Update : Wed Aug 13 09:38:18 2014
Response via : Initial Calibration

        Compound                   R.T. QIon  Response  Conc Units Dev(Min)
 --------------------------------------------------------------------------
 Internal Standards
   1) Fluorobenzene               4.852   96   361865    25.00000 ug/L     0.0000
  43) Chlorobenzene-d5            7.785  117   280496    25.00000 ug/L     0.0000
  61) 1,4-Dichlorobenzene-d4      9.154  152   138263    25.00000 ug/L     0.0000

 System Monitoring Compounds
  27) Dibromofluoromethane        3.838  111   215286    45.3094 ug/L    0.0000
   Spiked Amount     25.000   Range  86 - 118    Recovery   =  181.238%#
  32) 1,2-Dichloroethane-d4       4.507   65   209455    44.2636 ug/L    0.0000
   Spiked Amount     25.000   Range  80 - 120    Recovery   =  177.054%#
  44) Toluene-d8                  6.470   98   786722    45.0315 ug/L    0.0000
   Spiked Amount     25.000   Range  88 - 110    Recovery   =  180.126%#
  63) p-Bromofluorobenzene        8.564   95   282135    48.6020 ug/L    0.0000
   Spiked Amount     25.000   Range  86 - 115    Recovery   =  194.408%#

 Target Compounds                                                  Qvalue
   2) Dichlorodifluoromethane     0.975   85   358932   106.0240 ug/L     100
   3) Chloromethane               1.079   50   431217    99.8226 ug/L     100
   4) Vinyl Chloride              1.120   62   465063   100.9931 ug/L     100
   5) 1,3-Butadiene               1.128   54   304329    97.6039 ug/L      99
   6) Bromomethane                1.288   94   249350   110.0994 ug/L      99
   7) Chloroethane                1.351   64   252486    97.9279 ug/L      99
   8) Trichlorofluoromethane      1.424  101   611486   102.6856 ug/L     100
   9) Diethyl ether               1.615   59   244405    95.9108 ug/L     100
  10) 1,1-Dichloroethene          1.728   61   605795    98.1215 ug/L     100
  11) Carbon Disulfide            1.742   76   964463    91.3905 ug/L     100
  12) 1,1,2-Trichloro-1,2,2-...   1.754  101   369623    95.8402 ug/L      99
  13) Acrolein                    1.948   56    35386    95.2664 ug/L      99
  14) Methylene Chloride          2.113   84   406127    93.1989 ug/L      98
  15) Acetone                     2.153   43    76554    94.7858 ug/L      98
  16) trans-1,2-Dichloroethene    2.231   96   384082    94.6559 ug/L      99
  17) Methyl Tert Butyl Ether     2.321   73  1033324    96.6841 ug/L     100
  18) 1,1-Dichloroethane          2.735   63   741924    95.6368 ug/L     100
  19) Acrylonitrile               2.782   53    94110    96.9948 ug/L     100
  20) Vinyl Acetate               2.999   86    39796   103.9897 ug/L      99
  21) cis-1,2-Dichloroethene      3.277   96   456125   100.0512 ug/L      99
  22) 2,2-Dichloropropane         3.387   77   619363    98.4393 ug/L      97
  23) Cyclohexane                 3.482   56   595121    94.6273 ug/L     100
  24) Bromochloromethane          3.497  130   299231   104.4848 ug/L      99
  25) Chloroform                  3.613   83   751212    98.4924 ug/L      99
  26) Carbon Tetrachloride        3.743  117   626711   103.0144 ug/L     100
  28) 1,1,1-Trichloroethane       3.833   97   681013    98.9303 ug/L     100
  29) 1,1-Dichloropropene         4.009   75   565408    98.6549 ug/L      97
  30) 2-Butanone                  4.015   43   130160    99.4491 ug/L      99
  31) Benzene                     4.333   78  1680052    98.1153 ug/L     100
  33) 1,2-Dichloroethane          4.591   62   507878    99.4399 ug/L     100
  34) Trichloroethene             5.049  130   484536    97.8937 ug/L      99
  35) Dibromomethane              5.483   93   252834   101.7434 ug/L     100
  36) 1,2-Dichloropropane         5.587   63   470940   100.6504 ug/L      98
  37) Bromodichloromethane        5.689   83   595710   102.3010 ug/L     100
  38) 1,4-Dioxane                 5.894   88     6310   205.9453 ug/L      97
  39) 2-Chloroethyl Vinyl Ether   6.288   63   240779   103.1639 ug/L     100
  40) cis-1,3-Dichloropropene     6.305   75   713069   102.5425 ug/L      99
  41) 4-Methyl-2-Pentanone        6.893   58   119633   101.7647 ug/L      99
  42) trans-1,3-Dichloropropene   6.919   75   621398   102.5587 ug/L     100
  45) Toluene                     6.517   91  1874991    98.0975 ug/L     100
  46) Tetrachloroethene           6.855  166   512634    98.1035 ug/L     100
  47) 1,1,2-Trichloroethane       7.049   97   347879    98.8153 ug/L      99
  48) Dibromochloromethane        7.194  129   480418   103.5969 ug/L     100
  49) 1,3-Dichloropropane         7.275   76   575703    98.8942 ug/L     100
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                              Quantitation Report    (Not Reviewed)

  Data Path : D:\MassHunter\GCMS\1\data\081214\
  Data File : 17M007351.D
  Acq On    : 12 Aug 2014  17:11
  Operator  : ADC
  Sample    : WG487972-09 100.0ug/L STD 8260
  Misc      : 1,1 STD65747
  ALS Vial  : 9   Sample Multiplier: 1

  Quant Time: Aug 13 09:39:10 2014
  Quant Method : D:\MassHunter\GCMS\1\methods\8260VMS.M
  Quant Title  : 8260B/624 SOP:OVL MSV01 WATER 08/12/14 HPMS17
  QLast Update : Wed Aug 13 09:38:18 2014
  Response via : Initial Calibration

          Compound                   R.T. QIon  Response  Conc Units Dev(Min)
   --------------------------------------------------------------------------
    50) 1,2-Dibromoethane           7.368  107   356501   102.4763 ug/L      99
    51) 2-Hexanone                  7.614   43   215573    98.9893 ug/L      99
    52) Chlorobenzene               7.796  112  1225815    98.7903 ug/L     100
    53) 1-Chlorohexane              7.817   69   111072    99.7364 ug/L      93
    54) Ethylbenzene                7.837  106   669169    99.9522 ug/L      97
    55) 1,1,1,2-Tetrachloroethane   7.857  131   467769   100.3112 ug/L     100
    56) m-,p-Xylene                 7.944  106  1633271   204.5464 ug/L      98
    57) o-Xylene                    8.216  106   770389    97.7229 ug/L      98
    58) Styrene                     8.251  104  1296688   103.3929 ug/L      99
    59) Bromoform                   8.254  173   341201   104.1430 ug/L      99
    60) Isopropylbenzene            8.410  105  2064196   101.9386 ug/L     100
    62) 1,3,5-Trimethylbenzene      8.758  105  1749989   102.9794 ug/L     100
    64) Bromobenzene                8.616  156   558412   103.0741 ug/L     100
    65) n-Propylbenzene             8.648   91  2392386   105.1174 ug/L      99
    66) 1,1,2,2-Tetrachloroethane   8.694   83   409090   101.7521 ug/L     100
    67) 2-Chlorotoluene             8.723   91  1377687   101.1832 ug/L     100
    68) 1,2,3-Trichloropropane      8.755  110   114473   104.1686 ug/L      99
    69) 1,2,4-Trimethylbenzene      8.957  105  1746310   102.9910 ug/L     100
    70) 4-Chlorotoluene             8.813   91  1420352   101.6837 ug/L     100
    71) tert-Butylbenzene           8.920  134   326091   101.3674 ug/L      98
    72) sec-Butylbenzene            9.012  105  2188591   103.7463 ug/L      99
    73) p-Isopropyltoluene          9.088  119  1874572   105.2981 ug/L      99
    74) 1,3-Dichlorobenzene         9.117  146  1012098   103.5535 ug/L     100
    75) 1,4-Dichlorobenzene         9.163  146   997915    98.5300 ug/L     100
    76) n-Butylbenzene              9.293   91  1672840   109.0166 ug/L     100
    77) 1,2-Dichlorobenzene         9.366  146   947303    99.4100 ug/L      99
    78) 1,2-Dibromo-3-Chloropr...   9.745   75    78266   107.9503 ug/L      99
    79) Hexachlorobutadiene        10.043  225   445311   105.8664 ug/L      99
    80) 1,2,4-Trichlorobenzene     10.058  180   758419   111.9793 ug/L     100
    81) Naphthalene                10.205  128  1418514   116.4113 ug/L      99
    82) 1,2,3-Trichlorobenzene     10.292  180   700326   113.8445 ug/L     100
   --------------------------------------------------------------------------

   (#) = qualifier out of range (m) = manual integration (+) = signals summed
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8260VMS.M Wed Aug 13 09:39:10 2014                                    Page:  2
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Quantitation Report   (Not Reviewed)

00193446

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Data Path : D:\MassHunter\GCMS\1\data\081214\
Data File : 17M007351.D
Acq On    : 12 Aug 2014  17:11
Operator  : ADC
Sample    : WG487972-09 100.0ug/L STD 8260
Misc      : 1,1 STD65747
ALS Vial  : 9   Sample Multiplier: 1

Quant Time: Aug 13 09:39:10 2014
Quant Method : D:\MassHunter\GCMS\1\methods\8260VMS.M
Quant Title  : 8260B/624 SOP:OVL MSV01 WATER 08/12/14 HPMS17
QLast Update : Wed Aug 13 09:38:18 2014
Response via : Initial Calibration
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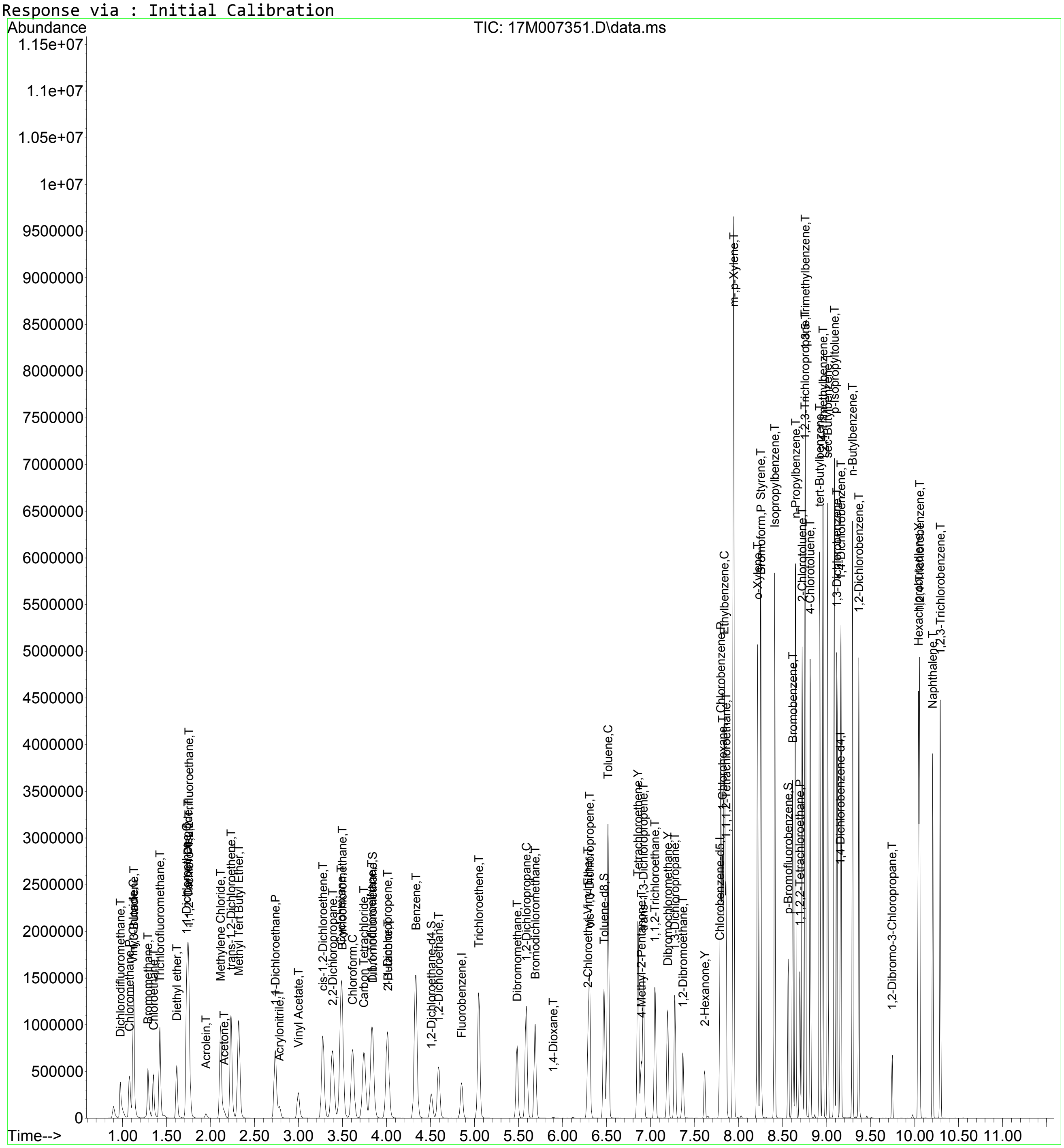

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                              Quantitation Report    (Not Reviewed)

     Data Path : D:\MassHunter\GCMS\1\data\081214\
     Data File : 17M007352.D
     Acq On    : 12 Aug 2014  17:30
     Operator  : ADC
     Sample    : WG487972-10 200.0ug/L STD 8260
     Misc      : 1,1 STD65747
     ALS Vial  : 10   Sample Multiplier: 1

     Quant Time: Aug 13 09:39:13 2014
     Quant Method : D:\MassHunter\GCMS\1\methods\8260VMS.M
     Quant Title  : 8260B/624 SOP:OVL MSV01 WATER 08/12/14 HPMS17
     QLast Update : Wed Aug 13 09:38:18 2014
     Response via : Initial Calibration

             Compound                   R.T. QIon  Response  Conc Units Dev(Min)
      --------------------------------------------------------------------------
      Internal Standards
        1) Fluorobenzene               4.852   96   344560    25.00000 ug/L     0.0000
       43) Chlorobenzene-d5            7.787  117   277377    25.00000 ug/L     0.0000
       61) 1,4-Dichlorobenzene-d4      9.157  152   142085    25.00000 ug/L   # 0.0000

      System Monitoring Compounds
       27) Dibromofluoromethane        3.841  111   441093    97.4955 ug/L    0.0000
        Spiked Amount     25.000   Range  86 - 118    Recovery   =  389.982%#
       32) 1,2-Dichloroethane-d4       4.507   65   425799    94.5022 ug/L    0.0000
        Spiked Amount     25.000   Range  80 - 120    Recovery   =  378.009%#
       44) Toluene-d8                  6.473   98  1559619    90.2755 ug/L    0.0000
        Spiked Amount     25.000   Range  88 - 110    Recovery   =  361.102%#
       63) p-Bromofluorobenzene        8.566   95   589489    98.8168 ug/L    0.0000
        Spiked Amount     25.000   Range  86 - 115    Recovery   =  395.267%#

      Target Compounds                                                Qvalue
        2) Dichlorodifluoromethane     0.972   85   720807   223.6107 ug/L     100
        3) Chloromethane               1.076   50   858747   208.7756 ug/L     100
        4) Vinyl Chloride              1.117   62   944319   215.3676 ug/L     100
        5) 1,3-Butadiene               1.125   54   636861   214.5114 ug/L      99
        6) Bromomethane                1.287   94   523365   242.6957 ug/L     100
        7) Chloroethane                1.348   64   481578   196.1633 ug/L      97
        8) Trichlorofluoromethane      1.415  101  1049772   185.1397 ug/L     100
        9) Diethyl ether               1.617   59   500563   206.2994 ug/L      99
       10) 1,1-Dichloroethene          1.722   61  1241047   211.1099 ug/L      99
       11) Carbon Disulfide            1.736   76  2059598   204.9650 ug/L     100
       12) 1,1,2-Trichloro-1,2,2-...   1.748  101   762318   207.5902 ug/L      99
       13) Acrolein                    1.950   56    74434   210.4560 ug/L      99
       14) Methylene Chloride          2.113   84   842173   202.9700 ug/L      99
       15) Acetone                     2.159   43   150701   195.9626 ug/L      97
       16) trans-1,2-Dichloroethene    2.228   96   801898   207.5508 ug/L      99
       17) Methyl Tert Butyl Ether     2.321   73  2105101   206.8584 ug/L     100
       18) 1,1-Dichloroethane          2.732   63  1515732   205.1965 ug/L     100
       19) Acrylonitrile               2.784   53   197145   213.3929 ug/L     100
       20) Vinyl Acetate               2.996   86    71255   195.5456 ug/L      99
       21) cis-1,2-Dichloroethene      3.277   96   894417   206.0441 ug/L     100
       22) 2,2-Dichloropropane         3.384   77  1213936   202.6287 ug/L      98
       23) Cyclohexane                 3.482   56  1210482   202.1394 ug/L     100
       24) Bromochloromethane          3.494  130   591188   216.7973 ug/L      99
       25) Chloroform                  3.612   83  1481525   204.0004 ug/L     100
       26) Carbon Tetrachloride        3.743  117  1243259   214.6219 ug/L      99
       28) 1,1,1-Trichloroethane       3.832   97  1355773   206.8439 ug/L     100
       29) 1,1-Dichloropropene         4.009   75  1127595   206.6291 ug/L      97
       30) 2-Butanone                  4.018   43   260575   209.0922 ug/L      99
       31) Benzene                     4.330   78  3304250   202.6602 ug/L     100
       33) 1,2-Dichloroethane          4.591   62  1010627   207.8135 ug/L     100
       34) Trichloroethene             5.048  130   979981   207.9351 ug/L     100
       35) Dibromomethane              5.483   93   505986   213.8411 ug/L     100
       36) 1,2-Dichloropropane         5.590   63   938449   210.6406 ug/L      98
       37) Bromodichloromethane        5.688   83  1181996   213.1783 ug/L     100
       38) 1,4-Dioxane                 5.900   88    12865   440.9751 ug/L      98
       39) 2-Chloroethyl Vinyl Ether   6.291   63   477834   215.0146 ug/L      99
       40) cis-1,3-Dichloropropene     6.308   75  1384580   209.1087 ug/L     100
       41) 4-Methyl-2-Pentanone        6.899   58   230104   205.5664 ug/L     100
       42) trans-1,3-Dichloropropene   6.922   75  1236690   214.3608 ug/L     100
       45) Toluene                     6.519   91  3608838   190.9336 ug/L      99
       46) Tetrachloroethene           6.858  166  1006417   194.7652 ug/L      99
       47) 1,1,2-Trichloroethane       7.052   97   684614   196.6518 ug/L      99
       48) Dibromochloromethane        7.194  129   970866   211.7107 ug/L     100
       49) 1,3-Dichloropropane         7.278   76  1151005   199.9428 ug/L     100

   8260VMS.M Wed Aug 13 09:39:13 2014                                          Page:  1
```
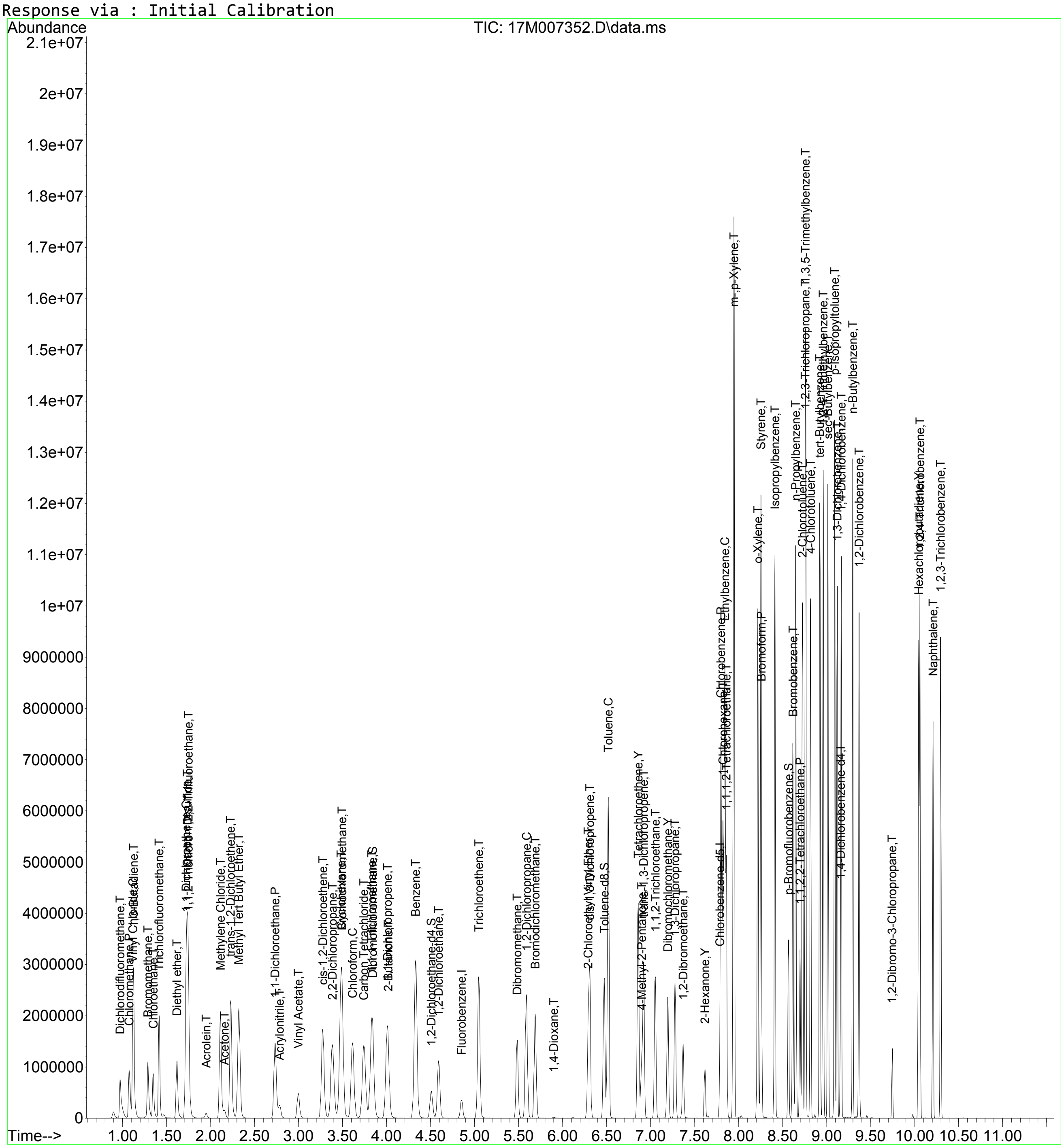

```
                          Quantitation Report    (Not Reviewed)

Data Path : D:\MassHunter\GCMS\1\data\081214\
Data File : 17M007352.D
Acq On    : 12 Aug 2014  17:30
Operator  : ADC
Sample    : WG487972-10 200.0ug/L STD 8260
Misc      : 1,1 STD65747
ALS Vial  : 10   Sample Multiplier: 1

Quant Time: Aug 13 09:39:13 2014
Quant Method : D:\MassHunter\GCMS\1\methods\8260VMS.M
Quant Title  : 8260B/624 SOP:OVL MSV01 WATER 08/12/14 HPMS17
QLast Update : Wed Aug 13 09:38:18 2014
Response via : Initial Calibration

        Compound                  R.T. QIon  Response  Conc Units Dev(Min)
 --------------------------------------------------------------------------
  50) 1,2-Dibromoethane          7.371  107   715537   207.9940 ug/L     100
  51) 2-Hexanone                 7.617   43   436398   202.6437 ug/L      99
  52) Chlorobenzene              7.799  112  2463134   200.7398 ug/L      99
  53) 1-Chlorohexane             7.822   69   230585   209.3805 ug/L      95
  54) Ethylbenzene               7.842  106  1345250   203.1963 ug/L      95
  55) 1,1,1,2-Tetrachloroethane  7.860  131   938176   203.4503 ug/L      99
  56) m-,p-Xylene                7.947  106  3211573   406.7313 ug/L      92
  57) o-Xylene                   8.219  106  1606893   206.1244 ug/L      98
  58) Styrene                    8.254  104  2652474   213.8762 ug/L      99
  59) Bromoform                  8.259  173   700797   216.3058 ug/L     100
  60) Isopropylbenzene           8.413  105  3997104   199.6132 ug/L      97
  62) 1,3,5-Trimethylbenzene     8.760  105  3481137   199.3398 ug/L      98
  64) Bromobenzene               8.618  156  1106162   198.6878 ug/L      99
  65) n-Propylbenzene            8.647   91  4580726   195.8553 ug/L      97
  66) 1,1,2,2-Tetrachloroethane  8.697   83   802322   194.1918 ug/L     100
  67) 2-Chlorotoluene            8.726   91  2781380   198.7815 ug/L      98
  68) 1,2,3-Trichloropropane     8.757  110   233435   206.7081 ug/L      99
  69) 1,2,4-Trimethylbenzene     8.960  105  3427673   196.7139 ug/L      97
  70) 4-Chlorotoluene            8.818   91  2889117   201.2696 ug/L      99
  71) tert-Butylbenzene          8.922  134   662575   200.4252 ug/L      93
  72) sec-Butylbenzene           9.015  105  4191400   193.3413 ug/L      97
  73) p-Isopropyltoluene         9.090  119  3599680   196.7614 ug/L      97
  74) 1,3-Dichlorobenzene        9.119  146  2017267   200.8460 ug/L      98
  75) 1,4-Dichlorobenzene        9.166  146  2035585   195.5788 ug/L      99
  76) n-Butylbenzene             9.296   91  3297273   209.0985 ug/L      98
  77) 1,2-Dichlorobenzene        9.368  146  1941727   198.2837 ug/L      99
  78) 1,2-Dibromo-3-Chloropr...  9.745   75   155237   208.3548 ug/L     100
  79) Hexachlorobutadiene       10.046  225   887959   205.4213 ug/L     100
  80) 1,2,4-Trichlorobenzene    10.060  180  1525115   219.1236 ug/L      99
  81) Naphthalene               10.208  128  2723493   217.4931 ug/L      98
  82) 1,2,3-Trichlorobenzene    10.295  180  1396762   220.9491 ug/L     100
 --------------------------------------------------------------------------

 (#) = qualifier out of range (m) = manual integration (+) = signals summed
```

```
Data Path : D:\MassHunter\GCMS\1\data\081214\
Data File : 17M007352.D
Acq On    : 12 Aug 2014  17:30
Operator  : ADC
Sample    : WG487972-10 200.0ug/L STD 8260
Misc      : 1,1 STD65747
ALS Vial  : 10   Sample Multiplier: 1

Quant Time: Aug 13 09:39:13 2014
Quant Method : D:\MassHunter\GCMS\1\methods\8260VMS.M
Quant Title  : 8260B/624 SOP:OVL MSV01 WATER 08/12/14 HPMS17
QLast Update : Wed Aug 13 09:38:18 2014
Response via : Initial Calibration
```



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                             Quantitation Report    (Not Reviewed)

  Data Path : D:\MassHunter\GCMS\1\data\081214\
  Data File : 17M007353.D
  Acq On    : 12 Aug 2014  17:50
  Operator  : ADC
  Sample    : WG487972-11 300.0ug/L STD 8260
  Misc      : 1,1 STD65747
  ALS Vial  : 11   Sample Multiplier: 1

  Quant Time: Aug 13 09:39:16 2014
  Quant Method : D:\MassHunter\GCMS\1\methods\8260VMS.M
  Quant Title  : 8260B/624 SOP:OVL MSV01 WATER 08/12/14 HPMS17
  QLast Update : Wed Aug 13 09:38:18 2014
  Response via : Initial Calibration

          Compound                   R.T. QIon  Response  Conc Units Dev(Min)
   --------------------------------------------------------------------------
   Internal Standards
     1) Fluorobenzene               4.852   96   348965    25.00000 ug/L     0.0000
    43) Chlorobenzene-d5            7.790  117   277199    25.00000 ug/L     0.0000
    61) 1,4-Dichlorobenzene-d4      9.160  152   142243    25.00000 ug/L   # 0.0000

   System Monitoring Compounds
    27) Dibromofluoromethane        3.841  111   673432   146.9709 ug/L    0.0000
     Spiked Amount     25.000   Range  86 - 118    Recovery   =  587.884%#
    32) 1,2-Dichloroethane-d4       4.507   65   647928   141.9866 ug/L    0.0000
     Spiked Amount     25.000   Range  80 - 120    Recovery   =  567.946%#
    44) Toluene-d8                  6.473   98  2428848   140.6794 ug/L    0.0000
     Spiked Amount     25.000   Range  88 - 110    Recovery   =  562.718%#
    63) p-Bromofluorobenzene        8.566   95   904638   151.4773 ug/L    0.0000
     Spiked Amount     25.000   Range  86 - 115    Recovery   =  605.909%#

   Target Compounds                                                  Qvalue
     2) Dichlorodifluoromethane     0.972   85  1089299   333.6597 ug/L     100
     3) Chloromethane               1.076   50  1320484   316.9792 ug/L     100
     4) Vinyl Chloride              1.117   62  1429332   321.8679 ug/L     100
     5) 1,3-Butadiene               1.123   54   981052   326.2727 ug/L      99
     6) Bromomethane                1.288   94   805522   368.8228 ug/L     100
     7) Chloroethane                1.348   64   684121   275.1484 ug/L      96
     8) Trichlorofluoromethane      1.415  101  1521122   264.8815 ug/L     100
     9) Diethyl ether               1.621   59   767826   312.4532 ug/L      99
    10) 1,1-Dichloroethene          1.716   61  1887137   316.9617 ug/L      99
    11) Carbon Disulfide            1.731   76  3173998   311.8795 ug/L      99
    12) 1,1,2-Trichloro-1,2,2-...   1.742  101  1149702   309.1284 ug/L      99
    13) Acrolein                    1.951   56   111882   312.3440 ug/L      99
    14) Methylene Chloride          2.110   84  1282992   305.3075 ug/L     100
    15) Acetone                     2.165   43   224361   288.0630 ug/L      97
    16) trans-1,2-Dichloroethene    2.226   96  1222921   312.5264 ug/L     100
    17) Methyl Tert Butyl Ether     2.327   73  3135992   304.2693 ug/L     100
    18) 1,1-Dichloroethane          2.732   63  2289961   306.0967 ug/L     100
    19) Acrylonitrile               2.790   53   294368   314.6066 ug/L     100
    20) Vinyl Acetate               2.999   86   113620   307.8722 ug/L      98
    21) cis-1,2-Dichloroethene      3.277   96  1327276   301.9009 ug/L     100
    22) 2,2-Dichloropropane         3.384   77  1826366   301.0065 ug/L      99
    23) Cyclohexane                 3.482   56  1816358   299.4864 ug/L     100
    24) Bromochloromethane          3.497  130   877687   317.7978 ug/L      99
    25) Chloroform                  3.612   83  2224679   302.4631 ug/L     100
    26) Carbon Tetrachloride        3.743  117  1892901   322.6439 ug/L      99
    28) 1,1,1-Trichloroethane       3.833   97  2063138   310.7899 ug/L     100
    29) 1,1-Dichloropropene         4.009   75  1714322   310.1800 ug/L      97
    30) 2-Butanone                  4.024   43   386913   306.5500 ug/L      99
    31) Benzene                     4.331   78  4989743   302.1738 ug/L      99
    33) 1,2-Dichloroethane          4.594   62  1531474   310.9392 ug/L     100
    34) Trichloroethene             5.049  130  1484747   311.0611 ug/L     100
    35) Dibromomethane              5.486   93   773321   322.6974 ug/L     100
    36) 1,2-Dichloropropane         5.590   63  1374365   304.5906 ug/L      99
    37) Bromodichloromethane        5.691   83  1790393   318.8293 ug/L     100
    38) 1,4-Dioxane                 5.909   88    17737   600.2987 ug/L      96
    39) 2-Chloroethyl Vinyl Ether   6.294   63   728333   323.5966 ug/L      99
    40) cis-1,3-Dichloropropene     6.311   75  2148791   320.4285 ug/L     100
    41) 4-Methyl-2-Pentanone        6.905   58   351353   309.9236 ug/L     100
    42) trans-1,3-Dichloropropene   6.922   75  1876437   321.1453 ug/L      99
    45) Toluene                     6.522   91  5480547   290.1467 ug/L      98
    46) Tetrachloroethene           6.861  166  1586071   307.1390 ug/L     100
    47) 1,1,2-Trichloroethane       7.055   97  1040331   299.0215 ug/L      99
    48) Dibromochloromethane        7.197  129  1454210   317.3142 ug/L     100
    49) 1,3-Dichloropropane         7.281   76  1712461   297.6652 ug/L     100

8260VMS.M Wed Aug 13 09:39:16 2014                                                 Page:  1
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                          Quantitation Report    (Not Reviewed)

   Data Path : D:\MassHunter\GCMS\1\data\081214\
   Data File : 17M007353.D
   Acq On    : 12 Aug 2014  17:50
   Operator  : ADC
   Sample    : WG487972-11 300.0ug/L STD 8260
   Misc      : 1,1 STD65747
   ALS Vial  : 11   Sample Multiplier: 1

   Quant Time: Aug 13 09:39:16 2014
   Quant Method : D:\MassHunter\GCMS\1\methods\8260VMS.M
   Quant Title  : 8260B/624 SOP:OVL MSV01 WATER 08/12/14 HPMS17
   QLast Update : Wed Aug 13 09:38:18 2014
   Response via : Initial Calibration

           Compound                   R.T. QIon  Response  Conc Units Dev(Min)
    -------------------------------------------------------------------------
     50) 1,2-Dibromoethane           7.371  107  1068222   310.7127 ug/L      99
     51) 2-Hexanone                  7.620   43   635670   295.3662 ug/L      99
     52) Chlorobenzene               7.802  112  3638378   296.7099 ug/L      98
     53) 1-Chlorohexane              7.825   69   349125   317.2232 ug/L      86
     54) Ethylbenzene                7.846  106  2015307   304.6020 ug/L      91
     55) 1,1,1,2-Tetrachloroethane   7.866  131  1394320   302.5626 ug/L      99
     56) m-,p-Xylene                 7.953  106  4604424   583.5040 ug/L      86
     57) o-Xylene                    8.219  106  2360937   303.0439 ug/L      95
     58) Styrene                     8.257  104  3916501   316.0009 ug/L      96
     59) Bromoform                   8.260  173  1051246   324.6827 ug/L      99
     60) Isopropylbenzene            8.413  105  5651771   282.4276 ug/L      94
     62) 1,3,5-Trimethylbenzene      8.763  105  4870203   278.5719 ug/L      95
     64) Bromobenzene                8.619  156  1689704   303.1660 ug/L     100
     65) n-Propylbenzene             8.650   91  6397656   273.2368 ug/L      94
     66) 1,1,2,2-Tetrachloroethane   8.700   83  1221829   295.3996 ug/L      99
     67) 2-Chlorotoluene             8.729   91  4055155   289.4946 ug/L      97
     68) 1,2,3-Trichloropropane      8.760  110   338137   299.0898 ug/L      99
     69) 1,2,4-Trimethylbenzene      8.963  105  4793442   274.7896 ug/L      94
     70) 4-Chlorotoluene             8.818   91  4173377   290.4143 ug/L      98
     71) tert-Butylbenzene           8.925  134   990683   299.3432 ug/L      87
     72) sec-Butylbenzene            9.018  105  5780165   266.3319 ug/L      94
     73) p-Isopropyltoluene          9.093  119  5027864   274.5219 ug/L      93
     74) 1,3-Dichlorobenzene         9.122  146  3000389   298.3972 ug/L      97
     75) 1,4-Dichlorobenzene         9.169  146  3001160   288.0309 ug/L      98
     76) n-Butylbenzene              9.299   91  4624790   292.9579 ug/L      95
     77) 1,2-Dichlorobenzene         9.371  146  2882947   294.0714 ug/L      98
     78) 1,2-Dibromo-3-Chloropr...   9.745   75   231646   310.5636 ug/L      98
     79) Hexachlorobutadiene        10.043  225  1369024   316.3596 ug/L     100
     80) 1,2,4-Trichlorobenzene     10.060  180  2298368   329.8552 ug/L      99
     81) Naphthalene                10.205  128  3962151   316.0586 ug/L      97
     82) 1,2,3-Trichlorobenzene     10.295  180  2092538   330.6438 ug/L      99
    -------------------------------------------------------------------------

    (#) = qualifier out of range (m) = manual integration (+) = signals summed
```

Quantitation Report   (Not Reviewed)

00193452

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Data Path : D:\MassHunter\GCMS\1\data\081214\
Data File : 17M007353.D
Acq On    : 12 Aug 2014  17:50
Operator  : ADC
Sample    : WG487972-11 300.0ug/L STD 8260
Misc      : 1,1 STD65747
ALS Vial  : 11   Sample Multiplier: 1

Quant Time: Aug 13 09:39:16 2014
Quant Method : D:\MassHunter\GCMS\1\methods\8260VMS.M
Quant Title  : 8260B/624 SOP:OVL MSV01 WATER 08/12/14 HPMS17
QLast Update : Wed Aug 13 09:38:18 2014
Response via : Initial Calibration
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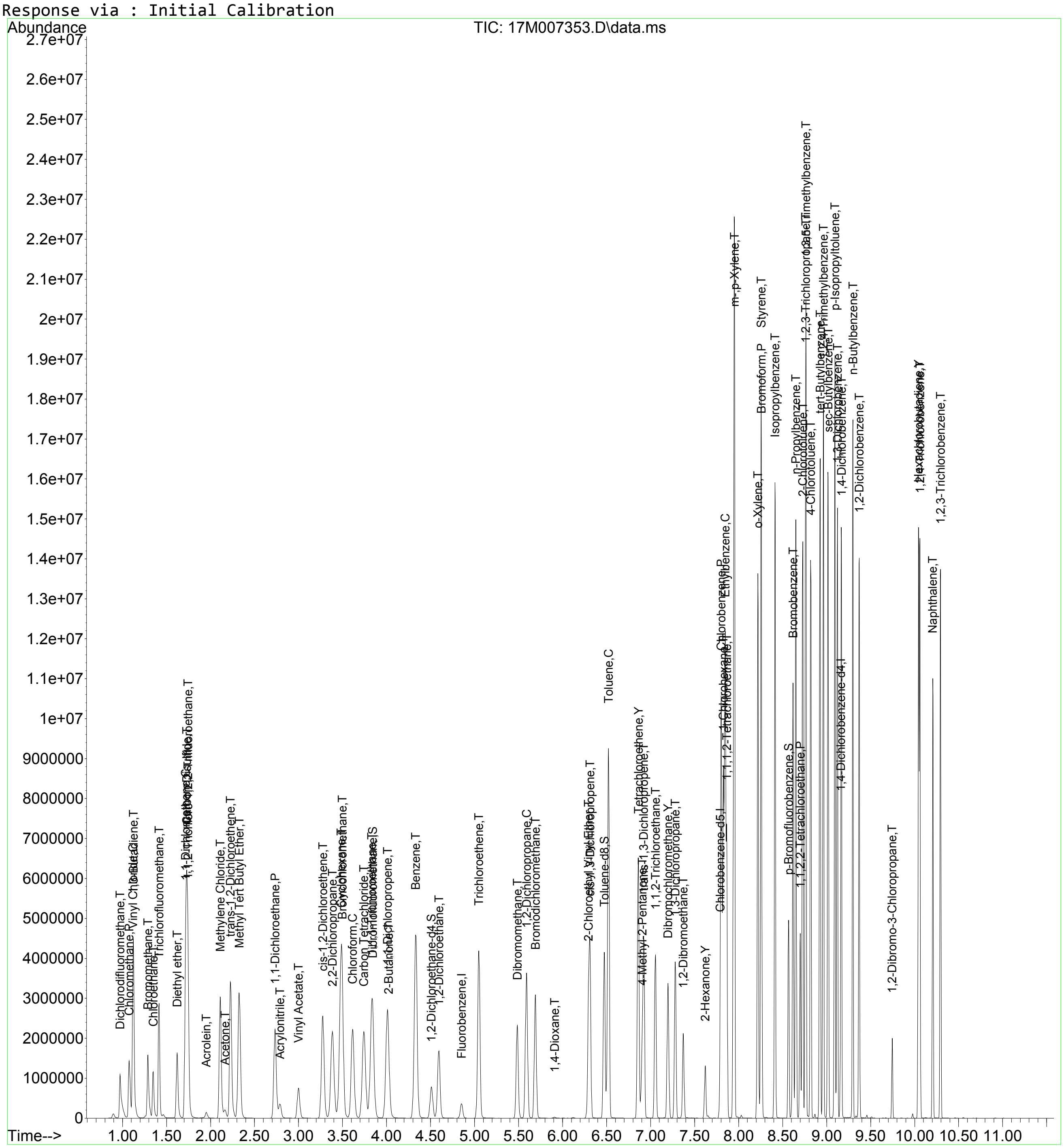

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                         Quantitation Report    (Not Reviewed)

  Data Path : D:\MassHunter\GCMS\1\data\081214\
  Data File : 17M007355.D
  Acq On    : 12 Aug 2014  18:29
  Operator  : ADC
  Sample    : WG487972-12 50.0ug/L ALTSRC 8260
  Misc      : 1,1 STD65748
  ALS Vial  : 13   Sample Multiplier: 1

  Quant Time: Aug 13 09:39:22 2014
  Quant Method : D:\MassHunter\GCMS\1\methods\8260VMS.M
  Quant Title  : 8260B/624 SOP:OVL MSV01 WATER 08/12/14 HPMS17
  QLast Update : Wed Aug 13 09:38:18 2014
  Response via : Initial Calibration

          Compound                   R.T. QIon  Response  Conc Units Dev(Min)
   --------------------------------------------------------------------------
   Internal Standards
     1) Fluorobenzene               4.849   96   351766    25.00000 ug/L     0.0000
    43) Chlorobenzene-d5            7.784  117   273633    25.00000 ug/L     0.0000
    61) 1,4-Dichlorobenzene-d4      9.154  152   142630    25.00000 ug/L     0.0000

   System Monitoring Compounds
    27) Dibromofluoromethane        3.838  111   109207    23.6437 ug/L    0.0000
     Spiked Amount     25.000   Range  86 - 118    Recovery   =   94.575%
    32) 1,2-Dichloroethane-d4       4.504   65   101899    22.1523 ug/L    0.0000
     Spiked Amount     25.000   Range  80 - 120    Recovery   =   88.609%
    44) Toluene-d8                  6.467   98   398014    23.3535 ug/L    0.0000
     Spiked Amount     25.000   Range  88 - 110    Recovery   =   93.414%
    63) p-Bromofluorobenzene        8.563   95   149970    25.0436 ug/L    0.0000
     Spiked Amount     25.000   Range  86 - 115    Recovery   =  100.174%

   Target Compounds                                                  Qvalue
     2) Dichlorodifluoromethane     0.969   85   222673    67.6631 ug/L      99
     3) Chloromethane               1.073   50   227544    54.1865 ug/L     100
     4) Vinyl Chloride              1.114   62   231717    51.7643 ug/L     100
     5) 1,3-Butadiene               1.122   54   182233    60.1234 ug/L      99
     6) Bromomethane                1.284   94   113907    51.7391 ug/L     100
     7) Chloroethane                1.345   64   110705    44.1702 ug/L      99
     8) Trichlorofluoromethane      1.412  101   246257    42.5407 ug/L      99
     9) Diethyl ether               1.620   59   708109   285.8580 ug/L      99
    10) 1,1-Dichloroethene          1.707   61   265163    44.1819 ug/L     100
    11) Carbon Disulfide            1.722   76   399768    38.9687 ug/L      99
    12) 1,1,2-Trichloro-1,2,2-...   1.733  101   177135    47.2483 ug/L      97
    13) Acrolein                    1.953   56    30418    84.2426 ug/L      98
    14) Methylene Chloride          2.107   84   194468    45.9081 ug/L      98
    15) Acetone                     2.167   43    41298    52.6014 ug/L     100
    16) trans-1,2-Dichloroethene    2.223   96   188776    47.8589 ug/L      99
    17) Methyl Tert Butyl Ether     2.330   73   529898    51.0039 ug/L     100
    18) 1,1-Dichloroethane          2.729   63   352086    46.6882 ug/L     100
    19) Acrylonitrile               2.787   53    21463    22.7560 ug/L      98
    20) Vinyl Acetate               2.996   86    22810    61.3153 ug/L      98
    21) cis-1,2-Dichloroethene      3.271   96   216894    48.9417 ug/L      99
    22) 2,2-Dichloropropane         3.381   77   274569    44.8919 ug/L      99
    23) Cyclohexane                 3.470   56   329141    53.8376 ug/L #    77
    24) Bromochloromethane          3.491  130   136396    48.9938 ug/L      98
    25) Chloroform                  3.609   83   354993    47.8799 ug/L     100
    26) Carbon Tetrachloride        3.734  117   291143    49.2300 ug/L      99
    28) 1,1,1-Trichloroethane       3.827   97   322476    48.1908 ug/L     100
    29) 1,1-Dichloropropene         4.000   75   260674    46.7894 ug/L     100
    30) 2-Butanone                  4.023   43    65107    51.1733 ug/L      98
    31) Benzene                     4.325   78   795183    47.7720 ug/L     100
    33) 1,2-Dichloroethane          4.585   62   245468    49.4412 ug/L     100
    34) Trichloroethene             5.043  130   226816    47.1406 ug/L      98
    35) Dibromomethane              5.480   93   117381    48.5916 ug/L     100
    36) 1,2-Dichloropropane         5.584   63   219433    48.2441 ug/L      99
    37) Bromodichloromethane        5.685   83   274795    48.5452 ug/L     100
    38) 1,4-Dioxane                 5.900   88    16287   546.8350 ug/L      98
    39) 2-Chloroethyl Vinyl Ether   6.285   63   118784    52.3552 ug/L      99
    40) cis-1,3-Dichloropropene     6.305   75   346193    51.2134 ug/L     100
    41) 4-Methyl-2-Pentanone        6.896   58    59934    52.4460 ug/L      99
    42) trans-1,3-Dichloropropene   6.916   75   282920    48.0352 ug/L     100
    45) Toluene                     6.513   91   889877    47.7251 ug/L     100
    46) Tetrachloroethene           6.855  166   239112    46.9069 ug/L     100
    47) 1,1,2-Trichloroethane       7.049   97   165065    48.0628 ug/L     100
    48) Dibromochloromethane        7.194  129   224067    49.5294 ug/L     100
    49) 1,3-Dichloropropane         7.275   76   272147    47.9219 ug/L      99

8260VMS.M Wed Aug 13 09:39:22 2014                                     Page:  1
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                          Quantitation Report    (Not Reviewed)

  Data Path : D:\MassHunter\GCMS\1\data\081214\
  Data File : 17M007355.D
  Acq On    : 12 Aug 2014  18:29
  Operator  : ADC
  Sample    : WG487972-12 50.0ug/L ALTSRC 8260
  Misc      : 1,1 STD65748
  ALS Vial  : 13   Sample Multiplier: 1

  Quant Time: Aug 13 09:39:22 2014
  Quant Method : D:\MassHunter\GCMS\1\methods\8260VMS.M
  Quant Title  : 8260B/624 SOP:OVL MSV01 WATER 08/12/14 HPMS17
  QLast Update : Wed Aug 13 09:38:18 2014
  Response via : Initial Calibration

          Compound                   R.T. QIon  Response  Conc Units Dev(Min)
   --------------------------------------------------------------------------
    50) 1,2-Dibromoethane           7.365  107   163833    48.2750 ug/L      99
    51) 2-Hexanone                  7.617   43   108728    51.1792 ug/L     100
    52) Chlorobenzene               7.796  112   558661    46.1526 ug/L     100
    53) 1-Chlorohexane              7.813   69    54227    49.9140 ug/L      96
    54) Ethylbenzene                7.834  106   317823    48.6631 ug/L     100
    55) 1,1,1,2-Tetrachloroethane   7.854  131   220498    48.4709 ug/L      99
    56) m-,p-Xylene                 7.941  106   754587    96.8726 ug/L     100
    57) o-Xylene                    8.213  106   351678    45.7288 ug/L      98
    58) Styrene                     8.248  104   627238    51.2679 ug/L      99
    59) Bromoform                   8.254  173   164325    51.4140 ug/L      99
    60) Isopropylbenzene            8.407  105   936418    47.4041 ug/L     100
    62) 1,3,5-Trimethylbenzene      8.757  105   886151    50.5496 ug/L     100
    64) Bromobenzene                8.615  156   260063    46.5338 ug/L      99
    65) n-Propylbenzene             8.644   91  1059031    45.1073 ug/L     100
    66) 1,1,2,2-Tetrachloroethane   8.696   83   196012    47.2609 ug/L     100
    67) 2-Chlorotoluene             8.723   91   644614    45.8937 ug/L     100
    68) 1,2,3-Trichloropropane      8.754  110    54550    48.1198 ug/L     100
    69) 1,2,4-Trimethylbenzene      8.957  105   884418    50.5627 ug/L     100
    70) 4-Chlorotoluene             8.812   91   658087    45.6703 ug/L     100
    71) tert-Butylbenzene           8.919  134   150531    45.3608 ug/L     100
    72) sec-Butylbenzene            9.009  105  1019689    46.8566 ug/L     100
    73) p-Isopropyltoluene          9.087  119   868212    47.2758 ug/L     100
    74) 1,3-Dichlorobenzene         9.116  146   463560    45.9773 ug/L     100
    75) 1,4-Dichlorobenzene         9.163  146   502652    48.1102 ug/L     100
    76) n-Butylbenzene              9.293   91   847444    53.5358 ug/L     100
    77) 1,2-Dichlorobenzene         9.365  146   453649    46.1483 ug/L     100
    78) 1,2-Dibromo-3-Chloropr...   9.745   75    38159    51.0203 ug/L      99
    79) Hexachlorobutadiene        10.040  225   215467    49.6559 ug/L     100
    80) 1,2,4-Trichlorobenzene     10.054  180   362653    51.9057 ug/L     100
    81) Naphthalene                10.202  128   652247    51.8882 ug/L      99
    82) 1,2,3-Trichlorobenzene     10.289  180   332488    52.3942 ug/L     100
   --------------------------------------------------------------------------

   (#) = qualifier out of range (m) = manual integration (+) = signals summed
```
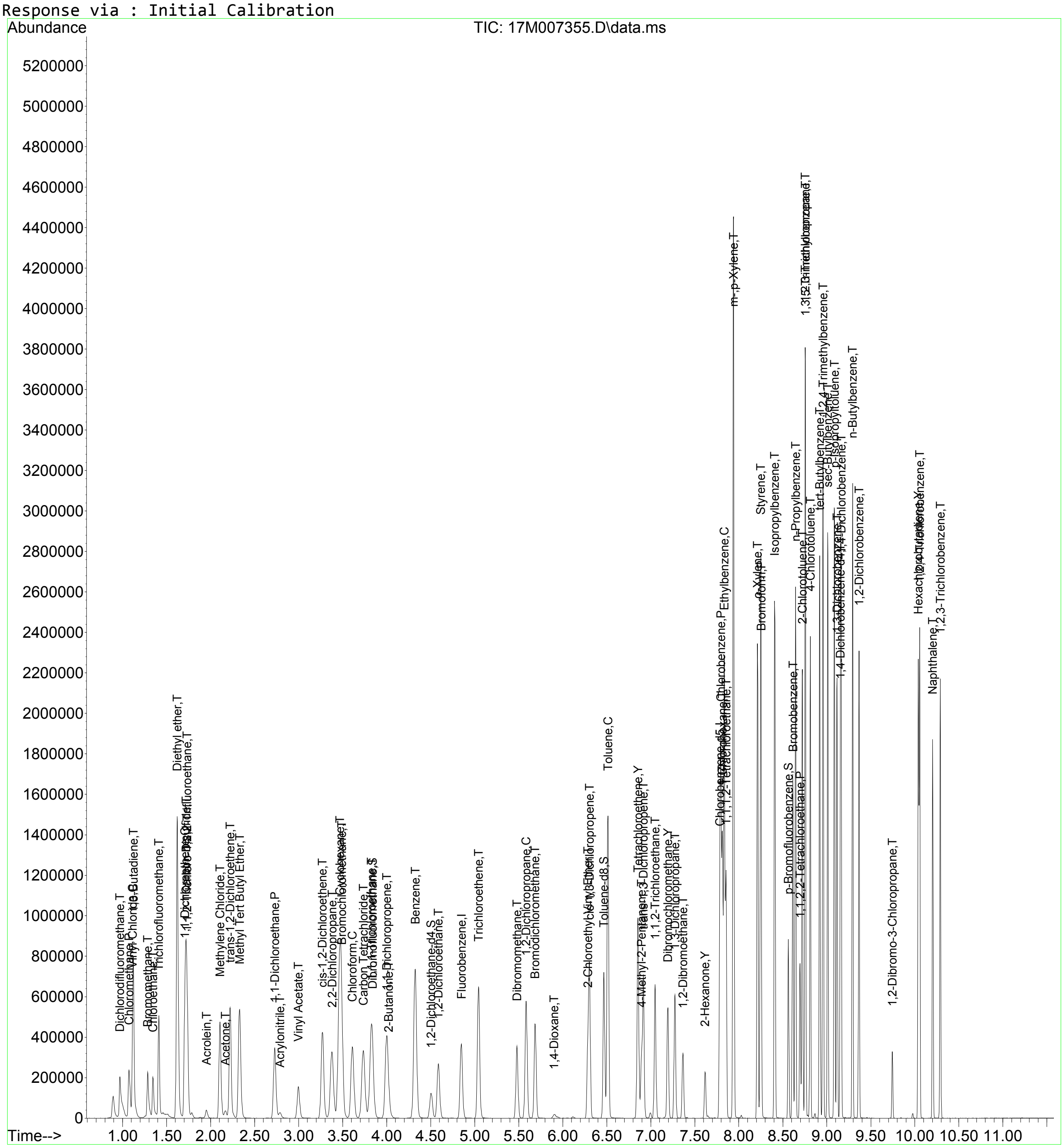

Quantitation Report (Not Reviewed)

```
Data Path : D:\MassHunter\GCMS\1\data\081214\
Data File : 17M007355.D
Acq On    : 12 Aug 2014  18:29
Operator  : ADC
Sample    : WG487972-12 50.0ug/L ALTSRC 8260
Misc      : 1,1 STD65748
ALS Vial  : 13   Sample Multiplier: 1

Quant Time: Aug 13 09:39:22 2014
Quant Method : D:\MassHunter\GCMS\1\methods\8260VMS.M
Quant Title  : 8260B/624 SOP:OVL MSV01 WATER 08/12/14 HPMS17
QLast Update : Wed Aug 13 09:38:18 2014
Response via : Initial Calibration
```



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8260VMS.M Wed Aug 13 09:39:23 2014                                  Page: 3
```

```
                          Evaluate Continuing Calibration Report

  Data Path : D:\MassHunter\GCMS\1\data\081214\
  Data File : 17M007355.D
  Acq On    : 12 Aug 2014  18:29
  Operator  : ADC
  Sample    : WG487972-12 50.0ug/L ALTSRC 8260
  Misc      : 1,1 STD65748
  ALS Vial  : 13   Sample Multiplier: 1

  Quant Time: Aug 13 09:39:22 2014
  Quant Method : D:\MassHunter\GCMS\1\methods\8260VMS.M
  Quant Title  : 8260B/624 SOP:OVL MSV01 WATER 08/12/14 HPMS17
  QLast Update : Wed Aug 13 09:38:18 2014
  Response via : Initial Calibration


  Min. RRF     :   0.000  Min. Rel. Area :   50%  Max. R.T. Dev  0.500min
  Max. RRF Dev :  25%     Max. Rel. Area :  150%

         Compound                       Amount  Calc.     %Dev Area% Dev(min)
  -----------------------------------------------------------------------
   1 I    Fluorobenzene                25.000  25.000       0.0   98   0.000
   2 T    Dichlorodifluoromethane      50.000  67.663     -35.3# 126   0.000
   3 P    Chloromethane                50.000  54.186      -8.4  107   0.000
   4 C    Vinyl Chloride               50.000  51.764      -3.5# 102   0.000
   5 T    1,3-Butadiene                50.000  60.123     -20.2  115   0.000
   6 T    Bromomethane                 50.000  51.739      -3.5   99   0.000
   7 T    Chloroethane                 50.000  44.170      11.7   83   0.000
   8 T    Trichlorofluoromethane       50.000  42.541      14.9   82  -0.020
   9 T    Diethyl ether                50.000 285.858    -471.7# 564   0.000
  10 C    1,1-Dichloroethene           50.000  44.182      11.6#  87  -0.024
  11 T    Carbon Disulfide             50.000  38.969      22.1   78  -0.023
  12 T    1,1,2-Trichloro-1,2,2-Trifl  50.000  47.248       5.5   94  -0.021
  13 T    Acrolein                     50.000  84.243     -68.5# 161   0.000
  14 T    Methylene Chloride           50.000  45.908       8.2   92   0.000
  15 T    Acetone                      50.000  52.601      -5.2  106   0.014
  16 T    trans-1,2-Dichloroethene     50.000  47.859       4.3   95  -0.011
  17 T    Methyl Tert Butyl Ether      50.000  51.004      -2.0  101   0.012
  18 P    1,1-Dichloroethane           50.000  46.688       6.6   93   0.000
  19 T    Acrylonitrile                50.000  22.756      54.5#  43   0.000
  20 T    Vinyl Acetate                50.000  61.315     -22.6  120   0.000
  21 T    cis-1,2-Dichloroethene       50.000  48.942       2.1  101   0.000
  22 T    2,2-Dichloropropane          50.000  44.892      10.2   90   0.000
  23 T    Cyclohexane                  50.000  53.838      -7.7  105  -0.015
  24 T    Bromochloromethane           50.000  48.994       2.0   93   0.000
  25 C    Chloroform                   50.000  47.880       4.2#  96   0.000
  26 T    Carbon Tetrachloride         50.000  49.230       1.5   95  -0.012
  27 S    Dibromofluoromethane         25.000  23.644       5.4   98   0.000
  28 T    1,1,1-Trichloroethane        50.000  48.191       3.6   96   0.000
  29 T    1,1-Dichloropropene          50.000  46.789       6.4   97  -0.012
  30 T    2-Butanone                   50.000  51.173      -2.3  108   0.000
  31 T    Benzene                      50.000  47.772       4.5   97   0.000
  32 S    1,2-Dichloroethane-d4        25.000  22.152      11.4   93   0.000
  33 T    1,2-Dichloroethane           50.000  49.441       1.1   97   0.000
  34 T    Trichloroethene              50.000  47.141       5.7   95   0.000
  35 T    Dibromomethane               50.000  48.592       2.8   96   0.000
  36 C    1,2-Dichloropropane          50.000  48.244       3.5# 101   0.000
  37 T    Bromodichloromethane         50.000  48.545       2.9   97   0.000
  38 T    1,4-Dioxane                 100.000 546.835    -446.8# 581   0.000
  39 T    2-Chloroethyl Vinyl Ether    50.000  52.355      -4.7  103   0.000
  40 T    cis-1,3-Dichloropropene      50.000  51.213      -2.4  100   0.000
  41 T    4-Methyl-2-Pentanone         50.000  52.446      -4.9  105   0.000
  42 T    trans-1,3-Dichloropropene    50.000  48.035       3.9   93   0.000

  43 I    Chlorobenzene-d5             25.000  25.000       0.0   99   0.000
  44 S    Toluene-d8                   25.000  23.353       6.6   98   0.000
  45 C    Toluene                      50.000  47.725       4.5#  97   0.000
  46 Y    Tetrachloroethene            50.000  46.907       6.2   96   0.000
  47 T    1,1,2-Trichloroethane        50.000  48.063       3.9   98   0.000
  48 Y    Dibromochloromethane         50.000  49.529       0.9   96   0.000
  49 T    1,3-Dichloropropane          50.000  47.922       4.2   97   0.000
  50 T    1,2-Dibromoethane            50.000  48.275       3.5   96   0.000
  51 Y    2-Hexanone                   50.000  51.179      -2.4  105   0.000
  52 P    Chlorobenzene                50.000  46.153       7.7   94   0.000
  53 T    1-Chlorohexane               50.000  49.914       0.2   96   0.000
  54 C    Ethylbenzene                 50.000  48.663       2.7#  98   0.000
  55 T    1,1,1,2-Tetrachloroethane    50.000  48.471       3.1   96   0.000

8260VMS.M Wed Aug 13 09:42:19 2014                                          Page:  1
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```
                          Evaluate Continuing Calibration Report

  Data Path : D:\MassHunter\GCMS\1\data\081214\
  Data File : 17M007355.D
  Acq On    : 12 Aug 2014  18:29
  Operator  : ADC
  Sample    : WG487972-12 50.0ug/L ALTSRC 8260
  Misc      : 1,1 STD65748
  ALS Vial  : 13   Sample Multiplier: 1

  Quant Time: Aug 13 09:39:22 2014
  Quant Method : D:\MassHunter\GCMS\1\methods\8260VMS.M
  Quant Title  : 8260B/624 SOP:OVL MSV01 WATER 08/12/14 HPMS17
  QLast Update : Wed Aug 13 09:38:18 2014
  Response via : Initial Calibration


  Min. RRF     :   0.000  Min. Rel. Area :   50%  Max. R.T. Dev  0.500min
  Max. RRF Dev :  25%     Max. Rel. Area :  150%

         Compound                       Amount  Calc.     %Dev Area% Dev(min)
  -----------------------------------------------------------------------
 56 T    m-,p-Xylene                 100.000  96.873       3.1   96   0.000
 57 T    o-Xylene                     50.000  45.729       8.5   90   0.000
 58 T    Styrene                      50.000  51.268      -2.5   99   0.000
 59 P    Bromoform                    50.000  51.414      -2.8   99   0.000
 60 T    Isopropylbenzene             50.000  47.404       5.2   93   0.000

 61 I    1,4-Dichlorobenzene-d4       25.000  25.000       0.0  102   0.000
 62 T    1,3,5-Trimethylbenzene       50.000  50.550      -1.1  104   0.000
 63 S    p-Bromofluorobenzene         25.000  25.044      -0.2  105   0.000
 64 T    Bromobenzene                 50.000  46.534       6.9   97   0.000
 65 T    n-Propylbenzene              50.000  45.107       9.8   90   0.000
 66 P    1,1,2,2-Tetrachloroethane    50.000  47.261       5.5   99   0.000
 67 T    2-Chlorotoluene              50.000  45.894       8.2   97   0.000
 68 T    1,2,3-Trichloropropane       50.000  48.120       3.8  100   0.000
 69 T    1,2,4-Trimethylbenzene       50.000  50.563      -1.1  104   0.000
 70 T    4-Chlorotoluene              50.000  45.670       8.7   95   0.000
 71 T    tert-Butylbenzene            50.000  45.361       9.3   96   0.000
 72 T    sec-Butylbenzene             50.000  46.857       6.3   95   0.000
 73 T    p-Isopropyltoluene           50.000  47.276       5.4   95   0.000
 74 T    1,3-Dichlorobenzene          50.000  45.977       8.0   95   0.000
 75 T    1,4-Dichlorobenzene          50.000  48.110       3.8  103   0.000
 76 T    n-Butylbenzene               50.000  53.536      -7.1  104   0.000
 77 T    1,2-Dichlorobenzene          50.000  46.148       7.7   99   0.000
 78 T    1,2-Dibromo-3-Chloropropane  50.000  51.020      -2.0  101   0.000
 79 Y    Hexachlorobutadiene          50.000  49.656       0.7  102   0.000
 80 T    1,2,4-Trichlorobenzene       50.000  51.906      -3.8  101   0.000
 81 T    Naphthalene                  50.000  51.888      -3.8   97   0.000
 82 T    1,2,3-Trichlorobenzene       50.000  52.394      -4.8  100   0.000
 -------------------------------------------------------------------------

   (#) = Out of Range               SPCC's out = 0  CCC's out = 6
```

```
                         Quantitation Report    (Not Reviewed)

  Data Path : D:\MassHunter\GCMS\1\data\090914\
  Data File : 17M008074.D
  Acq On    : 09 Sep 2014  13:36
  Operator  : adc
  Sample    : WG491620-02 50ug/L CCV 8260
  Misc      : 1,1 STD66320
  ALS Vial  : 1   Sample Multiplier: 1

  Quant Time: Sep 09 13:48:36 2014
  Quant Method : D:\MassHunter\GCMS\1\methods\8260VMS.M
  Quant Title  : 8260B/624 SOP:OVL MSV01 WATER 08/12/14 HPMS17
  QLast Update : Fri Aug 15 15:53:53 2014
  Response via : Initial Calibration

          Compound                   R.T. QIon  Response  Conc Units Dev(Min)
   --------------------------------------------------------------------------
   Internal Standards
     1) Fluorobenzene              4.846   96   297879    25.00000 ug/L     0.0000
    43) Chlorobenzene-d5           7.779  117   218521    25.00000 ug/L     0.0000
    61) 1,4-Dichlorobenzene-d4     9.151  152   103946    25.00000 ug/L     0.0000

   System Monitoring Compounds
    27) Dibromofluoromethane       3.830  111    92611    23.6778 ug/L    0.0000
     Spiked Amount     25.000   Range  86 - 118    Recovery   =   94.711%
    32) 1,2-Dichloroethane-d4      4.498   65    88380    22.6891 ug/L    0.0000
     Spiked Amount     25.000   Range  80 - 120    Recovery   =   90.756%
    44) Toluene-d8                 6.464   98   345933    25.4168 ug/L    0.0000
     Spiked Amount     25.000   Range  88 - 110    Recovery   =  101.667%
    63) p-Bromofluorobenzene       8.561   95   118687    27.1956 ug/L    0.0000
     Spiked Amount     25.000   Range  86 - 115    Recovery   =  108.782%

   Target Compounds                                                Qvalue
     2) Dichlorodifluoromethane    0.975   85   120984    43.4137 ug/L      99
     3) Chloromethane              1.079   50   170479    47.9414 ug/L     100
     4) Vinyl Chloride             1.117   62   183345    48.3677 ug/L     100
     5) 1,3-Butadiene              1.125   54   179796    70.0504 ug/L      99
     6) Bromomethane               1.287   94    80836    37.1797 ug/L      99
     7) Chloroethane               1.348   64   108749    51.2391 ug/L      99
     8) Trichlorofluoromethane     1.429  101   251078    51.2198 ug/L     100
     9) Diethyl ether              1.612   59   119598    57.0149 ug/L      99
    10) 1,1-Dichloroethene         1.728   61   249797    49.1510 ug/L      99
    11) Carbon Disulfide           1.742   76   546707    62.9328 ug/L     100
    12) 1,1,2-Trichloro-1,2,2-...  1.754  101   154185    48.5666 ug/L      98
    13) Acrolein                   1.942   56    17272    56.4882 ug/L      99
    14) Methylene Chloride         2.110   84   165142    46.0376 ug/L      95
    15) Acetone                    2.144   43    28064    42.2116 ug/L      98
    16) trans-1,2-Dichloroethene   2.228   96   155295    46.4930 ug/L      96
    17) Methyl Tert Butyl Ether    2.312   73   370627    42.1272 ug/L     100
    18) 1,1-Dichloroethane         2.729   63   302408    47.3550 ug/L     100
    19) Acrylonitrile              2.776   53    38344    48.0083 ug/L     100
    20) Vinyl Acetate              2.990   86    15948    50.6249 ug/L      91
    21) cis-1,2-Dichloroethene     3.268   96   174883    46.6007 ug/L      98
    22) 2,2-Dichloropropane        3.378   77   260525    50.3013 ug/L      98
    23) Cyclohexane                3.476   56   312802    60.4209 ug/L      98
    24) Bromochloromethane         3.485  130   106857    45.3269 ug/L      99
    25) Chloroform                 3.604   83   295915    47.1318 ug/L      99
    26) Carbon Tetrachloride       3.737  117   244306    48.7833 ug/L      99
    28) 1,1,1-Trichloroethane      3.824   97   266362    47.0060 ug/L      99
    29) 1,1-Dichloropropene        4.000   75   224765    47.6422 ug/L      99
    30) 2-Butanone                 3.997   43    44779    41.5628 ug/L      97
    31) Benzene                    4.322   78   649132    46.0525 ug/L      99
    33) 1,2-Dichloroethane         4.582   62   193818    46.1001 ug/L      99
    34) Trichloroethene            5.040  130   176263    43.2610 ug/L      94
    35) Dibromomethane             5.474   93    90435    44.2094 ug/L     100
    36) 1,2-Dichloropropane        5.578   63   181884    47.2227 ug/L      99
    37) Bromodichloromethane       5.680   83   224273    46.7874 ug/L     100
    38) 1,4-Dioxane                5.888   88     2047    81.1609 ug/L      94
    39) 2-Chloroethyl Vinyl Ether  6.279   63    80371    41.8326 ug/L     100
    40) cis-1,3-Dichloropropene    6.296   75   270526    47.2594 ug/L      98
    41) 4-Methyl-2-Pentanone       6.884   58    39473    40.7899 ug/L      98
    42) trans-1,3-Dichloropropene  6.910   75   228901    45.8941 ug/L      99
    45) Toluene                    6.508   91   726139    48.7654 ug/L      99
    46) Tetrachloroethene          6.849  166   193974    47.6491 ug/L      97
    47) 1,1,2-Trichloroethane      7.043   97   121586    44.3316 ug/L      99
    48) Dibromochloromethane       7.185  129   165492    45.8076 ug/L     100
    49) 1,3-Dichloropropane        7.269   76   206765    45.5914 ug/L      98

8260VMS.M Wed Sep 10 10:01:53 2014                                     Page:  1
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                              Quantitation Report    (Not Reviewed)

  Data Path : D:\MassHunter\GCMS\1\data\090914\
  Data File : 17M008074.D
  Acq On    : 09 Sep 2014  13:36
  Operator  : adc
  Sample    : WG491620-02 50ug/L CCV 8260
  Misc      : 1,1 STD66320
  ALS Vial  : 1   Sample Multiplier: 1

  Quant Time: Sep 09 13:48:36 2014
  Quant Method : D:\MassHunter\GCMS\1\methods\8260VMS.M
  Quant Title  : 8260B/624 SOP:OVL MSV01 WATER 08/12/14 HPMS17
  QLast Update : Fri Aug 15 15:53:53 2014
  Response via : Initial Calibration

          Compound                   R.T. QIon  Response  Conc Units Dev(Min)
   --------------------------------------------------------------------------
    50) 1,2-Dibromoethane           7.359  107   122901    45.3473 ug/L      99
    51) 2-Hexanone                  7.608   43    71068    41.8892 ug/L      99
    52) Chlorobenzene               7.790  112   466418    48.2501 ug/L      98
    53) 1-Chlorohexane              7.811   69    48361    55.7414 ug/L      86
    54) Ethylbenzene                7.831  106   256379    49.1555 ug/L      95
    55) 1,1,1,2-Tetrachloroethane   7.848  131   173308    47.7057 ug/L      99
    56) m-,p-Xylene                 7.935  106   631386   101.4990 ug/L      99
    57) o-Xylene                    8.210  106   304184    49.5286 ug/L      98
    58) Styrene                     8.245  104   495010    50.6644 ug/L      99
    59) Bromoform                   8.248  173   112491    44.0728 ug/L      99
    60) Isopropylbenzene            8.404  105   801679    50.8185 ug/L     100
    62) 1,3,5-Trimethylbenzene      8.752  105   696046    54.4818 ug/L      99
    64) Bromobenzene                8.610  156   201263    49.4148 ug/L      96
    65) n-Propylbenzene             8.642   91   962979    56.2805 ug/L      99
    66) 1,1,2,2-Tetrachloroethane   8.691   83   147713    48.8699 ug/L     100
    67) 2-Chlorotoluene             8.717   91   548552    53.5888 ug/L      99
    68) 1,2,3-Trichloropropane      8.752  110    38009    46.0064 ug/L      95
    69) 1,2,4-Trimethylbenzene      8.954  105   687705    53.9484 ug/L      99
    70) 4-Chlorotoluene             8.810   91   565704    53.8695 ug/L      99
    71) tert-Butylbenzene           8.917  134   125893    52.0546 ug/L      99
    72) sec-Butylbenzene            9.006  105   881195    55.5620 ug/L      99
    73) p-Isopropyltoluene          9.085  119   744303    55.6117 ug/L     100
    74) 1,3-Dichlorobenzene         9.114  146   381188    51.8776 ug/L      99
    75) 1,4-Dichlorobenzene         9.160  146   380242    49.9382 ug/L     100
    76) n-Butylbenzene              9.290   91   688287    59.6631 ug/L      98
    77) 1,2-Dichlorobenzene         9.363  146   356332    49.7387 ug/L     100
    78) 1,2-Dibromo-3-Chloropr...   9.742   75    24992    45.8511 ug/L      94
    79) Hexachlorobutadiene        10.043  225   163964    51.8491 ug/L     100
    80) 1,2,4-Trichlorobenzene     10.057  180   267624    52.5596 ug/L      99
    81) Naphthalene                10.205  128   432144    47.1724 ug/L      99
    82) 1,2,3-Trichlorobenzene     10.292  180   232075    50.1809 ug/L      99
   --------------------------------------------------------------------------

   (#) = qualifier out of range (m) = manual integration (+) = signals summed
```

Quantitation Report   (Not Reviewed)

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Data Path : D:\MassHunter\GCMS\1\data\090914\
Data File : 17M008074.D
Acq On    : 09 Sep 2014  13:36
Operator  : adc
Sample    : WG491620-02 50ug/L CCV 8260
Misc      : 1,1 STD66320
ALS Vial  : 1   Sample Multiplier: 1

Quant Time: Sep 09 13:48:36 2014
Quant Method : D:\MassHunter\GCMS\1\methods\8260VMS.M
Quant Title  : 8260B/624 SOP:OVL MSV01 WATER 08/12/14 HPMS17
QLast Update : Fri Aug 15 15:53:53 2014
Response via : Initial Calibration
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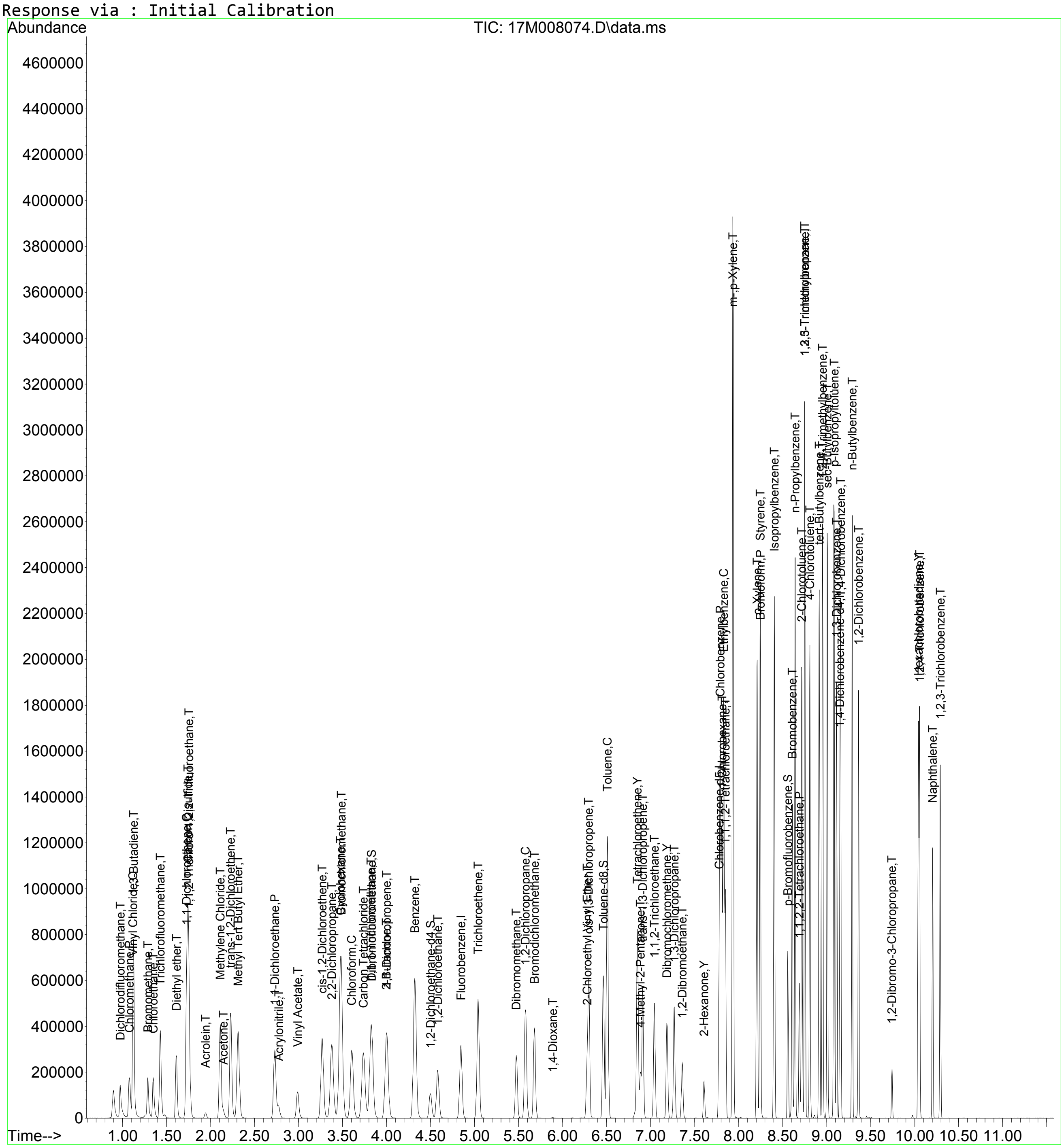

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                              Evaluate Continuing Calibration Report

  Data Path : D:\MassHunter\GCMS\1\data\090914\
  Data File : 17M008074.D
  Acq On    : 09 Sep 2014  13:36
  Operator  : adc
  Sample    : WG491620-02 50ug/L CCV 8260
  Misc      : 1,1 STD66320
  ALS Vial  : 1   Sample Multiplier: 1

  Quant Time: Sep 09 13:48:36 2014
  Quant Method : D:\MassHunter\GCMS\1\methods\8260VMS.M
  Quant Title  : 8260B/624 SOP:OVL MSV01 WATER 08/12/14 HPMS17
  QLast Update : Fri Aug 15 15:53:53 2014
  Response via : Initial Calibration


  Min. RRF     :   0.000  Min. Rel. Area :   50%  Max. R.T. Dev  0.500min
  Max. RRF Dev :  25%     Max. Rel. Area :  150%

         Compound                      AvgRF   CCRF      %Dev Area% Dev(min)
  -------------------------------------------------------------------------
  1 I    Fluorobenzene                 1.000   1.000       0.0   83   0.000
  2 T    Dichlorodifluoromethane       0.234   0.203      13.2   68   0.000
  3 P    Chloromethane                 0.298   0.286       4.0   80   0.000
  4 C    Vinyl Chloride                0.318   0.308       3.1#  81   0.000
  5 T    1,3-Butadiene                 0.215   0.302     -40.5# 113   0.000
  6 T    Bromomethane                  0.156   0.136      12.8   70   0.000
  7 T    Chloroethane                  0.178   0.183      -2.8   82   0.000
  8 T    Trichlorofluoromethane        0.411   0.421      -2.4   83   0.000
  9 T    Diethyl ether                 0.176   0.201     -14.2   95   0.000
 10 C    1,1-Dichloroethene            0.427   0.419       1.9#  82   0.000
 11 T    Carbon Disulfide              0.729   0.918     -25.9# 107   0.000
 12 T    1,1,2-Trichloro-1,2,2-Trifl   0.266   0.259       2.6   82   0.000
 13 T    Acrolein                      0.026   0.029     -11.5   91   0.000
 14 T    Methylene Chloride            0.301   0.277       8.0   78   0.000
 15 T    Acetone                       0.056   0.047      16.1   72   0.000
 16 T    trans-1,2-Dichloroethene      0.280   0.261       6.8   78   0.000
 17 T    Methyl Tert Butyl Ether       0.738   0.622      15.7   70   0.000
 18 P    1,1-Dichloroethane            0.536   0.508       5.2   80   0.000
 19 T    Acrylonitrile                 0.067   0.064       4.5   77   0.000
 20 T    Vinyl Acetate                 0.026   0.027      -3.8   84   0.000
 21 T    cis-1,2-Dichloroethene        0.315   0.294       6.7   81   0.000
 22 T    2,2-Dichloropropane           0.435   0.437      -0.5   85   0.000
 23 T    Cyclohexane                   0.434   0.525     -21.0  100   0.000
 24 T    Bromochloromethane            0.198   0.179       9.6   73  -0.012
 25 C    Chloroform                    0.527   0.497       5.7#  80   0.000
 26 T    Carbon Tetrachloride          0.420   0.410       2.4   79   0.000
 27 S    Dibromofluoromethane          0.328   0.311       5.2   83   0.000
 28 T    1,1,1-Trichloroethane         0.476   0.447       6.1   79   0.000
 29 T    1,1-Dichloropropene           0.396   0.377       4.8   84  -0.012
 30 T    2-Butanone                    0.090   0.075      16.7   74  -0.018
 31 T    Benzene                       1.183   1.090       7.9   79   0.000
 32 S    1,2-Dichloroethane-d4         0.327   0.297       9.2   80   0.000
 33 T    1,2-Dichloroethane            0.353   0.325       7.9   77   0.000
 34 T    Trichloroethene               0.342   0.296      13.5   74   0.000
 35 T    Dibromomethane                0.172   0.152      11.6   74   0.000
 36 C    1,2-Dichloropropane           0.323   0.305       5.6#  83   0.000
 37 T    Bromodichloromethane          0.402   0.376       6.5   79   0.000
 38 T    1,4-Dioxane                   0.002   0.002       0.0   73   0.000
 39 T    2-Chloroethyl Vinyl Ether     0.161   0.135      16.1   70   0.000
 40 T    cis-1,3-Dichloropropene       0.480   0.454       5.4   78   0.000
 41 T    4-Methyl-2-Pentanone          0.081   0.066      18.5   69   0.000
 42 T    trans-1,3-Dichloropropene     0.419   0.384       8.4   76   0.000

 43 I    Chlorobenzene-d5              1.000   1.000       0.0   79   0.000
 44 S    Toluene-d8                    1.557   1.583      -1.7   85   0.000
 45 C    Toluene                       1.704   1.661       2.5#  79   0.000
 46 Y    Tetrachloroethene             0.466   0.444       4.7   78   0.000
 47 T    1,1,2-Trichloroethane         0.314   0.278      11.5   72   0.000
 48 Y    Dibromochloromethane          0.413   0.379       8.2   71   0.000
 49 T    1,3-Dichloropropane           0.519   0.473       8.9   74   0.000
 50 T    1,2-Dibromoethane             0.310   0.281       9.4   72   0.000
 51 Y    2-Hexanone                    0.194   0.163      16.0   68   0.000
 52 P    Chlorobenzene                 1.106   1.067       3.5   78   0.000
 53 T    1-Chlorohexane                0.099   0.111     -12.1   86   0.000
 54 C    Ethylbenzene                  0.597   0.587       1.7#  79   0.000
 55 T    1,1,1,2-Tetrachloroethane     0.416   0.397       4.6   75   0.000

8260VMS.M Wed Sep 10 09:33:30 2014                                           Page:  1
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                           Evaluate Continuing Calibration Report

  Data Path : D:\MassHunter\GCMS\1\data\090914\
  Data File : 17M008074.D
  Acq On    : 09 Sep 2014  13:36
  Operator  : adc
  Sample    : WG491620-02 50ug/L CCV 8260
  Misc      : 1,1 STD66320
  ALS Vial  : 1   Sample Multiplier: 1

  Quant Time: Sep 09 13:48:36 2014
  Quant Method : D:\MassHunter\GCMS\1\methods\8260VMS.M
  Quant Title  : 8260B/624 SOP:OVL MSV01 WATER 08/12/14 HPMS17
  QLast Update : Fri Aug 15 15:53:53 2014
  Response via : Initial Calibration


  Min. RRF     :   0.000  Min. Rel. Area :   50%  Max. R.T. Dev  0.500min
  Max. RRF Dev :  25%     Max. Rel. Area :  150%

         Compound                      AvgRF   CCRF      %Dev Area% Dev(min)
  ------------------------------------------------------------------------
 56 T    m-,p-Xylene                   0.712   0.722      -1.4   80   0.000
 57 T    o-Xylene                      0.703   0.696       1.0   78   0.000
 58 T    Styrene                       1.118   1.133      -1.3   78   0.000
 59 P    Bromoform                     0.292   0.257      12.0   68   0.000
 60 T    Isopropylbenzene              1.805   1.834      -1.6   79   0.000

 61 I    1,4-Dichlorobenzene-d4        1.000   1.000       0.0   74   0.000
 62 T    1,3,5-Trimethylbenzene        3.073   3.348      -8.9   82   0.000
 63 S    p-Bromofluorobenzene          1.050   1.142      -8.8   83   0.000
 64 T    Bromobenzene                  0.980   0.968       1.2   75   0.000
 65 T    n-Propylbenzene               4.115   4.632     -12.6   82   0.000
 66 P    1,1,2,2-Tetrachloroethane     0.727   0.711       2.2   75   0.000
 67 T    2-Chlorotoluene               2.462   2.639      -7.2   82   0.000
 68 T    1,2,3-Trichloropropane        0.199   0.183       8.0   70   0.000
 69 T    1,2,4-Trimethylbenzene        3.066   3.308      -7.9   81   0.000
 70 T    4-Chlorotoluene               2.526   2.721      -7.7   82   0.000
 71 T    tert-Butylbenzene             0.582   0.606      -4.1   81   0.000
 72 T    sec-Butylbenzene              3.814   4.239     -11.1   82   0.000
 73 T    p-Isopropyltoluene            3.219   3.580     -11.2   81   0.000
 74 T    1,3-Dichlorobenzene           1.767   1.834      -3.8   78   0.000
 75 T    1,4-Dichlorobenzene           1.831   1.829       0.1   78   0.000
 76 T    n-Butylbenzene                2.775   3.311     -19.3   84   0.000
 77 T    1,2-Dichlorobenzene           1.723   1.714       0.5   78   0.000
 78 T    1,2-Dibromo-3-Chloropropane   0.131   0.120       8.4   66   0.000
 79 Y    Hexachlorobutadiene           0.761   0.789      -3.7   78   0.000
 80 T    1,2,4-Trichlorobenzene        1.225   1.287      -5.1   74   0.000
 81 T    Naphthalene                   2.203   2.079       5.6   64   0.000
 82 T    1,2,3-Trichlorobenzene        1.112   1.116      -0.4   70   0.000
 -------------------------------------------------------------------------

    (#) = Out of Range              SPCC's out = 0  CCC's out = 6
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8260VMS.M Wed Sep 10 09:33:30 2014                                        Page:  2
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                           Evaluate Continuing Calibration Report

  Data Path : D:\MassHunter\GCMS\1\data\090914\
  Data File : 17M008074.D
  Acq On    : 09 Sep 2014  13:36
  Operator  : adc
  Sample    : WG491620-02 50ug/L CCV 8260
  Misc      : 1,1 STD66320
  ALS Vial  : 1   Sample Multiplier: 1

  Quant Time: Sep 09 13:48:36 2014
  Quant Method : D:\MassHunter\GCMS\1\methods\8260VMS.M
  Quant Title  : 8260B/624 SOP:OVL MSV01 WATER 08/12/14 HPMS17
  QLast Update : Fri Aug 15 15:53:53 2014
  Response via : Initial Calibration


  Min. RRF     :   0.000  Min. Rel. Area :   50%  Max. R.T. Dev  0.500min
  Max. RRF Dev :  25%     Max. Rel. Area :  150%

         Compound                      Amount  Calc.     %Dev Area% Dev(min)
  ----------------------------------------------------------------------
  1 I    Fluorobenzene                25.000  25.000       0.0   83   0.000
  2 T    Dichlorodifluoromethane      50.000  43.414      13.2   68   0.000
  3 P    Chloromethane                50.000  47.941       4.1   80   0.000
  4 C    Vinyl Chloride               50.000  48.368       3.3#  81   0.000
  5 T    1,3-Butadiene                50.000  70.050     -40.1# 113   0.000
  6 T    Bromomethane                 50.000  37.180      25.6#  70   0.000
  7 T    Chloroethane                 50.000  51.239      -2.5   82   0.000
  8 T    Trichlorofluoromethane       50.000  51.220      -2.4   83   0.000
  9 T    Diethyl ether                50.000  57.015     -14.0   95   0.000
 10 C    1,1-Dichloroethene           50.000  49.151       1.7#  82   0.000
 11 T    Carbon Disulfide             50.000  62.933     -25.9# 107   0.000
 12 T    1,1,2-Trichloro-1,2,2-Trifl  50.000  48.567       2.9   82   0.000
 13 T    Acrolein                     50.000  56.488     -13.0   91   0.000
 14 T    Methylene Chloride           50.000  46.038       7.9   78   0.000
 15 T    Acetone                      50.000  42.212      15.6   72   0.000
 16 T    trans-1,2-Dichloroethene     50.000  46.493       7.0   78   0.000
 17 T    Methyl Tert Butyl Ether      50.000  42.127      15.7   70   0.000
 18 P    1,1-Dichloroethane           50.000  47.355       5.3   80   0.000
 19 T    Acrylonitrile                50.000  48.008       4.0   77   0.000
 20 T    Vinyl Acetate                50.000  50.625      -1.3   84   0.000
 21 T    cis-1,2-Dichloroethene       50.000  46.601       6.8   81   0.000
 22 T    2,2-Dichloropropane          50.000  50.301      -0.6   85   0.000
 23 T    Cyclohexane                  50.000  60.421     -20.8  100   0.000
 24 T    Bromochloromethane           50.000  45.327       9.3   73  -0.012
 25 C    Chloroform                   50.000  47.132       5.7#  80   0.000
 26 T    Carbon Tetrachloride         50.000  48.783       2.4   79   0.000
 27 S    Dibromofluoromethane         25.000  23.678       5.3   83   0.000
 28 T    1,1,1-Trichloroethane        50.000  47.006       6.0   79   0.000
 29 T    1,1-Dichloropropene          50.000  47.642       4.7   84  -0.012
 30 T    2-Butanone                   50.000  41.563      16.9   74  -0.018
 31 T    Benzene                      50.000  46.053       7.9   79   0.000
 32 S    1,2-Dichloroethane-d4        25.000  22.689       9.2   80   0.000
 33 T    1,2-Dichloroethane           50.000  46.100       7.8   77   0.000
 34 T    Trichloroethene              50.000  43.261      13.5   74   0.000
 35 T    Dibromomethane               50.000  44.209      11.6   74   0.000
 36 C    1,2-Dichloropropane          50.000  47.223       5.6#  83   0.000
 37 T    Bromodichloromethane         50.000  46.787       6.4   79   0.000
 38 T    1,4-Dioxane                 100.000  81.161      18.8   73   0.000
 39 T    2-Chloroethyl Vinyl Ether    50.000  41.833      16.3   70   0.000
 40 T    cis-1,3-Dichloropropene      50.000  47.259       5.5   78   0.000
 41 T    4-Methyl-2-Pentanone         50.000  40.790      18.4   69   0.000
 42 T    trans-1,3-Dichloropropene    50.000  45.894       8.2   76   0.000

 43 I    Chlorobenzene-d5             25.000  25.000       0.0   79   0.000
 44 S    Toluene-d8                   25.000  25.417      -1.7   85   0.000
 45 C    Toluene                      50.000  48.765       2.5#  79   0.000
 46 Y    Tetrachloroethene            50.000  47.649       4.7   78   0.000
 47 T    1,1,2-Trichloroethane        50.000  44.332      11.3   72   0.000
 48 Y    Dibromochloromethane         50.000  45.808       8.4   71   0.000
 49 T    1,3-Dichloropropane          50.000  45.591       8.8   74   0.000
 50 T    1,2-Dibromoethane            50.000  45.347       9.3   72   0.000
 51 Y    2-Hexanone                   50.000  41.889      16.2   68   0.000
 52 P    Chlorobenzene                50.000  48.250       3.5   78   0.000
 53 T    1-Chlorohexane               50.000  55.741     -11.5   86   0.000
 54 C    Ethylbenzene                 50.000  49.156       1.7#  79   0.000
 55 T    1,1,1,2-Tetrachloroethane    50.000  47.706       4.6   75   0.000
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                         Evaluate Continuing Calibration Report

  Data Path : D:\MassHunter\GCMS\1\data\090914\
  Data File : 17M008074.D
  Acq On    : 09 Sep 2014  13:36
  Operator  : adc
  Sample    : WG491620-02 50ug/L CCV 8260
  Misc      : 1,1 STD66320
  ALS Vial  : 1   Sample Multiplier: 1

  Quant Time: Sep 09 13:48:36 2014
  Quant Method : D:\MassHunter\GCMS\1\methods\8260VMS.M
  Quant Title  : 8260B/624 SOP:OVL MSV01 WATER 08/12/14 HPMS17
  QLast Update : Fri Aug 15 15:53:53 2014
  Response via : Initial Calibration


  Min. RRF     :   0.000  Min. Rel. Area :   50%  Max. R.T. Dev  0.500min
  Max. RRF Dev :  25%     Max. Rel. Area :  150%

         Compound                      Amount  Calc.     %Dev Area% Dev(min)
  -----------------------------------------------------------------------
 56 T    m-,p-Xylene                 100.000 101.499      -1.5   80   0.000
 57 T    o-Xylene                     50.000  49.529       0.9   78   0.000
 58 T    Styrene                      50.000  50.664      -1.3   78   0.000
 59 P    Bromoform                    50.000  44.073      11.9   68   0.000
 60 T    Isopropylbenzene             50.000  50.818      -1.6   79   0.000

 61 I    1,4-Dichlorobenzene-d4       25.000  25.000       0.0   74   0.000
 62 T    1,3,5-Trimethylbenzene       50.000  54.482      -9.0   82   0.000
 63 S    p-Bromofluorobenzene         25.000  27.196      -8.8   83   0.000
 64 T    Bromobenzene                 50.000  49.415       1.2   75   0.000
 65 T    n-Propylbenzene              50.000  56.281     -12.6   82   0.000
 66 P    1,1,2,2-Tetrachloroethane    50.000  48.870       2.3   75   0.000
 67 T    2-Chlorotoluene              50.000  53.589      -7.2   82   0.000
 68 T    1,2,3-Trichloropropane       50.000  46.006       8.0   70   0.000
 69 T    1,2,4-Trimethylbenzene       50.000  53.948      -7.9   81   0.000
 70 T    4-Chlorotoluene              50.000  53.869      -7.7   82   0.000
 71 T    tert-Butylbenzene            50.000  52.055      -4.1   81   0.000
 72 T    sec-Butylbenzene             50.000  55.562     -11.1   82   0.000
 73 T    p-Isopropyltoluene           50.000  55.612     -11.2   81   0.000
 74 T    1,3-Dichlorobenzene          50.000  51.878      -3.8   78   0.000
 75 T    1,4-Dichlorobenzene          50.000  49.938       0.1   78   0.000
 76 T    n-Butylbenzene               50.000  59.663     -19.3   84   0.000
 77 T    1,2-Dichlorobenzene          50.000  49.739       0.5   78   0.000
 78 T    1,2-Dibromo-3-Chloropropane  50.000  45.851       8.3   66   0.000
 79 Y    Hexachlorobutadiene          50.000  51.849      -3.7   78   0.000
 80 T    1,2,4-Trichlorobenzene       50.000  52.560      -5.1   74   0.000
 81 T    Naphthalene                  50.000  47.172       5.7   64   0.000
 82 T    1,2,3-Trichlorobenzene       50.000  50.181      -0.4   70   0.000
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    (#) = Out of Range              SPCC's out = 0  CCC's out = 6
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                         Quantitation Report    (Not Reviewed)

Data Path : D:\MassHunter\GCMS\1\data\091014\
Data File : 17M008115.D
Acq On    : 10 Sep 2014  11:38
Operator  : FJB
Sample    : WG491745-02 50ug/L CCV 8260
Misc      : 1,1 STD66320
ALS Vial  : 1   Sample Multiplier: 1

Quant Time: Sep 12 12:43:27 2014
Quant Method : D:\MassHunter\GCMS\1\methods\8260VMS.M
Quant Title  : 8260B/624 SOP:OVL MSV01 WATER 08/12/14 HPMS17
QLast Update : Fri Aug 15 15:53:53 2014
Response via : Initial Calibration

        Compound                   R.T. QIon  Response  Conc Units Dev(Min)
 --------------------------------------------------------------------------
 Internal Standards
   1) Fluorobenzene              4.846   96   304333    25.00000 ug/L     0.0000
  43) Chlorobenzene-d5           7.779  117   224737    25.00000 ug/L     0.0000
  61) 1,4-Dichlorobenzene-d4     9.151  152   107751    25.00000 ug/L     0.0000

 System Monitoring Compounds
  27) Dibromofluoromethane       3.827  111    98342    24.6099 ug/L   -0.0115
   Spiked Amount     25.000   Range  86 - 118    Recovery   =   98.440%
  32) 1,2-Dichloroethane-d4      4.498   65    94070    23.6377 ug/L    0.0000
   Spiked Amount     25.000   Range  80 - 120    Recovery   =   94.551%
  44) Toluene-d8                 6.461   98   365846    26.1364 ug/L    0.0000
   Spiked Amount     25.000   Range  88 - 110    Recovery   =  104.546%
  63) p-Bromofluorobenzene       8.558   95   125267    27.6897 ug/L    0.0000
   Spiked Amount     25.000   Range  86 - 115    Recovery   =  110.759%

 Target Compounds                                                 Qvalue
   2) Dichlorodifluoromethane    0.975   85   101502    35.6504 ug/L      99
   3) Chloromethane              1.076   50   146350    40.2831 ug/L      99
   4) Vinyl Chloride             1.117   62   159522    41.1906 ug/L      99
   5) 1,3-Butadiene              1.125   54   162225    61.8642 ug/L     100
   6) Bromomethane               1.287   94    74772    33.7286 ug/L     100
   7) Chloroethane               1.348   64    97559    44.9919 ug/L     100
   8) Trichlorofluoromethane     1.429  101   214149    42.7599 ug/L     100
   9) Diethyl ether              1.612   59   116724    54.4647 ug/L     100
  10) 1,1-Dichloroethene         1.727   61   217203    41.8314 ug/L      99
  11) Carbon Disulfide           1.742   76   501739    56.5315 ug/L      99
  12) 1,1,2-Trichloro-1,2,2-...  1.753  101   132479    40.8445 ug/L      98
  13) Acrolein                   1.942   56    17340    55.5079 ug/L      99
  14) Methylene Chloride         2.110   84   157427    42.9562 ug/L      94
  15) Acetone                    2.144   43    28315    41.6859 ug/L      98
  16) trans-1,2-Dichloroethene   2.228   96   141547    41.4784 ug/L      97
  17) Methyl Tert Butyl Ether    2.312   73   367954    40.9364 ug/L      99
  18) 1,1-Dichloroethane         2.729   63   279767    42.8805 ug/L     100
  19) Acrylonitrile              2.773   53    37893    46.4375 ug/L      99
  20) Vinyl Acetate              2.990   86    16034    49.8185 ug/L      89
  21) cis-1,2-Dichloroethene     3.271   96   163299    42.5912 ug/L      97
  22) 2,2-Dichloropropane        3.375   77   237007    44.7901 ug/L      98
  23) Cyclohexane                3.476   56   282821    53.4712 ug/L      98
  24) Bromochloromethane         3.488  130   102726    42.6505 ug/L      98
  25) Chloroform                 3.604   83   276522    43.1090 ug/L      99
  26) Carbon Tetrachloride       3.734  117   214144    41.8537 ug/L      99
  28) 1,1,1-Trichloroethane      3.824   97   236215    40.8018 ug/L      99
  29) 1,1-Dichloropropene        3.997   75   199326    41.3541 ug/L      99
  30) 2-Butanone                 4.006   43    45578    41.4072 ug/L     100
  31) Benzene                    4.319   78   598608    41.5675 ug/L      99
  33) 1,2-Dichloroethane         4.582   62   190289    44.3009 ug/L      99
  34) Trichloroethene            5.037  130   159903    38.4134 ug/L      94
  35) Dibromomethane             5.474   93    88939    42.5560 ug/L     100
  36) 1,2-Dichloropropane        5.578   63   174252    44.2818 ug/L      98
  37) Bromodichloromethane       5.680   83   215752    44.0552 ug/L     100
  38) 1,4-Dioxane                5.882   88     2089    81.0697 ug/L     100
  39) 2-Chloroethyl Vinyl Ether  6.276   63    86225    43.9279 ug/L     100
  40) cis-1,3-Dichloropropene    6.296   75   260416    44.5284 ug/L      99
  41) 4-Methyl-2-Pentanone       6.884   58    40097    40.5561 ug/L      99
  42) trans-1,3-Dichloropropene  6.910   75   224616    44.0799 ug/L      99
  45) Toluene                    6.508   91   670591    43.7894 ug/L      99
  46) Tetrachloroethene          6.849  166   171583    40.9830 ug/L      97
  47) 1,1,2-Trichloroethane      7.043   97   119550    42.3836 ug/L      99
  48) Dibromochloromethane       7.185  129   161854    43.5615 ug/L      99
  49) 1,3-Dichloropropane        7.269   76   202536    43.4237 ug/L      97
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                         Quantitation Report    (Not Reviewed)

  Data Path : D:\MassHunter\GCMS\1\data\091014\
  Data File : 17M008115.D
  Acq On    : 10 Sep 2014  11:38
  Operator  : FJB
  Sample    : WG491745-02 50ug/L CCV 8260
  Misc      : 1,1 STD66320
  ALS Vial  : 1   Sample Multiplier: 1

  Quant Time: Sep 12 12:43:27 2014
  Quant Method : D:\MassHunter\GCMS\1\methods\8260VMS.M
  Quant Title  : 8260B/624 SOP:OVL MSV01 WATER 08/12/14 HPMS17
  QLast Update : Fri Aug 15 15:53:53 2014
  Response via : Initial Calibration

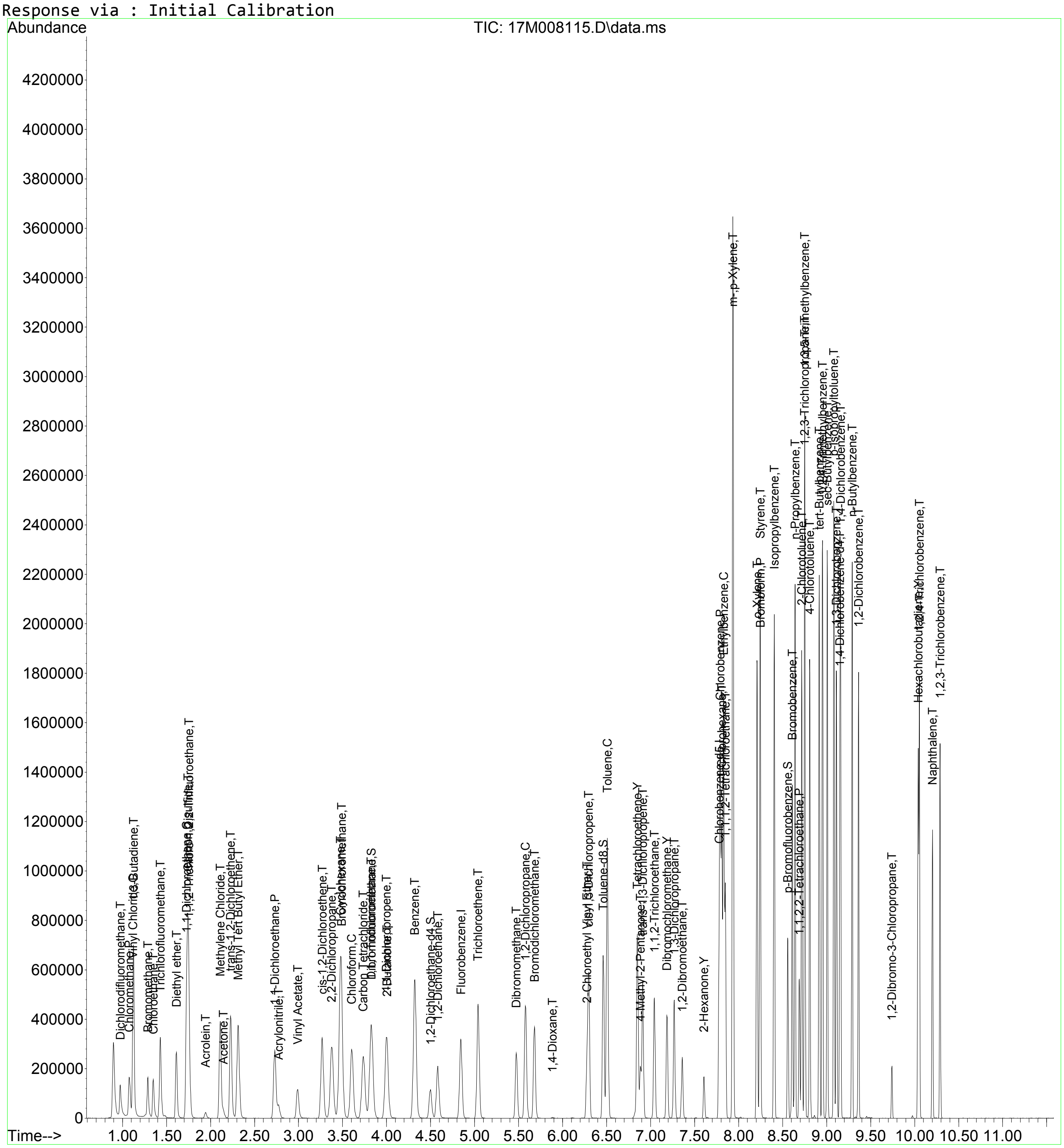
          Compound                   R.T. QIon  Response  Conc Units Dev(Min)
   --------------------------------------------------------------------------
    50) 1,2-Dibromoethane           7.359  107   121637    43.6396 ug/L      99
    51) 2-Hexanone                  7.605   43    73870    42.3364 ug/L      98
    52) Chlorobenzene               7.790  112   440385    44.2970 ug/L      98
    53) 1-Chlorohexane              7.808   69    43930    49.2337 ug/L      88
    54) Ethylbenzene                7.831  106   235807    43.9608 ug/L      96
    55) 1,1,1,2-Tetrachloroethane   7.848  131   164730    44.0903 ug/L      99
    56) m-,p-Xylene                 7.935  106   582425    91.0386 ug/L      99
    57) o-Xylene                    8.210  106   284355    45.0193 ug/L      98
    58) Styrene                     8.245  104   469127    46.6872 ug/L      99
    59) Bromoform                   8.248  173   110310    42.0230 ug/L      99
    60) Isopropylbenzene            8.404  105   730517    45.0267 ug/L      99
    62) 1,3,5-Trimethylbenzene      8.752  105   639493    48.2876 ug/L      99
    64) Bromobenzene                8.610  156   192687    45.6386 ug/L      97
    65) n-Propylbenzene             8.642   91   874456    49.3022 ug/L      99
    66) 1,1,2,2-Tetrachloroethane   8.688   83   147793    47.1697 ug/L     100
    67) 2-Chlorotoluene             8.717   91   513258    48.3703 ug/L      99
    68) 1,2,3-Trichloropropane      8.749  110    37547    43.8423 ug/L      93
    69) 1,2,4-Trimethylbenzene      8.954  105   641729    48.5640 ug/L     100
    70) 4-Chlorotoluene             8.807   91   532733    48.9384 ug/L      99
    71) tert-Butylbenzene           8.917  134   114698    45.7510 ug/L     100
    72) sec-Butylbenzene            9.006  105   798764    48.5860 ug/L      99
    73) p-Isopropyltoluene          9.082  119   675157    48.6640 ug/L     100
    74) 1,3-Dichlorobenzene         9.111  146   359105    47.1464 ug/L      99
    75) 1,4-Dichlorobenzene         9.157  146   362494    45.9262 ug/L     100
    76) n-Butylbenzene              9.290   91   622904    52.0888 ug/L      98
    77) 1,2-Dichlorobenzene         9.362  146   343408    46.2420 ug/L      99
    78) 1,2-Dibromo-3-Chloropr...   9.742   75    25524    45.1735 ug/L      95
    79) Hexachlorobutadiene        10.040  225   137690    42.0032 ug/L     100
    80) 1,2,4-Trichlorobenzene     10.054  180   254161    48.1529 ug/L     100
    81) Naphthalene                10.202  128   424809    44.7342 ug/L      99
    82) 1,2,3-Trichlorobenzene     10.289  180   222109    46.3301 ug/L      99
   --------------------------------------------------------------------------

   (#) = qualifier out of range (m) = manual integration (+) = signals summed
```

```
                    Quantitation Report    (Not Reviewed)

Data Path : D:\MassHunter\GCMS\1\data\091014\
Data File : 17M008115.D
Acq On    : 10 Sep 2014  11:38
Operator  : FJB
Sample    : WG491745-02 50ug/L CCV 8260
Misc      : 1,1 STD66320
ALS Vial  : 1   Sample Multiplier: 1

Quant Time: Sep 12 12:43:27 2014
Quant Method : D:\MassHunter\GCMS\1\methods\8260VMS.M
Quant Title  : 8260B/624 SOP:OVL MSV01 WATER 08/12/14 HPMS17
QLast Update : Fri Aug 15 15:53:53 2014
Response via : Initial Calibration
```



8260VMS.M Fri Sep 12 12:43:28 2014   Page: 3

```
                         Evaluate Continuing Calibration Report

  Data Path : D:\MassHunter\GCMS\1\data\091014\
  Data File : 17M008115.D
  Acq On    : 10 Sep 2014  11:38
  Operator  : FJB
  Sample    : WG491745-02 50ug/L CCV 8260
  Misc      : 1,1 STD66320
  ALS Vial  : 1   Sample Multiplier: 1

  Quant Time: Sep 12 12:43:27 2014
  Quant Method : D:\MassHunter\GCMS\1\methods\8260VMS.M
  Quant Title  : 8260B/624 SOP:OVL MSV01 WATER 08/12/14 HPMS17
  QLast Update : Fri Aug 15 15:53:53 2014
  Response via : Initial Calibration


  Min. RRF     :   0.000  Min. Rel. Area :   50%  Max. R.T. Dev  0.500min
  Max. RRF Dev :  25%     Max. Rel. Area :  150%

         Compound                      AvgRF   CCRF      %Dev Area% Dev(min)
  ------------------------------------------------------------------------
  1 I    Fluorobenzene                 1.000   1.000       0.0   85   0.000
  2 T    Dichlorodifluoromethane       0.234   0.167      28.6#  57   0.000
  3 P    Chloromethane                 0.298   0.240      19.5   69   0.000
  4 C    Vinyl Chloride                0.318   0.262      17.6#  70   0.000
  5 T    1,3-Butadiene                 0.215   0.267     -24.2  102   0.000
  6 T    Bromomethane                  0.156   0.123      21.2   65   0.000
  7 T    Chloroethane                  0.178   0.160      10.1   73   0.000
  8 T    Trichlorofluoromethane        0.411   0.352      14.4   71   0.000
  9 T    Diethyl ether                 0.176   0.192      -9.1   93   0.000
 10 C    1,1-Dichloroethene            0.427   0.357      16.4#  72   0.000
 11 T    Carbon Disulfide              0.729   0.824     -13.0   98   0.000
 12 T    1,1,2-Trichloro-1,2,2-Trifl   0.266   0.218      18.0   71   0.000
 13 T    Acrolein                      0.026   0.028      -7.7   92   0.000
 14 T    Methylene Chloride            0.301   0.259      14.0   74   0.000
 15 T    Acetone                       0.056   0.047      16.1   73   0.000
 16 T    trans-1,2-Dichloroethene      0.280   0.233      16.8   71   0.000
 17 T    Methyl Tert Butyl Ether       0.738   0.605      18.0   70   0.000
 18 P    1,1-Dichloroethane            0.536   0.460      14.2   74   0.000
 19 T    Acrylonitrile                 0.067   0.062       7.5   76   0.000
 20 T    Vinyl Acetate                 0.026   0.026       0.0   84   0.000
 21 T    cis-1,2-Dichloroethene        0.315   0.268      14.9   76   0.000
 22 T    2,2-Dichloropropane           0.435   0.389      10.6   77  -0.012
 23 T    Cyclohexane                   0.434   0.465      -7.1   90   0.000
 24 T    Bromochloromethane            0.198   0.169      14.6   70   0.000
 25 C    Chloroform                    0.527   0.454      13.9#  74   0.000
 26 T    Carbon Tetrachloride          0.420   0.352      16.2   70  -0.012
 27 S    Dibromofluoromethane          0.328   0.323       1.5   88  -0.011
 28 T    1,1,1-Trichloroethane         0.476   0.388      18.5   70   0.000
 29 T    1,1-Dichloropropene           0.396   0.327      17.4   74  -0.015
 30 T    2-Butanone                    0.090   0.075      16.7   75   0.000
 31 T    Benzene                       1.183   0.983      16.9   73  -0.012
 32 S    1,2-Dichloroethane-d4         0.327   0.309       5.5   86   0.000
 33 T    1,2-Dichloroethane            0.353   0.313      11.3   76   0.000
 34 T    Trichloroethene               0.342   0.263      23.1   67  -0.012
 35 T    Dibromomethane                0.172   0.146      15.1   73   0.000
 36 C    1,2-Dichloropropane           0.323   0.286      11.5#  80   0.000
 37 T    Bromodichloromethane          0.402   0.354      11.9   76   0.000
 38 T    1,4-Dioxane                   0.002   0.002       0.0   75   0.000
 39 T    2-Chloroethyl Vinyl Ether     0.161   0.142      11.8   75   0.000
 40 T    cis-1,3-Dichloropropene       0.480   0.428      10.8   75   0.000
 41 T    4-Methyl-2-Pentanone          0.081   0.066      18.5   70   0.000
 42 T    trans-1,3-Dichloropropene     0.419   0.369      11.9   74   0.000

 43 I    Chlorobenzene-d5              1.000   1.000       0.0   81   0.000
 44 S    Toluene-d8                    1.557   1.628      -4.6   90   0.000
 45 C    Toluene                       1.704   1.492      12.4#  73   0.000
 46 Y    Tetrachloroethene             0.466   0.382      18.0   69   0.000
 47 T    1,1,2-Trichloroethane         0.314   0.266      15.3   71   0.000
 48 Y    Dibromochloromethane          0.413   0.360      12.8   70   0.000
 49 T    1,3-Dichloropropane           0.519   0.451      13.1   72   0.000
 50 T    1,2-Dibromoethane             0.310   0.271      12.6   72   0.000
 51 Y    2-Hexanone                    0.194   0.164      15.5   71   0.000
 52 P    Chlorobenzene                 1.106   0.980      11.4   74   0.000
 53 T    1-Chlorohexane                0.099   0.098       1.0   78   0.000
 54 C    Ethylbenzene                  0.597   0.525      12.1#  73   0.000
 55 T    1,1,1,2-Tetrachloroethane     0.416   0.366      12.0   72   0.000
```

```
                         Evaluate Continuing Calibration Report

  Data Path : D:\MassHunter\GCMS\1\data\091014\
  Data File : 17M008115.D
  Acq On    : 10 Sep 2014  11:38
  Operator  : FJB
  Sample    : WG491745-02 50ug/L CCV 8260
  Misc      : 1,1 STD66320
  ALS Vial  : 1   Sample Multiplier: 1

  Quant Time: Sep 12 12:43:27 2014
  Quant Method : D:\MassHunter\GCMS\1\methods\8260VMS.M
  Quant Title  : 8260B/624 SOP:OVL MSV01 WATER 08/12/14 HPMS17
  QLast Update : Fri Aug 15 15:53:53 2014
  Response via : Initial Calibration


  Min. RRF     :   0.000  Min. Rel. Area :   50%  Max. R.T. Dev  0.500min
  Max. RRF Dev :  25%     Max. Rel. Area :  150%

         Compound                     AvgRF   CCRF      %Dev Area% Dev(min)
  ------------------------------------------------------------------------
 56 T    m-,p-Xylene                  0.712   0.648       9.0   74   0.000
 57 T    o-Xylene                     0.703   0.633      10.0   73   0.000
 58 T    Styrene                      1.118   1.044       6.6   74   0.000
 59 P    Bromoform                    0.292   0.245      16.1   66   0.000
 60 T    Isopropylbenzene             1.805   1.625      10.0   72   0.000

 61 I    1,4-Dichlorobenzene-d4       1.000   1.000       0.0   77   0.000
 62 T    1,3,5-Trimethylbenzene       3.073   2.967       3.4   75   0.000
 63 S    p-Bromofluorobenzene         1.050   1.163     -10.8   88   0.000
 64 T    Bromobenzene                 0.980   0.894       8.8   72   0.000
 65 T    n-Propylbenzene              4.115   4.058       1.4   75   0.000
 66 P    1,1,2,2-Tetrachloroethane    0.727   0.686       5.6   75   0.000
 67 T    2-Chlorotoluene              2.462   2.382       3.2   77   0.000
 68 T    1,2,3-Trichloropropane       0.199   0.174      12.6   69   0.000
 69 T    1,2,4-Trimethylbenzene       3.066   2.978       2.9   76   0.000
 70 T    4-Chlorotoluene              2.526   2.472       2.1   77   0.000
 71 T    tert-Butylbenzene            0.582   0.532       8.6   73   0.000
 72 T    sec-Butylbenzene             3.814   3.707       2.8   74   0.000
 73 T    p-Isopropyltoluene           3.219   3.133       2.7   74   0.000
 74 T    1,3-Dichlorobenzene          1.767   1.666       5.7   73   0.000
 75 T    1,4-Dichlorobenzene          1.831   1.682       8.1   74   0.000
 76 T    n-Butylbenzene               2.775   2.890      -4.1   76   0.000
 77 T    1,2-Dichlorobenzene          1.723   1.594       7.5   75   0.000
 78 T    1,2-Dibromo-3-Chloropropane  0.131   0.118       9.9   67   0.000
 79 Y    Hexachlorobutadiene          0.761   0.639      16.0   65   0.000
 80 T    1,2,4-Trichlorobenzene       1.225   1.179       3.8   71   0.000
 81 T    Naphthalene                  2.203   1.971      10.5   63   0.000
 82 T    1,2,3-Trichlorobenzene       1.112   1.031       7.3   67   0.000
 -------------------------------------------------------------------------

    (#) = Out of Range              SPCC's out = 0  CCC's out = 6
```

```
                          Evaluate Continuing Calibration Report

  Data Path : D:\MassHunter\GCMS\1\data\091014\
  Data File : 17M008115.D
  Acq On    : 10 Sep 2014  11:38
  Operator  : FJB
  Sample    : WG491745-02 50ug/L CCV 8260
  Misc      : 1,1 STD66320
  ALS Vial  : 1   Sample Multiplier: 1

  Quant Time: Sep 12 12:43:27 2014
  Quant Method : D:\MassHunter\GCMS\1\methods\8260VMS.M
  Quant Title  : 8260B/624 SOP:OVL MSV01 WATER 08/12/14 HPMS17
  QLast Update : Fri Aug 15 15:53:53 2014
  Response via : Initial Calibration


  Min. RRF     :   0.000  Min. Rel. Area :   50%  Max. R.T. Dev  0.500min
  Max. RRF Dev :  25%     Max. Rel. Area :  150%

         Compound                       Amount  Calc.     %Dev Area% Dev(min)
  ------------------------------------------------------------------------
   1 I    Fluorobenzene                 25.000  25.000       0.0   85   0.000
   2 T    Dichlorodifluoromethane       50.000  35.650      28.7#  57   0.000
   3 P    Chloromethane                 50.000  40.283      19.4   69   0.000
   4 C    Vinyl Chloride                50.000  41.191      17.6#  70   0.000
   5 T    1,3-Butadiene                 50.000  61.864     -23.7  102   0.000
   6 T    Bromomethane                  50.000  33.729      32.5#  65   0.000
   7 T    Chloroethane                  50.000  44.992      10.0   73   0.000
   8 T    Trichlorofluoromethane        50.000  42.760      14.5   71   0.000
   9 T    Diethyl ether                 50.000  54.465      -8.9   93   0.000
  10 C    1,1-Dichloroethene            50.000  41.831      16.3#  72   0.000
  11 T    Carbon Disulfide              50.000  56.532     -13.1   98   0.000
  12 T    1,1,2-Trichloro-1,2,2-Trifl   50.000  40.844      18.3   71   0.000
  13 T    Acrolein                      50.000  55.508     -11.0   92   0.000
  14 T    Methylene Chloride            50.000  42.956      14.1   74   0.000
  15 T    Acetone                       50.000  41.686      16.6   73   0.000
  16 T    trans-1,2-Dichloroethene      50.000  41.478      17.0   71   0.000
  17 T    Methyl Tert Butyl Ether       50.000  40.936      18.1   70   0.000
  18 P    1,1-Dichloroethane            50.000  42.881      14.2   74   0.000
  19 T    Acrylonitrile                 50.000  46.438       7.1   76   0.000
  20 T    Vinyl Acetate                 50.000  49.818       0.4   84   0.000
  21 T    cis-1,2-Dichloroethene        50.000  42.591      14.8   76   0.000
  22 T    2,2-Dichloropropane           50.000  44.790      10.4   77  -0.012
  23 T    Cyclohexane                   50.000  53.471      -6.9   90   0.000
  24 T    Bromochloromethane            50.000  42.651      14.7   70   0.000
  25 C    Chloroform                    50.000  43.109      13.8#  74   0.000
  26 T    Carbon Tetrachloride          50.000  41.854      16.3   70  -0.012
  27 S    Dibromofluoromethane          25.000  24.610       1.6   88  -0.011
  28 T    1,1,1-Trichloroethane         50.000  40.802      18.4   70   0.000
  29 T    1,1-Dichloropropene           50.000  41.354      17.3   74  -0.015
  30 T    2-Butanone                    50.000  41.407      17.2   75   0.000
  31 T    Benzene                       50.000  41.568      16.9   73  -0.012
  32 S    1,2-Dichloroethane-d4         25.000  23.638       5.4   86   0.000
  33 T    1,2-Dichloroethane            50.000  44.301      11.4   76   0.000
  34 T    Trichloroethene               50.000  38.413      23.2   67  -0.012
  35 T    Dibromomethane                50.000  42.556      14.9   73   0.000
  36 C    1,2-Dichloropropane           50.000  44.282      11.4#  80   0.000
  37 T    Bromodichloromethane          50.000  44.055      11.9   76   0.000
  38 T    1,4-Dioxane                  100.000  81.070      18.9   75   0.000
  39 T    2-Chloroethyl Vinyl Ether     50.000  43.928      12.1   75   0.000
  40 T    cis-1,3-Dichloropropene       50.000  44.528      10.9   75   0.000
  41 T    4-Methyl-2-Pentanone          50.000  40.556      18.9   70   0.000
  42 T    trans-1,3-Dichloropropene     50.000  44.080      11.8   74   0.000

  43 I    Chlorobenzene-d5              25.000  25.000       0.0   81   0.000
  44 S    Toluene-d8                    25.000  26.136      -4.5   90   0.000
  45 C    Toluene                       50.000  43.789      12.4#  73   0.000
  46 Y    Tetrachloroethene             50.000  40.983      18.0   69   0.000
  47 T    1,1,2-Trichloroethane         50.000  42.384      15.2   71   0.000
  48 Y    Dibromochloromethane          50.000  43.562      12.9   70   0.000
  49 T    1,3-Dichloropropane           50.000  43.424      13.2   72   0.000
  50 T    1,2-Dibromoethane             50.000  43.640      12.7   72   0.000
  51 Y    2-Hexanone                    50.000  42.336      15.3   71   0.000
  52 P    Chlorobenzene                 50.000  44.297      11.4   74   0.000
  53 T    1-Chlorohexane                50.000  49.234       1.5   78   0.000
  54 C    Ethylbenzene                  50.000  43.961      12.1#  73   0.000
  55 T    1,1,1,2-Tetrachloroethane     50.000  44.090      11.8   72   0.000
```

```
                            Evaluate Continuing Calibration Report

 Data Path : D:\MassHunter\GCMS\1\data\091014\
 Data File : 17M008115.D
 Acq On    : 10 Sep 2014  11:38
 Operator  : FJB
 Sample    : WG491745-02 50ug/L CCV 8260
 Misc      : 1,1 STD66320
 ALS Vial  : 1   Sample Multiplier: 1

 Quant Time: Sep 12 12:43:27 2014
 Quant Method : D:\MassHunter\GCMS\1\methods\8260VMS.M
 Quant Title  : 8260B/624 SOP:OVL MSV01 WATER 08/12/14 HPMS17
 QLast Update : Fri Aug 15 15:53:53 2014
 Response via : Initial Calibration


 Min. RRF     :   0.000  Min. Rel. Area :   50%  Max. R.T. Dev  0.500min
 Max. RRF Dev :  25%     Max. Rel. Area :  150%

        Compound                      Amount  Calc.     %Dev Area% Dev(min)
 -------------------------------------------------------------------------
56 T    m-,p-Xylene                 100.000  91.039       9.0   74   0.000
57 T    o-Xylene                     50.000  45.019      10.0   73   0.000
58 T    Styrene                      50.000  46.687       6.6   74   0.000
59 P    Bromoform                    50.000  42.023      16.0   66   0.000
60 T    Isopropylbenzene             50.000  45.027       9.9   72   0.000

61 I    1,4-Dichlorobenzene-d4       25.000  25.000       0.0   77   0.000
62 T    1,3,5-Trimethylbenzene       50.000  48.288       3.4   75   0.000
63 S    p-Bromofluorobenzene         25.000  27.690     -10.8   88   0.000
64 T    Bromobenzene                 50.000  45.639       8.7   72   0.000
65 T    n-Propylbenzene              50.000  49.302       1.4   75   0.000
66 P    1,1,2,2-Tetrachloroethane    50.000  47.170       5.7   75   0.000
67 T    2-Chlorotoluene              50.000  48.370       3.3   77   0.000
68 T    1,2,3-Trichloropropane       50.000  43.842      12.3   69   0.000
69 T    1,2,4-Trimethylbenzene       50.000  48.564       2.9   76   0.000
70 T    4-Chlorotoluene              50.000  48.938       2.1   77   0.000
71 T    tert-Butylbenzene            50.000  45.751       8.5   73   0.000
72 T    sec-Butylbenzene             50.000  48.586       2.8   74   0.000
73 T    p-Isopropyltoluene           50.000  48.664       2.7   74   0.000
74 T    1,3-Dichlorobenzene          50.000  47.146       5.7   73   0.000
75 T    1,4-Dichlorobenzene          50.000  45.926       8.1   74   0.000
76 T    n-Butylbenzene               50.000  52.089      -4.2   76   0.000
77 T    1,2-Dichlorobenzene          50.000  46.242       7.5   75   0.000
78 T    1,2-Dibromo-3-Chloropropane  50.000  45.174       9.7   67   0.000
79 Y    Hexachlorobutadiene          50.000  42.003      16.0   65   0.000
80 T    1,2,4-Trichlorobenzene       50.000  48.153       3.7   71   0.000
81 T    Naphthalene                  50.000  44.734      10.5   63   0.000
82 T    1,2,3-Trichlorobenzene       50.000  46.330       7.3   67   0.000
--------------------------------------------------------------------------

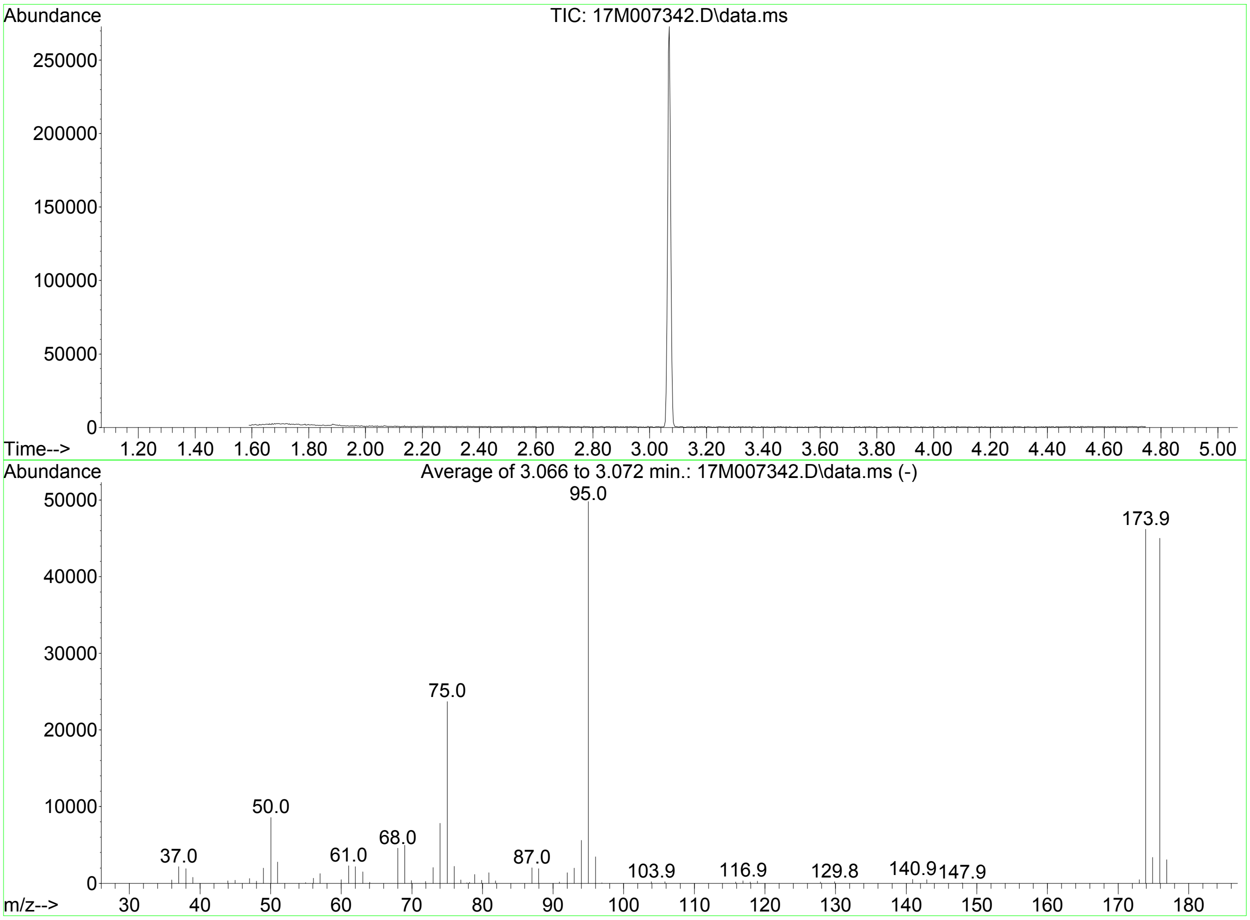
   (#) = Out of Range               SPCC's out = 0  CCC's out = 6
```

2.1.1.5 Raw QC Data

```
Data Path : D:\MassHunter\GCMS\1\data\081214\
Data File : 17M007342.D
Acq On    : 12 Aug 2014  14:16
Operator  : ADC
Sample    : WG487972-01 50ng BFB 8260
Misc      : 1,1 STD65934
ALS Vial  : 1   Sample Multiplier: 1

Integration File: rteint.p

Method    : D:\MassHunter\GCMS\1\methods\8260VMS.M
Title     : 8260B/624 SOP:OVL MSV01 WATER 08/12/14 HPMS17
Last Update  : Wed Aug 13 09:32:02 2014
```



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AutoFind: Scans 511, 512, 513; Background Corrected with Scan 502

| Target | Rel. to | Lower  | Upper  |  Rel.  |    Raw    |   Result  |
|  Mass  |  Mass   | Limit% | Limit% |  Abn%  |    Abn    | Pass/Fail |
-----------------------------------------------------------------------
|   50   |    95   |    15  |    40  |  17.2  |     8576  |  PASS     |
|   75   |    95   |    30  |    60  |  47.6  |    23704  |  PASS     |
|   95   |    95   |   100  |   100  | 100.0  |    49819  |  PASS     |
|   96   |    95   |     5  |     9  |   6.9  |     3435  |  PASS     |
|  173   |   174   |  0.00  |     2  |   1.0  |      482  |  PASS     |
|  174   |    95   |    50  |   100  |  92.7  |    46200  |  PASS     |
|  175   |   174   |     5  |     9  |   7.3  |     3392  |  PASS     |
|  176   |   174   |    95  |   101  |  97.4  |    45013  |  PASS     |
|  177   |   176   |     5  |     9  |   6.9  |     3088  |  PASS     |
-----------------------------------------------------------------------
```
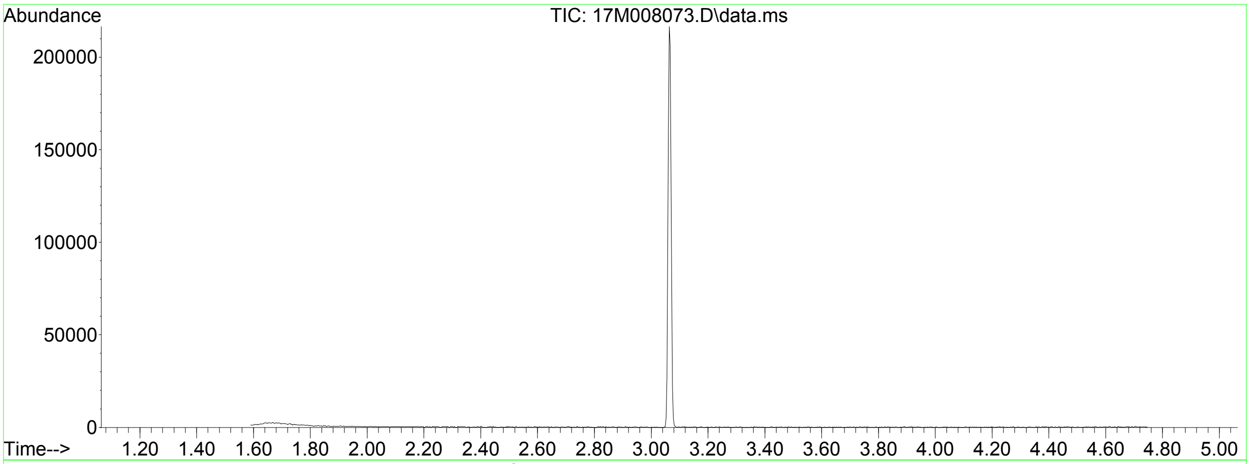
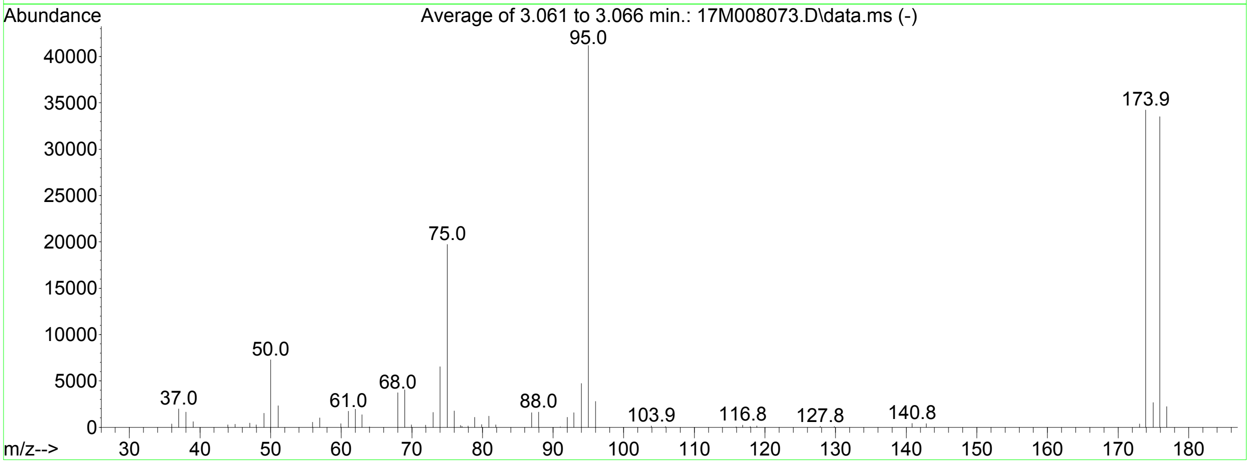

BFB

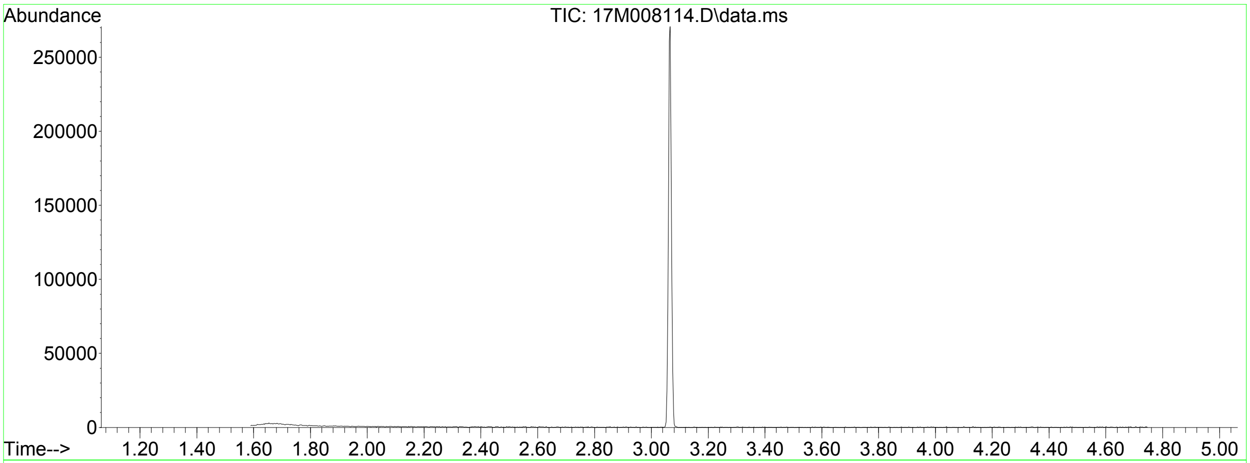
```
Data Path : D:\MassHunter\GCMS\1\data\090914\
Data File : 17M008073.D
Acq On    : 09 Sep 2014  13:18
Operator  : adc
Sample    : WG491620-01 50ng BFB STD
Misc      : 1,1 STD66239
ALS Vial  : 1   Sample Multiplier: 1

Integration File: rteint.p

Method    : D:\MassHunter\GCMS\1\methods\8260VMS.M
Title     : 8260B/624 SOP:OVL MSV01 WATER 08/12/14 HPMS17
Last Update  : Fri Aug 15 15:53:53 2014
```

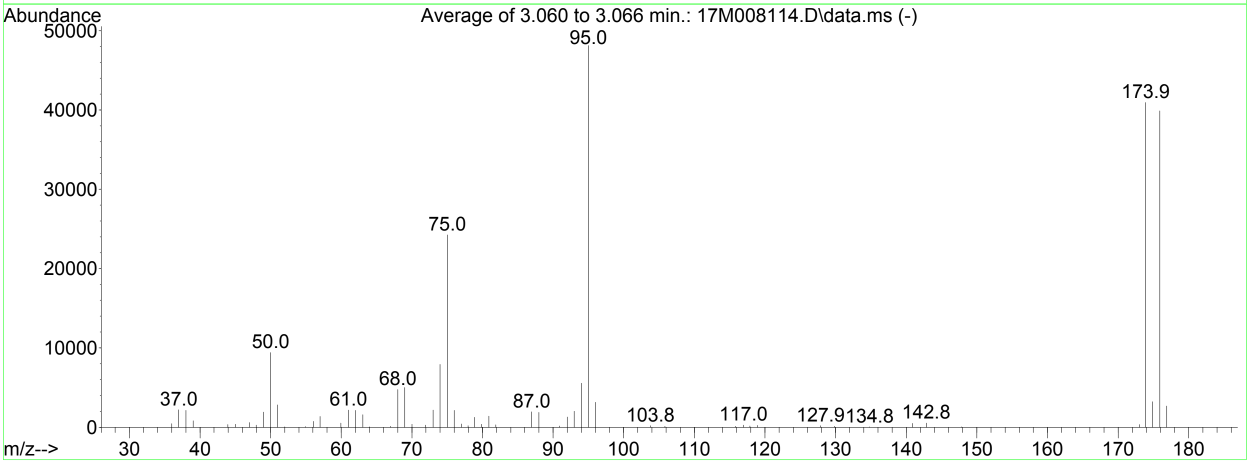




```
AutoFind: Scans 509, 510, 511; Background Corrected with Scan 500

| Target | Rel. to | Lower  | Upper  |  Rel.  |    Raw    |   Result  |
|  Mass  |  Mass   | Limit% | Limit% |  Abn%  |    Abn    | Pass/Fail |
----------------------------------------------------------------------
|   50   |    95   |    15  |    40  |  17.7  |      7293 |   PASS    |
|   75   |    95   |    30  |    60  |  47.9  |     19728 |   PASS    |
|   95   |    95   |   100  |   100  | 100.0  |     41205 |   PASS    |
|   96   |    95   |     5  |     9  |   6.8  |      2788 |   PASS    |
|  173   |   174   |  0.00  |     2  |   1.1  |       360 |   PASS    |
|  174   |    95   |    50  |   100  |  83.1  |     34221 |   PASS    |
|  175   |   174   |     5  |     9  |   7.8  |      2682 |   PASS    |
|  176   |   174   |    95  |   101  |  98.0  |     33531 |   PASS    |
|  177   |   176   |     5  |     9  |   6.6  |      2226 |   PASS    |
----------------------------------------------------------------------


8260VMS.M Wed Sep 10 09:33:18 2014                                Page: 1
```

```
Data Path : D:\MassHunter\GCMS\1\data\091014\
Data File : 17M008114.D
Acq On    : 10 Sep 2014  11:20
Operator  : FJB
Sample    : WG491745-01 BFB 50ng STD
Misc      : 1,1 STD66239
ALS Vial  : 1   Sample Multiplier: 1

Integration File: rteint.p

Method    : D:\MassHunter\GCMS\1\methods\8260VMS.M
Title     : 8260B/624 SOP:OVL MSV01 WATER 08/12/14 HPMS17
Last Update  : Fri Aug 15 15:53:53 2014
```



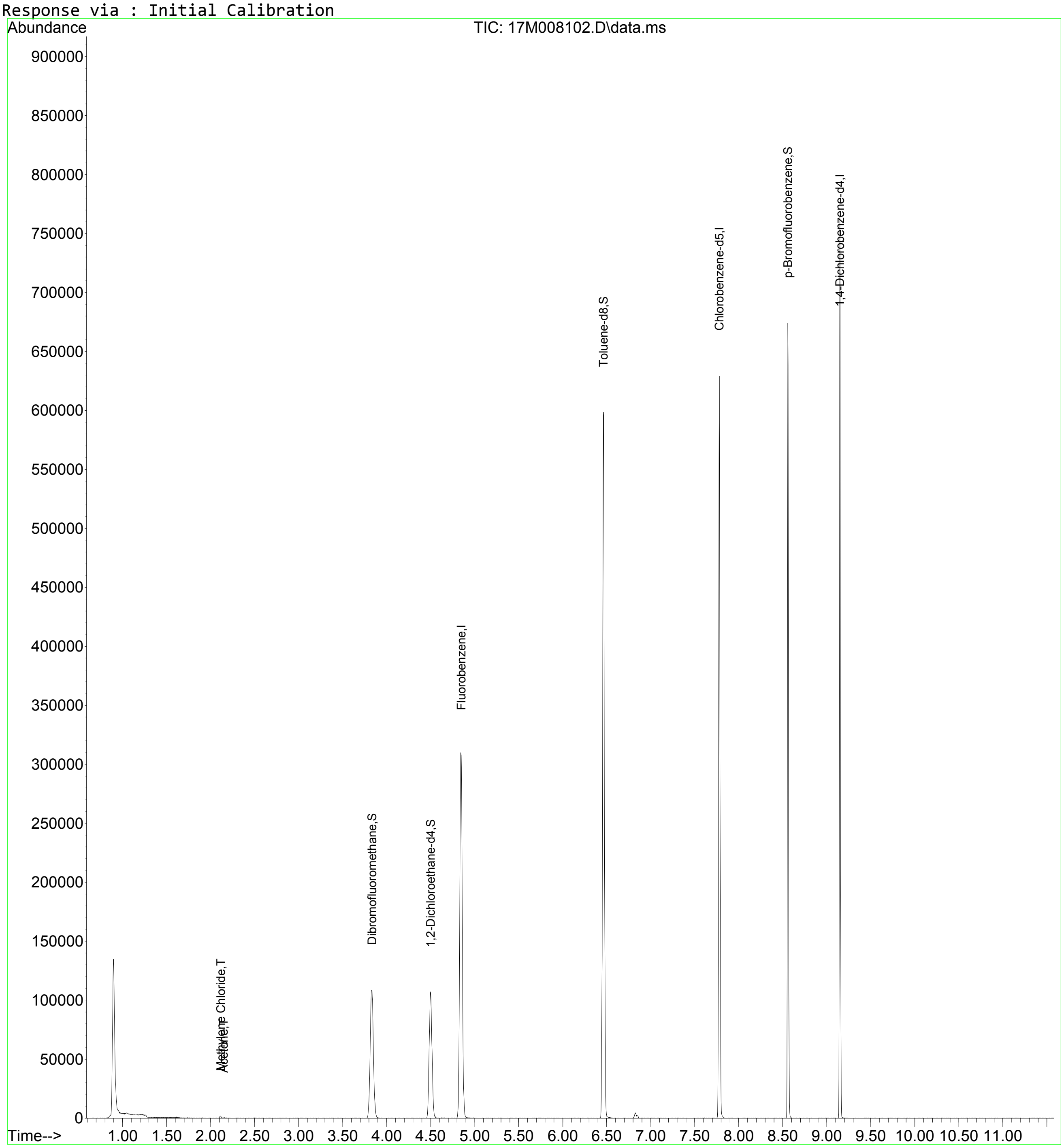


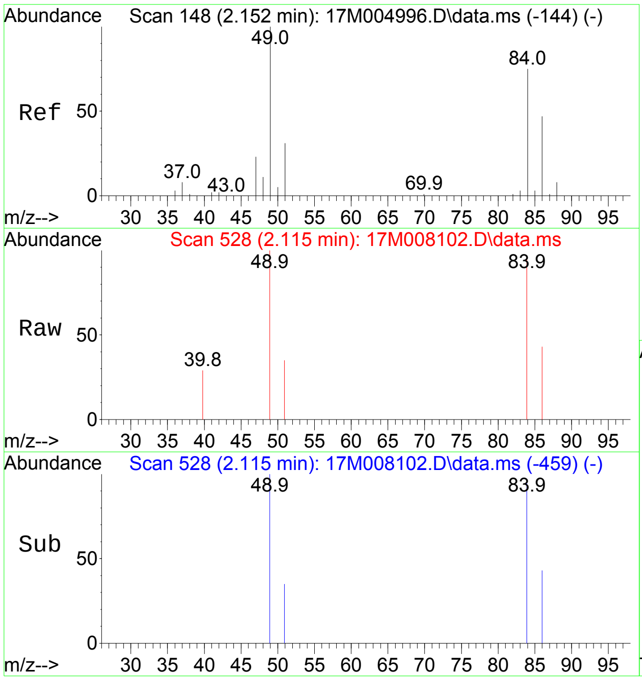
```
AutoFind: Scans 509, 510, 511; Background Corrected with Scan 500

| Target | Rel. to | Lower  | Upper  |  Rel.  |    Raw    |   Result  |
|  Mass  |  Mass   | Limit% | Limit% |  Abn%  |    Abn    | Pass/Fail |
-----------------------------------------------------------------------
|   50   |    95   |    15  |    40  |  19.5  |     9411 |   PASS    |
|   75   |    95   |    30  |    60  |  50.4  |    24261 |   PASS    |
|   95   |    95   |   100  |   100  | 100.0  |    48139 |   PASS    |
|   96   |    95   |     5  |     9  |   6.6  |     3157 |   PASS    |
|  173   |   174   |  0.00  |     2  |   0.9  |      363 |   PASS    |
|  174   |    95   |    50  |   100  |  85.0  |    40936 |   PASS    |
|  175   |   174   |     5  |     9  |   7.9  |     3217 |   PASS    |
|  176   |   174   |    95  |   101  |  97.5  |    39904 |   PASS    |
|  177   |   176   |     5  |     9  |   6.7  |     2690 |   PASS    |
-----------------------------------------------------------------------
```

```
                              Quantitation Report    (Not Reviewed)

Data Path : D:\MassHunter\GCMS\1\data\090914\
Data File : 17M008102.D
Acq On    : 09 Sep 2014  22:49
Operator  : adc
Sample    : WG491672-01 VBLK 0909 8260
Misc      : 1,1
ALS Vial  : 29   Sample Multiplier: 1

Quant Time: Sep 10 10:04:21 2014
Quant Method : D:\MassHunter\GCMS\1\methods\8260VMS.M
Quant Title  : 8260B/624 SOP:OVL MSV01 WATER 08/12/14 HPMS17
QLast Update : Fri Aug 15 15:53:53 2014
Response via : Initial Calibration

        Compound                   R.T. QIon  Response  Conc Units Dev(Min)
 --------------------------------------------------------------------------
 Internal Standards
   1) Fluorobenzene               4.846   96   294980    25.00000 ug/L     0.0000
  43) Chlorobenzene-d5            7.779  117   214811    25.00000 ug/L     0.0000
  61) 1,4-Dichlorobenzene-d4      9.148  152    97050    25.00000 ug/L     0.0000

 System Monitoring Compounds
  27) Dibromofluoromethane        3.832  111    87801    22.6687 ug/L    0.0000
   Spiked Amount     25.000   Range  86 - 118    Recovery   =   90.675%
  32) 1,2-Dichloroethane-d4       4.498   65    89216    23.1288 ug/L    0.0000
   Spiked Amount     25.000   Range  80 - 120    Recovery   =   92.515%
  44) Toluene-d8                  6.461   98   332638    24.8621 ug/L    0.0000
   Spiked Amount     25.000   Range  88 - 110    Recovery   =   99.448%
  63) p-Bromofluorobenzene        8.558   95   111422    27.3451 ug/L    0.0000
   Spiked Amount     25.000   Range  86 - 115    Recovery   =  109.380%

 Target Compounds                                                   Qvalue
  14) Methylene Chloride          2.115   84      651     0.1833 ug/L #    78
  15) Acetone                     2.147   43      485     0.7367 ug/L #    43
 --------------------------------------------------------------------------

 (#) = qualifier out of range (m) = manual integration (+) = signals summed
```

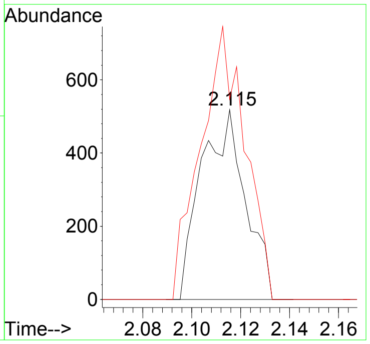
Quantitation Report   (Not Reviewed)

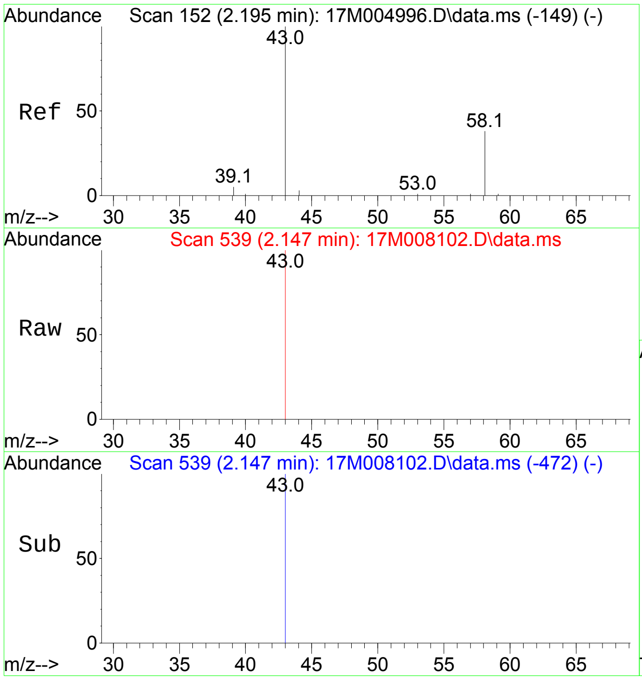
```
Data Path : D:\MassHunter\GCMS\1\data\090914\
Data File : 17M008102.D
Acq On    : 09 Sep 2014  22:49
Operator  : adc
Sample    : WG491672-01 VBLK 0909 8260
Misc      : 1,1
ALS Vial  : 29   Sample Multiplier: 1

Quant Time: Sep 10 10:04:21 2014
Quant Method : D:\MassHunter\GCMS\1\methods\8260VMS.M
Quant Title  : 8260B/624 SOP:OVL MSV01 WATER 08/12/14 HPMS17
QLast Update : Fri Aug 15 15:53:53 2014
Response via : Initial Calibration
```



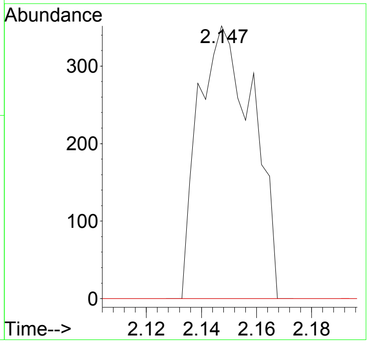


```
#14
Methylene Chloride
Concen:    0.1833 ug/L
RT:    2.115 min  Scan# 528
Delta R.T.  -0.001 min
Lab File:   17M008102.D
Acq: 09 Sep 2014  22:49

Tgt Ion: 84 Resp:      651
Ion  Ratio  Lower  Upper
 84  100
 49  146.1   97.1  145.7#
```



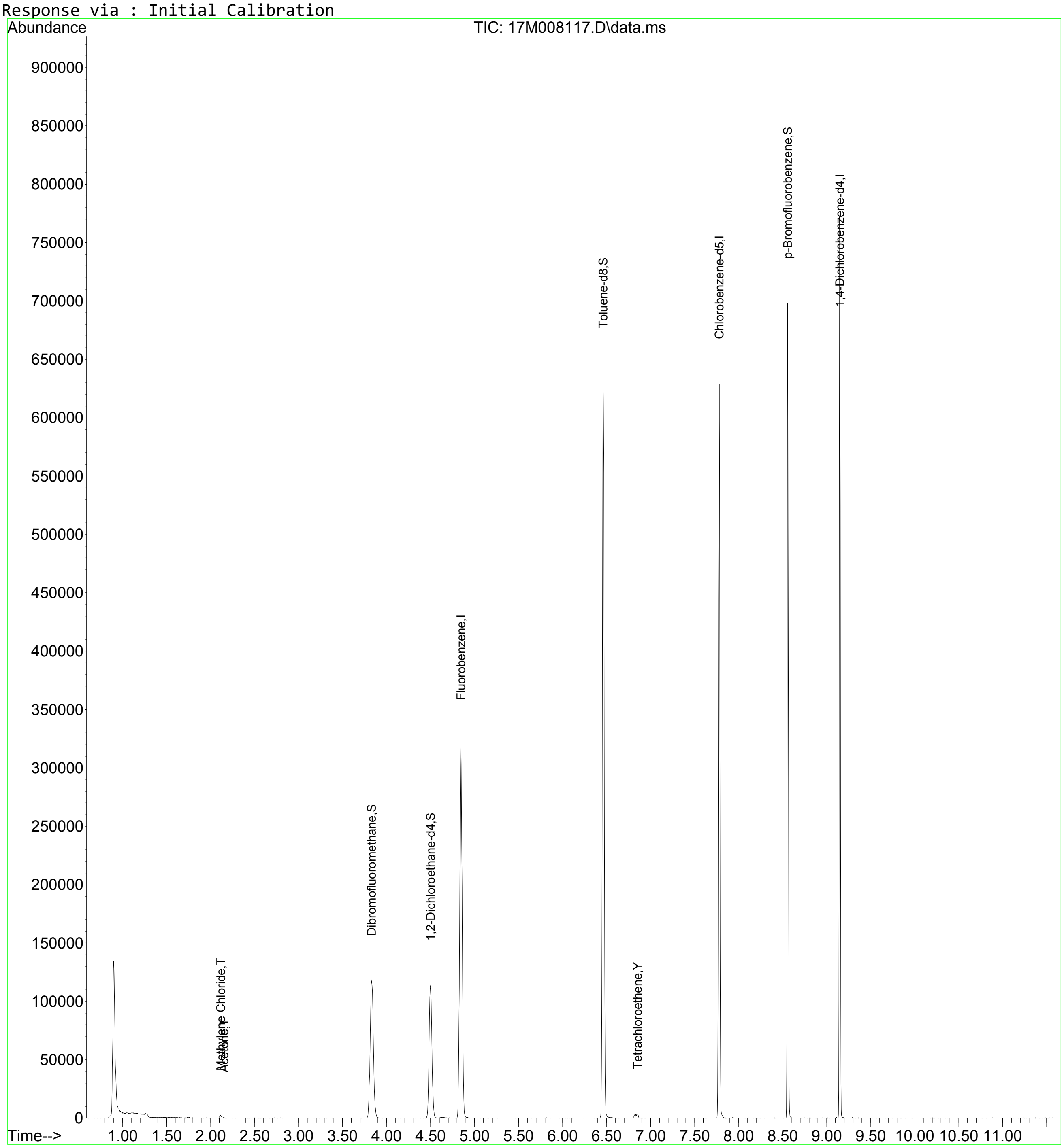


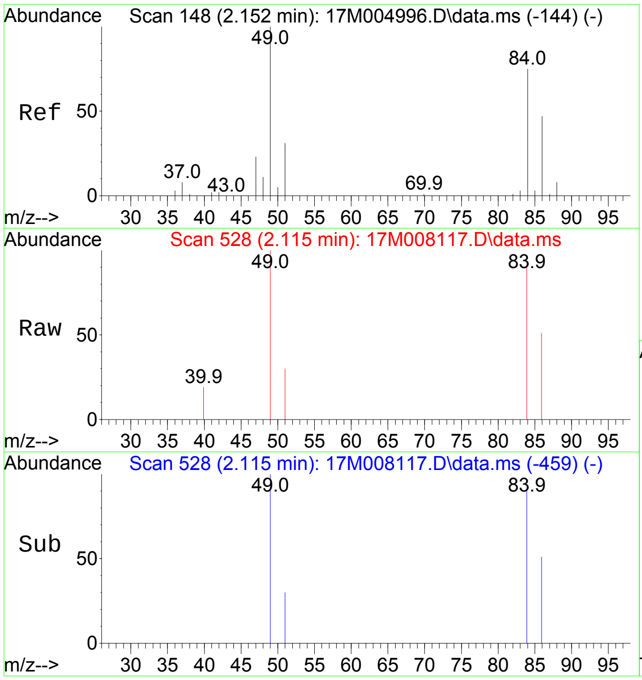
```
#15
Acetone
Concen:    0.7367 ug/L
RT:    2.147 min  Scan# 539
Delta R.T.  -0.006 min
Lab File:   17M008102.D
Acq: 09 Sep 2014  22:49

Tgt Ion: 43 Resp:      485
Ion  Ratio  Lower  Upper
 43  100
 58    0.0   18.7   43.7#
```



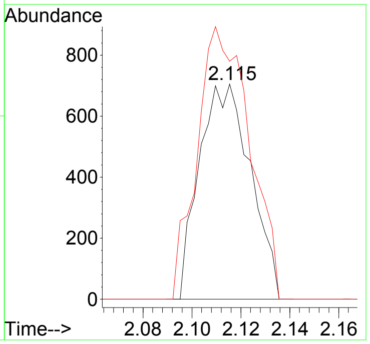
```
                          Quantitation Report    (Not Reviewed)

  Data Path : D:\MassHunter\GCMS\1\data\091014\
  Data File : 17M008117.D
  Acq On    : 10 Sep 2014  12:23
  Operator  : FJB
  Sample    : WG491746-01 VBLK0910 BLANK 8260
  Misc      : 1,1
  ALS Vial  : 3   Sample Multiplier: 1

  Quant Time: Sep 12 12:44:24 2014
  Quant Method : D:\MassHunter\GCMS\1\methods\8260VMS.M
  Quant Title  : 8260B/624 SOP:OVL MSV01 WATER 08/12/14 HPMS17
  QLast Update : Fri Aug 15 15:53:53 2014
  Response via : Initial Calibration

         Compound                   R.T. QIon  Response  Conc Units Dev(Min)
   --------------------------------------------------------------------------
   Internal Standards
     1) Fluorobenzene              4.846   96   305533    25.00000 ug/L     0.0000
    43) Chlorobenzene-d5           7.779  117   222048    25.00000 ug/L     0.0000
    61) 1,4-Dichlorobenzene-d4     9.151  152   101153    25.00000 ug/L     0.0000

   System Monitoring Compounds
    27) Dibromofluoromethane       3.829  111    94962    23.6707 ug/L    0.0000
     Spiked Amount     25.000   Range  86 - 118    Recovery   =   94.683%
    32) 1,2-Dichloroethane-d4      4.498   65    95840    23.9878 ug/L    0.0000
     Spiked Amount     25.000   Range  80 - 120    Recovery   =   95.951%
    44) Toluene-d8                 6.461   98   352452    25.4844 ug/L    0.0000
     Spiked Amount     25.000   Range  88 - 110    Recovery   =  101.938%
    63) p-Bromofluorobenzene       8.558   95   119787    28.2055 ug/L    0.0000
     Spiked Amount     25.000   Range  86 - 115    Recovery   =  112.822%

   Target Compounds                                                  Qvalue
    14) Methylene Chloride         2.115   84     1029     0.2797 ug/L      93
    15) Acetone                    2.153   43      372     0.5455 ug/L #    43
    46) Tetrachloroethene          6.852  166      777     0.1878 ug/L #    87
   --------------------------------------------------------------------------

   (#) = qualifier out of range (m) = manual integration (+) = signals summed
```

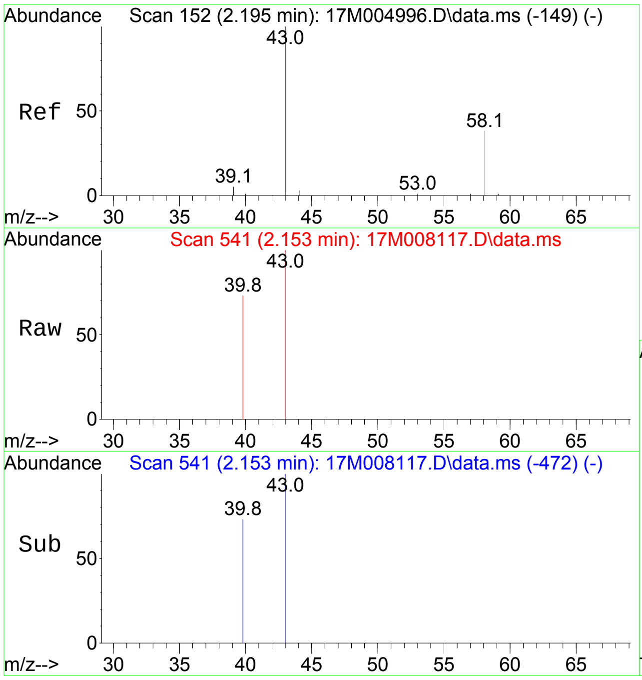
```
                              Quantitation Report    (Not Reviewed)

Data Path : D:\MassHunter\GCMS\1\data\091014\
Data File : 17M008117.D
Acq On    : 10 Sep 2014  12:23
Operator  : FJB
Sample    : WG491746-01 VBLK0910 BLANK 8260
Misc      : 1,1
ALS Vial  : 3   Sample Multiplier: 1

Quant Time: Sep 12 12:44:24 2014
Quant Method : D:\MassHunter\GCMS\1\methods\8260VMS.M
Quant Title  : 8260B/624 SOP:OVL MSV01 WATER 08/12/14 HPMS17
QLast Update : Fri Aug 15 15:53:53 2014
Response via : Initial Calibration
```



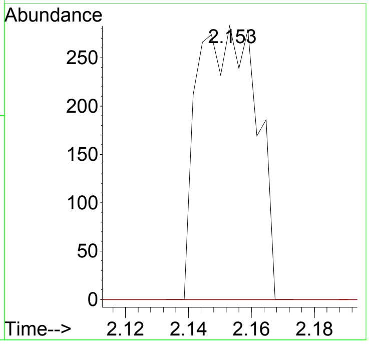


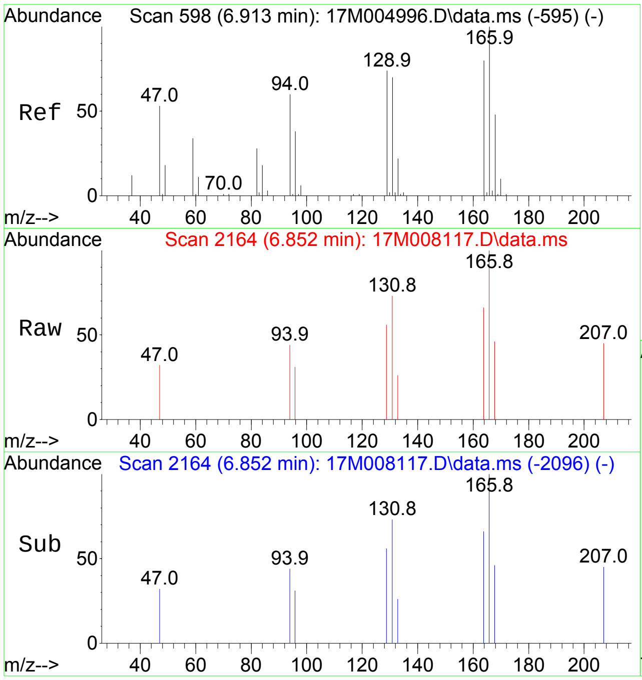
```
#14
Methylene Chloride
Concen:    0.2797 ug/L
RT:   2.115 min  Scan# 528
Delta R.T.  -0.001 min
Lab File:   17M008117.D
Acq: 10 Sep 2014  12:23

Tgt Ion: 84 Resp:    1029
Ion  Ratio  Lower  Upper
 84  100
 49  129.5   97.1  145.7
```



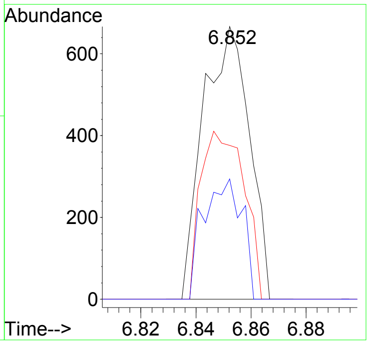


```
#15
Acetone
Concen:    0.5455 ug/L
RT:   2.153 min  Scan# 541
Delta R.T.  0.000 min
Lab File:   17M008117.D
Acq: 10 Sep 2014  12:23

Tgt Ion: 43 Resp:     372
Ion  Ratio  Lower  Upper
 43  100
 58    0.0   18.7   43.7#
```





```
#46
Tetrachloroethene
Concen:    0.1878 ug/L
RT:   6.852 min  Scan# 2164
Delta R.T.  -0.003 min
Lab File:   17M008117.D
Acq: 10 Sep 2014  12:23

Tgt Ion:166 Resp:     777
Ion  Ratio  Lower  Upper
166  100
129   58.3   59.0   88.4#
 94   36.8   31.3   46.9
```



```
                         Quantitation Report    (Not Reviewed)

     Data Path : D:\MassHunter\GCMS\1\data\090914\
     Data File : 17M008103.D
     Acq On    : 09 Sep 2014  23:09
     Operator  : adc
     Sample    : WG491672-02 20ug/L LCS 8260
     Misc      : 1,1
     ALS Vial  : 30   Sample Multiplier: 1

     Quant Time: Sep 09 23:21:04 2014
     Quant Method : D:\MassHunter\GCMS\1\methods\8260VMS.M
     Quant Title  : 8260B/624 SOP:OVL MSV01 WATER 08/12/14 HPMS17
     QLast Update : Fri Aug 15 15:53:53 2014
     Response via : Initial Calibration

             Compound                   R.T. QIon  Response  Conc Units Dev(Min)
      --------------------------------------------------------------------------
      Internal Standards
        1) Fluorobenzene               4.843   96   287489    25.00000 ug/L     0.0000
       43) Chlorobenzene-d5            7.779  117   214123    25.00000 ug/L     0.0000
       61) 1,4-Dichlorobenzene-d4      9.148  152   105019    25.00000 ug/L     0.0000

      System Monitoring Compounds
       27) Dibromofluoromethane        3.830  111    89613    23.7394 ug/L    0.0000
        Spiked Amount     25.000   Range  86 - 118    Recovery   =   94.958%
       32) 1,2-Dichloroethane-d4       4.495   65    88843    23.6322 ug/L   -0.0115
        Spiked Amount     25.000   Range  80 - 120    Recovery   =   94.529%
       44) Toluene-d8                  6.461   98   335257    25.1383 ug/L    0.0000
        Spiked Amount     25.000   Range  88 - 110    Recovery   =  100.553%
       63) p-Bromofluorobenzene        8.558   95   116517    26.4256 ug/L    0.0000
        Spiked Amount     25.000   Range  86 - 115    Recovery   =  105.702%

      Target Compounds                                                    Qvalue
        2) Dichlorodifluoromethane     0.972   85    69033    25.6669 ug/L      99
        3) Chloromethane               1.079   50    70785    20.6253 ug/L      99
        4) Vinyl Chloride              1.117   62    73047    19.9668 ug/L     100
        5) 1,3-Butadiene               1.125   54    56026    22.6172 ug/L     100
        6) Bromomethane                1.285   94    29391    14.4498 ug/L     100
        7) Chloroethane                1.345   64    42186    20.5951 ug/L      91
        8) Trichlorofluoromethane      1.415  101    94300    19.9324 ug/L      98
        9) Diethyl ether               1.615   59   235858   116.5020 ug/L      99
       10) 1,1-Dichloroethene          1.719   61    86825    17.7014 ug/L      99
       11) Carbon Disulfide            1.733   76   112630    13.4337 ug/L      98
       12) 1,1,2-Trichloro-1,2,2-...   1.745  101    57739    18.8445 ug/L      95
       13) Acrolein                    1.945   56    31622   107.1576 ug/L      98
       14) Methylene Chloride          2.107   84    63232    18.2646 ug/L      94
       15) Acetone                     2.153   43    14833    23.1169 ug/L      96
       16) trans-1,2-Dichloroethene    2.223   96    59351    18.4110 ug/L      97
       17) Methyl Tert Butyl Ether     2.318   73   162721    19.1641 ug/L     100
       18) 1,1-Dichloroethane          2.726   63   111561    18.1010 ug/L     100
       19) Acrylonitrile               2.773   53     4338     5.6277 ug/L      99
       20) Vinyl Acetate               2.987   86     5000    16.4455 ug/L      89
       21) cis-1,2-Dichloroethene      3.265   96    67072    18.5185 ug/L      98
       22) 2,2-Dichloropropane         3.375   77    73659    14.7358 ug/L      95
       23) Cyclohexane                 3.471   56   106072    21.2294 ug/L #    75
       24) Bromochloromethane          3.482  130    41537    18.2561 ug/L      99
       25) Chloroform                  3.604   83   112445    18.5569 ug/L      99
       26) Carbon Tetrachloride        3.734  117    89815    18.5825 ug/L      99
       28) 1,1,1-Trichloroethane       3.821   97   100914    18.4523 ug/L      99
       29) 1,1-Dichloropropene         3.995   75    83465    18.3310 ug/L      99
       30) 2-Butanone                  4.003   43    20434    19.6518 ug/L      98
       31) Benzene                     4.319   78   250421    18.4081 ug/L      98
       33) 1,2-Dichloroethane          4.577   62    79753    19.6550 ug/L      99
       34) Trichloroethene             5.037  130    71758    18.2484 ug/L      94
       35) Dibromomethane              5.474   93    36634    18.5558 ug/L     100
       36) 1,2-Dichloropropane         5.578   63    70590    18.9897 ug/L      98
       37) Bromodichloromethane        5.680   83    85365    18.4523 ug/L     100
       38) 1,4-Dioxane                 5.888   88     4566   187.5788 ug/L      98
       39) 2-Chloroethyl Vinyl Ether   6.276   63    32935    17.7620 ug/L     100
       40) cis-1,3-Dichloropropene     6.296   75   102049    18.4717 ug/L      99
       41) 4-Methyl-2-Pentanone        6.884   58    17662    18.9109 ug/L      95
       42) trans-1,3-Dichloropropene   6.910   75    82274    17.0919 ug/L      99
       45) Toluene                     6.508   91   278417    19.0817 ug/L      99
       46) Tetrachloroethene           6.846  166    70441    17.6590 ug/L      97
       47) 1,1,2-Trichloroethane       7.040   97    50391    18.7505 ug/L      99
       48) Dibromochloromethane        7.185  129    66315    18.7328 ug/L      99
       49) 1,3-Dichloropropane         7.266   76    85495    19.2387 ug/L      98
```

```
                              Quantitation Report    (Not Reviewed)

  Data Path : D:\MassHunter\GCMS\1\data\090914\
  Data File : 17M008103.D
  Acq On    : 09 Sep 2014  23:09
  Operator  : adc
  Sample    : WG491672-02 20ug/L LCS 8260
  Misc      : 1,1
  ALS Vial  : 30   Sample Multiplier: 1

  Quant Time: Sep 09 23:21:04 2014
  Quant Method : D:\MassHunter\GCMS\1\methods\8260VMS.M
  Quant Title  : 8260B/624 SOP:OVL MSV01 WATER 08/12/14 HPMS17
  QLast Update : Fri Aug 15 15:53:53 2014
  Response via : Initial Calibration

          Compound                   R.T. QIon  Response  Conc Units Dev(Min)
   -------------------------------------------------------------------------
    50) 1,2-Dibromoethane           7.359  107    50053    18.8476 ug/L      99
    51) 2-Hexanone                  7.608   43    32230    19.3873 ug/L      97
    52) Chlorobenzene               7.790  112   168369    17.7752 ug/L      98
    53) 1-Chlorohexane              7.808   69    15886    18.6865 ug/L      83
    54) Ethylbenzene                7.828  106    97337    19.0457 ug/L     100
    55) 1,1,1,2-Tetrachloroethane   7.848  131    65975    18.5336 ug/L      99
    56) m-,p-Xylene                 7.932  106   227187    37.2718 ug/L      98
    57) o-Xylene                    8.207  106   107995    17.9454 ug/L      98
    58) Styrene                     8.242  104   185933    19.4211 ug/L      98
    59) Bromoform                   8.248  173    46763    18.6976 ug/L      99
    60) Isopropylbenzene            8.404  105   282810    18.2956 ug/L     100
    62) 1,3,5-Trimethylbenzene      8.752  105   265723    20.5865 ug/L      99
    64) Bromobenzene                8.610  156    78111    18.9821 ug/L      96
    65) n-Propylbenzene             8.639   91   327314    18.9342 ug/L      99
    66) 1,1,2,2-Tetrachloroethane   8.688   83    58164    19.0466 ug/L     100
    67) 2-Chlorotoluene             8.717   91   197690    19.1153 ug/L      99
    68) 1,2,3-Trichloropropane      8.749  110    16467    19.7282 ug/L      92
    69) 1,2,4-Trimethylbenzene      8.951  105   263269    20.4416 ug/L     100
    70) 4-Chlorotoluene             8.807   91   196514    18.5220 ug/L      99
    71) tert-Butylbenzene           8.914  134    44919    18.3835 ug/L      99
    72) sec-Butylbenzene            9.006  105   305380    19.0584 ug/L      99
    73) p-Isopropyltoluene          9.082  119   254134    18.7940 ug/L      99
    74) 1,3-Dichlorobenzene         9.111  146   133942    18.0425 ug/L      99
    75) 1,4-Dichlorobenzene         9.157  146   145103    18.8621 ug/L     100
    76) n-Butylbenzene              9.287   91   242098    20.7715 ug/L      98
    77) 1,2-Dichlorobenzene         9.360  146   132340    18.2840 ug/L     100
    78) 1,2-Dibromo-3-Chloropr...   9.739   75    11412    20.7229 ug/L      94
    79) Hexachlorobutadiene        10.034  225    56037    17.5391 ug/L     100
    80) 1,2,4-Trichlorobenzene     10.049  180   100026    19.4437 ug/L      99
    81) Naphthalene                10.196  128   177005    19.1243 ug/L      99
    82) 1,2,3-Trichlorobenzene     10.280  180    91095    19.4960 ug/L     100
   -------------------------------------------------------------------------

   (#) = qualifier out of range (m) = manual integration (+) = signals summed
```

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                    Quantitation Report    (Not Reviewed)

Data Path : D:\MassHunter\GCMS\1\data\090914\
Data File : 17M008103.D
Acq On    : 09 Sep 2014  23:09
Operator  : adc
Sample    : WG491672-02 20ug/L LCS 8260
Misc      : 1,1
ALS Vial  : 30   Sample Multiplier: 1

Quant Time: Sep 09 23:21:04 2014
Quant Method : D:\MassHunter\GCMS\1\methods\8260VMS.M
Quant Title  : 8260B/624 SOP:OVL MSV01 WATER 08/12/14 HPMS17
QLast Update : Fri Aug 15 15:53:53 2014
Response via : Initial Calibration
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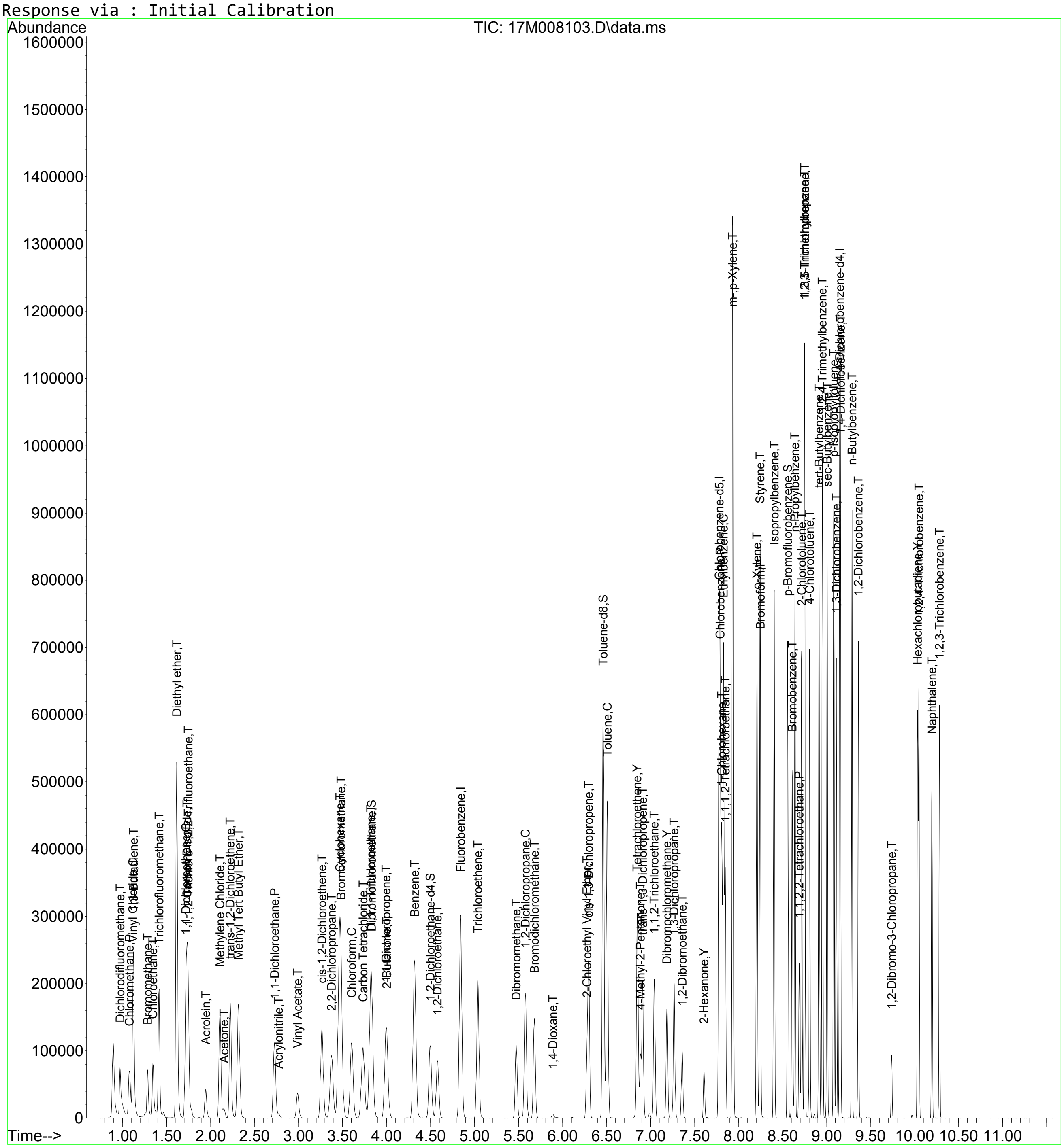

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8260VMS.M Wed Sep 10 10:07:59 2014                                   Page: 3
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                             Quantitation Report    (Not Reviewed)

  Data Path : D:\MassHunter\GCMS\1\data\091014\
  Data File : 17M008118.D
  Acq On    : 10 Sep 2014  12:43
  Operator  : FJB
  Sample    : WG491746-02 20ug/L LCS 8260
  Misc      : 1,1 STD66321
  ALS Vial  : 4   Sample Multiplier: 1

  Quant Time: Sep 12 12:43:33 2014
  Quant Method : D:\MassHunter\GCMS\1\methods\8260VMS.M
  Quant Title  : 8260B/624 SOP:OVL MSV01 WATER 08/12/14 HPMS17
  QLast Update : Fri Aug 15 15:53:53 2014
  Response via : Initial Calibration

          Compound                   R.T. QIon  Response  Conc Units Dev(Min)
   --------------------------------------------------------------------------
   Internal Standards
     1) Fluorobenzene               4.840   96   302992    25.00000 ug/L    -0.0121
    43) Chlorobenzene-d5            7.779  117   223093    25.00000 ug/L     0.0000
    61) 1,4-Dichlorobenzene-d4      9.151  152   107069    25.00000 ug/L     0.0000

   System Monitoring Compounds
    27) Dibromofluoromethane        3.827  111    95093    23.9021 ug/L   -0.0115
     Spiked Amount     25.000   Range  86 - 118    Recovery   =   95.608%
    32) 1,2-Dichloroethane-d4       4.498   65    93596    23.6226 ug/L    0.0000
     Spiked Amount     25.000   Range  80 - 120    Recovery   =   94.490%
    44) Toluene-d8                  6.461   98   350642    25.2348 ug/L    0.0000
     Spiked Amount     25.000   Range  88 - 110    Recovery   =  100.939%
    63) p-Bromofluorobenzene        8.557   95   120571    26.8215 ug/L    0.0000
     Spiked Amount     25.000   Range  86 - 115    Recovery   =  107.286%

   Target Compounds                                                     Qvalue
     2) Dichlorodifluoromethane     0.972   85    71013     25.0522 ug/L       99
     3) Chloromethane               1.079   50    74490     20.5943 ug/L      100
     4) Vinyl Chloride              1.116   62    77427     20.0811 ug/L      100
     5) 1,3-Butadiene               1.125   54    57508     22.0276 ug/L       99
     6) Bromomethane                1.284   94    30816     14.3788 ug/L      100
     7) Chloroethane                1.345   64    42064     19.4848 ug/L       91
     8) Trichlorofluoromethane      1.415  101    94885     19.0299 ug/L       99
     9) Diethyl ether               1.614   59   251629    117.9325 ug/L       99
    10) 1,1-Dichloroethene          1.719   61    90933     17.5904 ug/L      100
    11) Carbon Disulfide            1.733   76   122351     13.8464 ug/L       98
    12) 1,1,2-Trichloro-1,2,2-...   1.745  101    60370     18.6950 ug/L       95
    13) Acrolein                    1.945   56    38774    124.6707 ug/L       98
    14) Methylene Chloride          2.110   84    67036     18.3727 ug/L       95
    15) Acetone                     2.153   43    14956     22.1160 ug/L       95
    16) trans-1,2-Dichloroethene    2.222   96    62218     18.3128 ug/L       97
    17) Methyl Tert Butyl Ether     2.315   73   178735     19.9730 ug/L      100
    18) 1,1-Dichloroethane          2.726   63   117717     18.1226 ug/L      100
    19) Acrylonitrile               2.778   53     4929      6.0672 ug/L       98
    20) Vinyl Acetate               2.990   86     9081     28.3400 ug/L       85
    21) cis-1,2-Dichloroethene      3.265   96    70315     18.4205 ug/L       98
    22) 2,2-Dichloropropane         3.375   77    97249     18.4597 ug/L       97
    23) Cyclohexane                 3.470   56   111698     21.2115 ug/L #     76
    24) Bromochloromethane          3.482  130    44170     18.4200 ug/L      100
    25) Chloroform                  3.604   83   117566     18.4093 ug/L       99
    26) Carbon Tetrachloride        3.737  117    93316     18.3190 ug/L       98
    28) 1,1,1-Trichloroethane       3.821   97   104171     18.0732 ug/L       98
    29) 1,1-Dichloropropene         3.997   75    87374     18.2077 ug/L       99
    30) 2-Butanone                  4.009   43    22073     20.1419 ug/L       98
    31) Benzene                     4.316   78   262516     18.3099 ug/L       99
    33) 1,2-Dichloroethane          4.576   62    83254     19.4680 ug/L       99
    34) Trichloroethene             5.037  130    70475     17.0051 ug/L       95
    35) Dibromomethane              5.474   93    38641     18.5710 ug/L      100
    36) 1,2-Dichloropropane         5.578   63    73918     18.8675 ug/L       99
    37) Bromodichloromethane        5.677   83    89952     18.4489 ug/L      100
    38) 1,4-Dioxane                 5.891   88     4022    156.7762 ug/L       99
    39) 2-Chloroethyl Vinyl Ether   6.276   63    37601     19.2408 ug/L       99
    40) cis-1,3-Dichloropropene     6.296   75   111362     19.1260 ug/L       99
    41) 4-Methyl-2-Pentanone        6.884   58    19134     19.4387 ug/L       97
    42) trans-1,3-Dichloropropene   6.910   75    91176     17.9721 ug/L       99
    45) Toluene                     6.508   91   292707     19.2545 ug/L       99
    46) Tetrachloroethene           6.849  166    73983     17.8012 ug/L       98
    47) 1,1,2-Trichloroethane       7.043   97    53300     19.0355 ug/L      100
    48) Dibromochloromethane        7.185  129    70094     19.0042 ug/L       99
    49) 1,3-Dichloropropane         7.266   76    89526     19.3358 ug/L       97
```

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                         Quantitation Report    (Not Reviewed)

Data Path : D:\MassHunter\GCMS\1\data\091014\
Data File : 17M008118.D
Acq On    : 10 Sep 2014  12:43
Operator  : FJB
Sample    : WG491746-02 20ug/L LCS 8260
Misc      : 1,1 STD66321
ALS Vial  : 4   Sample Multiplier: 1

Quant Time: Sep 12 12:43:33 2014
Quant Method : D:\MassHunter\GCMS\1\methods\8260VMS.M
Quant Title  : 8260B/624 SOP:OVL MSV01 WATER 08/12/14 HPMS17
QLast Update : Fri Aug 15 15:53:53 2014
Response via : Initial Calibration

        Compound                   R.T. QIon  Response  Conc Units Dev(Min)
 --------------------------------------------------------------------------
  50) 1,2-Dibromoethane           7.359  107    53339    19.2774 ug/L      99
  51) 2-Hexanone                  7.608   43    35382    20.4276 ug/L      97
  52) Chlorobenzene               7.790  112   175992    17.8329 ug/L      98
  53) 1-Chlorohexane              7.808   69    17251    19.4762 ug/L      94
  54) Ethylbenzene                7.828  106   101085    18.9838 ug/L      99
  55) 1,1,1,2-Tetrachloroethane   7.848  131    69038    18.6143 ug/L      98
  56) m-,p-Xylene                 7.935  106   237509    37.3985 ug/L      98
  57) o-Xylene                    8.207  106   113213    18.0561 ug/L      98
  58) Styrene                     8.242  104   195310    19.5803 ug/L      99
  59) Bromoform                   8.248  173    49515    19.0019 ug/L      99
  60) Isopropylbenzene            8.404  105   295699    18.3602 ug/L      99
  62) 1,3,5-Trimethylbenzene      8.751  105   278417    21.1570 ug/L      99
  64) Bromobenzene                8.610  156    82623    19.6942 ug/L      98
  65) n-Propylbenzene             8.641   91   341678    19.3866 ug/L      99
  66) 1,1,2,2-Tetrachloroethane   8.691   83    67030    21.5296 ug/L      99
  67) 2-Chlorotoluene             8.717   91   205170    19.4587 ug/L      99
  68) 1,2,3-Trichloropropane      8.751  110    17580    20.6583 ug/L      97
  69) 1,2,4-Trimethylbenzene      8.954  105   276187    21.0341 ug/L      99
  70) 4-Chlorotoluene             8.809   91   204742    18.9280 ug/L     100
  71) tert-Butylbenzene           8.917  134    46493    18.6633 ug/L      98
  72) sec-Butylbenzene            9.006  105   316230    19.3577 ug/L      99
  73) p-Isopropyltoluene          9.082  119   265533    19.2610 ug/L      99
  74) 1,3-Dichlorobenzene         9.113  146   140349    18.5436 ug/L      98
  75) 1,4-Dichlorobenzene         9.157  146   151436    19.3084 ug/L     100
  76) n-Butylbenzene              9.290   91   254675    21.4322 ug/L      98
  77) 1,2-Dichlorobenzene         9.362  146   139053    18.8436 ug/L     100
  78) 1,2-Dibromo-3-Chloropr...   9.745   75    11838    21.0849 ug/L      95
  79) Hexachlorobutadiene        10.043  225    58341    17.9106 ug/L     100
  80) 1,2,4-Trichlorobenzene     10.057  180   104407    19.9068 ug/L     100
  81) Naphthalene                10.208  128   182250    19.3140 ug/L      99
  82) 1,2,3-Trichlorobenzene     10.295  180    95139    19.9716 ug/L     100
 --------------------------------------------------------------------------

 (#) = qualifier out of range (m) = manual integration (+) = signals summed
```

Quantitation Report   (Not Reviewed)

00193488

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Data Path : D:\MassHunter\GCMS\1\data\091014\
Data File : 17M008118.D
Acq On    : 10 Sep 2014  12:43
Operator  : FJB
Sample    : WG491746-02 20ug/L LCS 8260
Misc      : 1,1 STD66321
ALS Vial  : 4   Sample Multiplier: 1

Quant Time: Sep 12 12:43:33 2014
Quant Method : D:\MassHunter\GCMS\1\methods\8260VMS.M
Quant Title  : 8260B/624 SOP:OVL MSV01 WATER 08/12/14 HPMS17
QLast Update : Fri Aug 15 15:53:53 2014
Response via : Initial Calibration
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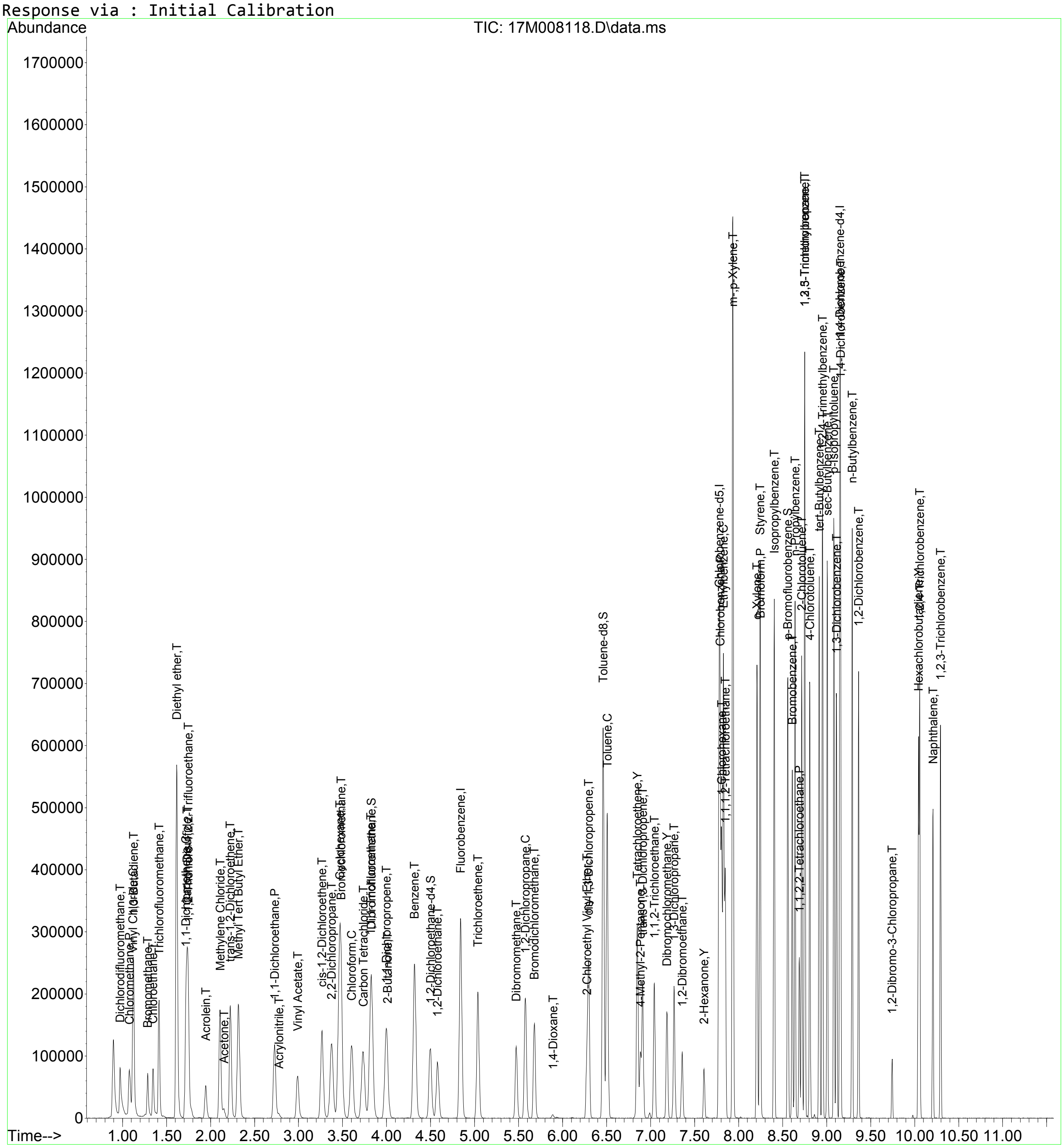

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                          Quantitation Report    (Not Reviewed)

  Data Path : D:\MassHunter\GCMS\1\data\090914\
  Data File : 17M008104.D
  Acq On    : 09 Sep 2014  23:29
  Operator  : adc
  Sample    : WG491672-03 20ug/L LCSDUP 8260
  Misc      : 1,1
  ALS Vial  : 31   Sample Multiplier: 1

  Quant Time: Sep 09 23:40:43 2014
  Quant Method : D:\MassHunter\GCMS\1\methods\8260VMS.M
  Quant Title  : 8260B/624 SOP:OVL MSV01 WATER 08/12/14 HPMS17
  QLast Update : Fri Aug 15 15:53:53 2014
  Response via : Initial Calibration

          Compound                   R.T. QIon  Response  Conc Units Dev(Min)
   --------------------------------------------------------------------------
   Internal Standards
     1) Fluorobenzene              4.843   96   281385    25.00000 ug/L     0.0000
    43) Chlorobenzene-d5           7.779  117   206696    25.00000 ug/L     0.0000
    61) 1,4-Dichlorobenzene-d4     9.148  152   100352    25.00000 ug/L     0.0000

   System Monitoring Compounds
    27) Dibromofluoromethane       3.827  111    89300    24.1696 ug/L   -0.0115
     Spiked Amount     25.000   Range  86 - 118    Recovery   =   96.678%
    32) 1,2-Dichloroethane-d4      4.495   65    89201    24.2421 ug/L   -0.0116
     Spiked Amount     25.000   Range  80 - 120    Recovery   =   96.968%
    44) Toluene-d8                 6.461   98   333664    25.9179 ug/L    0.0000
     Spiked Amount     25.000   Range  88 - 110    Recovery   =  103.672%
    63) p-Bromofluorobenzene       8.558   95   115948    27.5195 ug/L    0.0000
     Spiked Amount     25.000   Range  86 - 115    Recovery   =  110.078%

   Target Compounds                                                Qvalue
     2) Dichlorodifluoromethane    0.972   85    67607    25.6820 ug/L      99
     3) Chloromethane              1.079   50    71497    21.2846 ug/L     100
     4) Vinyl Chloride             1.117   62    72767    20.3217 ug/L      99
     5) 1,3-Butadiene              1.125   54    55978    23.0880 ug/L     100
     6) Bromomethane               1.284   94    32654    16.3062 ug/L      99
     7) Chloroethane               1.345   64    40789    20.3450 ug/L      91
     8) Trichlorofluoromethane     1.415  101    89628    19.3559 ug/L      98
     9) Diethyl ether              1.615   59   234145   118.1648 ug/L      99
    10) 1,1-Dichloroethene         1.719   61    84641    17.6305 ug/L      99
    11) Carbon Disulfide           1.733   76   110673    13.4866 ug/L      99
    12) 1,1,2-Trichloro-1,2,2-...  1.742  101    55822    18.6140 ug/L      95
    13) Acrolein                   1.945   56    31601   109.4094 ug/L     100
    14) Methylene Chloride         2.107   84    62811    18.5366 ug/L      94
    15) Acetone                    2.153   43    15270    24.3142 ug/L      96
    16) trans-1,2-Dichloroethene   2.225   96    59150    18.7467 ug/L      98
    17) Methyl Tert Butyl Ether    2.318   73   164299    19.7696 ug/L     100
    18) 1,1-Dichloroethane         2.726   63   110457    18.3107 ug/L     100
    19) Acrylonitrile              2.773   53     4557     6.0400 ug/L      97
    20) Vinyl Acetate              2.990   86     5223    17.5516 ug/L      94
    21) cis-1,2-Dichloroethene     3.268   96    66143    18.6581 ug/L      97
    22) 2,2-Dichloropropane        3.375   77    72278    14.7732 ug/L      95
    23) Cyclohexane                3.473   56   103350    21.1333 ug/L #    75
    24) Bromochloromethane         3.485  130    41739    18.7428 ug/L     100
    25) Chloroform                 3.606   83   111022    18.7195 ug/L      99
    26) Carbon Tetrachloride       3.734  117    87445    18.4847 ug/L      99
    28) 1,1,1-Trichloroethane      3.821   97    97940    18.2970 ug/L      98
    29) 1,1-Dichloropropene        3.994   75    81624    18.3156 ug/L      99
    30) 2-Butanone                 4.003   43    20862    20.4986 ug/L      96
    31) Benzene                    4.316   78   247006    18.5510 ug/L      99
    33) 1,2-Dichloroethane         4.576   62    79157    19.9313 ug/L      99
    34) Trichloroethene            5.037  130    70748    18.3818 ug/L      94
    35) Dibromomethane             5.471   93    36856    19.0733 ug/L     100
    36) 1,2-Dichloropropane        5.578   63    69774    19.1774 ug/L      99
    37) Bromodichloromethane       5.680   83    83961    18.5425 ug/L     100
    38) 1,4-Dioxane                5.888   88     4918   206.4223 ug/L      97
    39) 2-Chloroethyl Vinyl Ether  6.276   63    33338    18.3694 ug/L     100
    40) cis-1,3-Dichloropropene    6.296   75   101162    18.7083 ug/L      99
    41) 4-Methyl-2-Pentanone       6.884   58    18191    19.8998 ug/L      95
    42) trans-1,3-Dichloropropene  6.910   75    83069    17.6314 ug/L      99
    45) Toluene                    6.508   91   275696    19.5742 ug/L      99
    46) Tetrachloroethene          6.849  166    69368    18.0149 ug/L      97
    47) 1,1,2-Trichloroethane      7.040   97    50962    19.6443 ug/L      99
    48) Dibromochloromethane       7.185  129    65641    19.2087 ug/L      99
    49) 1,3-Dichloropropane        7.266   76    86762    20.2254 ug/L      98

8260VMS.M Wed Sep 10 10:08:01 2014                                         Page:  1
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                         Quantitation Report    (Not Reviewed)

   Data Path : D:\MassHunter\GCMS\1\data\090914\
   Data File : 17M008104.D
   Acq On    : 09 Sep 2014  23:29
   Operator  : adc
   Sample    : WG491672-03 20ug/L LCSDUP 8260
   Misc      : 1,1
   ALS Vial  : 31   Sample Multiplier: 1

   Quant Time: Sep 09 23:40:43 2014
   Quant Method : D:\MassHunter\GCMS\1\methods\8260VMS.M
   Quant Title  : 8260B/624 SOP:OVL MSV01 WATER 08/12/14 HPMS17
   QLast Update : Fri Aug 15 15:53:53 2014
   Response via : Initial Calibration

           Compound                   R.T. QIon  Response  Conc Units Dev(Min)
    -------------------------------------------------------------------------
     50) 1,2-Dibromoethane           7.359  107    50379    19.6520 ug/L     100
     51) 2-Hexanone                  7.608   43    32802    20.4404 ug/L      98
     52) Chlorobenzene               7.790  112   164896    18.0341 ug/L      97
     53) 1-Chlorohexane              7.808   69    15492    18.8778 ug/L      83
     54) Ethylbenzene                7.828  106    95429    19.3433 ug/L     100
     55) 1,1,1,2-Tetrachloroethane   7.848  131    65090    18.9420 ug/L      99
     56) m-,p-Xylene                 7.935  106   223860    38.0456 ug/L      98
     57) o-Xylene                    8.207  106   105826    18.2168 ug/L      98
     58) Styrene                     8.245  104   184545    19.9688 ug/L      99
     59) Bromoform                   8.248  173    46397    19.2178 ug/L      98
     60) Isopropylbenzene            8.404  105   277864    18.6215 ug/L     100
     62) 1,3,5-Trimethylbenzene      8.752  105   262082    21.2487 ug/L      99
     64) Bromobenzene                8.610  156    78239    19.8975 ug/L      97
     65) n-Propylbenzene             8.642   91   321382    19.4556 ug/L      99
     66) 1,1,2,2-Tetrachloroethane   8.688   83    59336    20.3340 ug/L      99
     67) 2-Chlorotoluene             8.717   91   195022    19.7343 ug/L      99
     68) 1,2,3-Trichloropropane      8.749  110    16589    20.7986 ug/L      93
     69) 1,2,4-Trimethylbenzene      8.951  105   260420    21.1608 ug/L      99
     70) 4-Chlorotoluene             8.807   91   193201    19.0566 ug/L      99
     71) tert-Butylbenzene           8.914  134    44298    18.9725 ug/L      99
     72) sec-Butylbenzene            9.006  105   299024    19.5296 ug/L      99
     73) p-Isopropyltoluene          9.082  119   249194    19.2857 ug/L      99
     74) 1,3-Dichlorobenzene         9.111  146   132346    18.6566 ug/L      99
     75) 1,4-Dichlorobenzene         9.157  146   143175    19.4770 ug/L      99
     76) n-Butylbenzene              9.287   91   238875    21.4481 ug/L      98
     77) 1,2-Dichlorobenzene         9.360  146   131810    19.0577 ug/L      99
     78) 1,2-Dibromo-3-Chloropr...   9.739   75    11625    22.0914 ug/L      93
     79) Hexachlorobutadiene        10.034  225    55438    18.1586 ug/L      99
     80) 1,2,4-Trichlorobenzene     10.049  180    99048    20.1490 ug/L      99
     81) Naphthalene                10.193  128   183599    20.7593 ug/L     100
     82) 1,2,3-Trichlorobenzene     10.280  180    91188    20.4235 ug/L      99
    -------------------------------------------------------------------------

    (#) = qualifier out of range (m) = manual integration (+) = signals summed
```

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Data Path : D:\MassHunter\GCMS\1\data\090914\
Data File : 17M008104.D
Acq On    : 09 Sep 2014  23:29
Operator  : adc
Sample    : WG491672-03 20ug/L LCSDUP 8260
Misc      : 1,1
ALS Vial  : 31   Sample Multiplier: 1

Quant Time: Sep 09 23:40:43 2014
Quant Method : D:\MassHunter\GCMS\1\methods\8260VMS.M
Quant Title  : 8260B/624 SOP:OVL MSV01 WATER 08/12/14 HPMS17
QLast Update : Fri Aug 15 15:53:53 2014
Response via : Initial Calibration
```

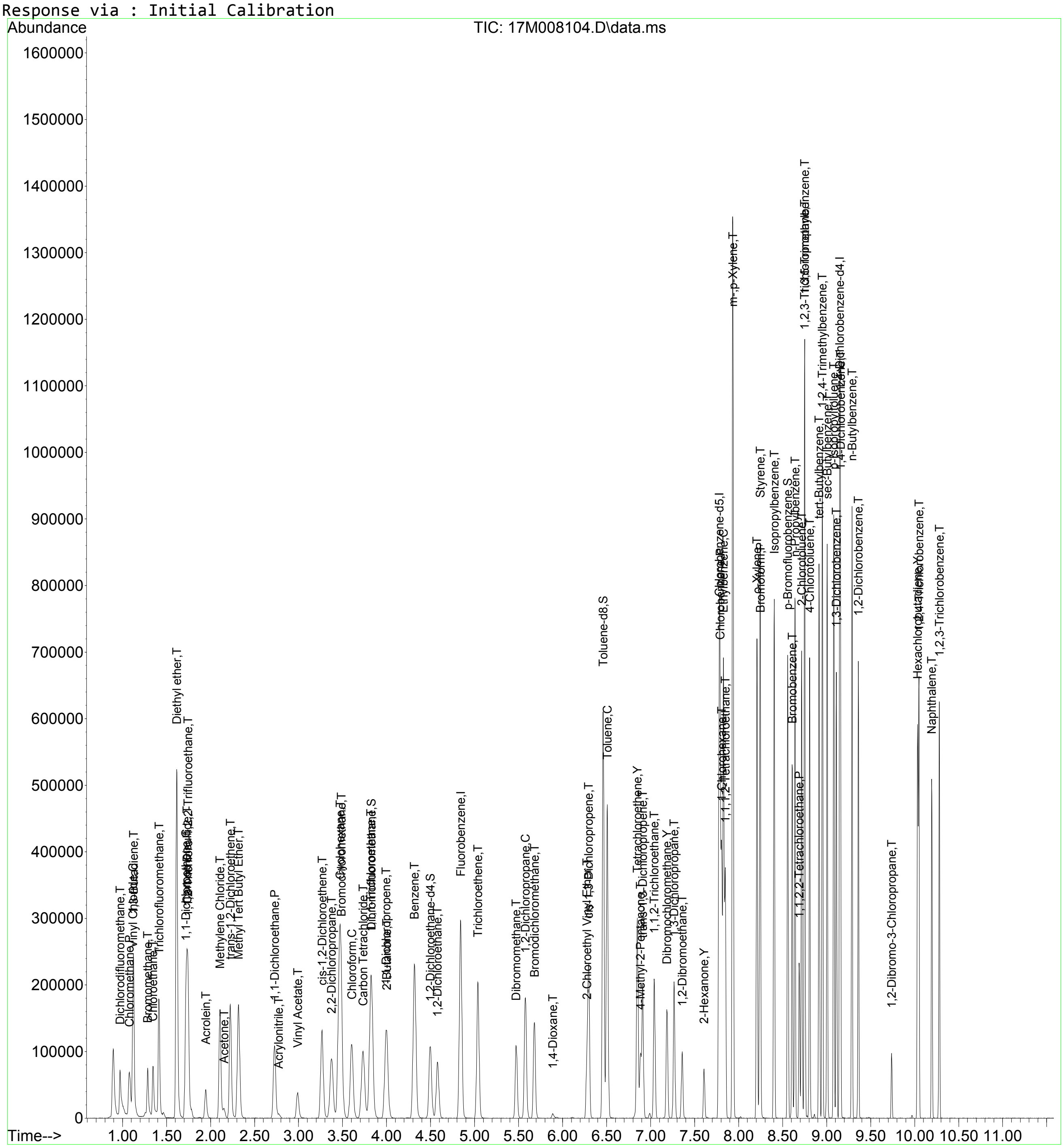

```
                             Quantitation Report    (Not Reviewed)
                                                                                          00193492
     Data Path : D:\MassHunter\GCMS\1\data\091014\
     Data File : 17M008119.D
     Acq On    : 10 Sep 2014  13:03
     Operator  : FJB
     Sample    : WG491746-03 20ug/L LCSDUP 8260
     Misc      : 1,1 STD66321
     ALS Vial  : 5   Sample Multiplier: 1

     Quant Time: Sep 12 12:43:36 2014
     Quant Method : D:\MassHunter\GCMS\1\methods\8260VMS.M
     Quant Title  : 8260B/624 SOP:OVL MSV01 WATER 08/12/14 HPMS17
     QLast Update : Fri Aug 15 15:53:53 2014
     Response via : Initial Calibration

             Compound                   R.T. QIon  Response  Conc Units Dev(Min)
      --------------------------------------------------------------------------
      Internal Standards
        1) Fluorobenzene              4.840   96   306269    25.00000 ug/L    -0.0119
       43) Chlorobenzene-d5           7.779  117   227635    25.00000 ug/L     0.0000
       61) 1,4-Dichlorobenzene-d4     9.151  152   111978    25.00000 ug/L     0.0000

      System Monitoring Compounds
       27) Dibromofluoromethane       3.827  111    94627    23.5305 ug/L   -0.0112
        Spiked Amount     25.000   Range  86 - 118    Recovery   =   94.122%
       32) 1,2-Dichloroethane-d4      4.496   65    93262    23.2865 ug/L   -0.0114
        Spiked Amount     25.000   Range  80 - 120    Recovery   =   93.146%
       44) Toluene-d8                 6.462   98   351895    24.8197 ug/L    0.0000
        Spiked Amount     25.000   Range  88 - 110    Recovery   =   99.279%
       63) p-Bromofluorobenzene       8.558   95   119666    25.4532 ug/L    0.0000
        Spiked Amount     25.000   Range  86 - 115    Recovery   =  101.813%

      Target Compounds                                                  Qvalue
        2) Dichlorodifluoromethane    0.972   85    68716    23.9824 ug/L      99
        3) Chloromethane              1.079   50    74274    20.3148 ug/L     100
        4) Vinyl Chloride             1.117   62    74963    19.2340 ug/L     100
        5) 1,3-Butadiene              1.125   54    59631    22.5964 ug/L     100
        6) Bromomethane               1.285   94    32790    15.0987 ug/L      99
        7) Chloroethane               1.345   64    40149    18.3987 ug/L      91
        8) Trichlorofluoromethane     1.412  101    90687    17.9933 ug/L     100
        9) Diethyl ether              1.615   59   241496   111.9724 ug/L      99
       10) 1,1-Dichloroethene         1.719   61    88440    16.9251 ug/L      99
       11) Carbon Disulfide           1.733   76   118927    13.3149 ug/L      99
       12) 1,1,2-Trichloro-1,2,2-...  1.742  101    58166    17.8198 ug/L      95
       13) Acrolein                   1.945   56    37345   118.7912 ug/L      99
       14) Methylene Chloride         2.107   84    65124    17.6577 ug/L      95
       15) Acetone                    2.150   43    13972    20.4398 ug/L      99
       16) trans-1,2-Dichloroethene   2.223   96    60603    17.6466 ug/L      96
       17) Methyl Tert Butyl Ether    2.318   73   169926    18.7855 ug/L     100
       18) 1,1-Dichloroethane         2.727   63   113717    17.3195 ug/L      99
       19) Acrylonitrile              2.776   53     4629     5.6369 ug/L      97
       20) Vinyl Acetate              2.990   86     9000    27.7867 ug/L      90
       21) cis-1,2-Dichloroethene     3.265   96    68566    17.7701 ug/L      98
       22) 2,2-Dichloropropane        3.372   77    92512    17.3726 ug/L      97
       23) Cyclohexane                3.474   56   107646    20.2233 ug/L #    75
       24) Bromochloromethane         3.482  130    42937    17.7142 ug/L     100
       25) Chloroform                 3.601   83   113822    17.6323 ug/L      99
       26) Carbon Tetrachloride       3.731  117    90379    17.5526 ug/L      99
       28) 1,1,1-Trichloroethane      3.824   97   101833    17.4786 ug/L      99
       29) 1,1-Dichloropropene        3.995   75    84586    17.4381 ug/L      99
       30) 2-Butanone                 4.006   43    21221    19.1572 ug/L      98
       31) Benzene                    4.319   78   255474    17.6280 ug/L      99
       33) 1,2-Dichloroethane         4.582   62    80220    18.5578 ug/L      99
       34) Trichloroethene            5.037  130    68907    16.4488 ug/L      94
       35) Dibromomethane             5.471   93    37600    17.8773 ug/L     100
       36) 1,2-Dichloropropane        5.576   63    71564    18.0712 ug/L      99
       37) Bromodichloromethane       5.680   83    86585    17.5684 ug/L     100
       38) 1,4-Dioxane                5.885   88     4065   156.7569 ug/L      97
       39) 2-Chloroethyl Vinyl Ether  6.276   63    35215    17.8271 ug/L      98
       40) cis-1,3-Dichloropropene    6.296   75   108742    18.4762 ug/L      98
       41) 4-Methyl-2-Pentanone       6.884   58    18174    18.2659 ug/L      99
       42) trans-1,3-Dichloropropene  6.910   75    87573    17.0772 ug/L      99
       45) Toluene                    6.508   91   283507    18.2772 ug/L      99
       46) Tetrachloroethene          6.849  166    71352    16.8256 ug/L      97
       47) 1,1,2-Trichloroethane      7.041   97    51618    18.0669 ug/L      99
       48) Dibromochloromethane       7.185  129    67605    17.9636 ug/L      99
       49) 1,3-Dichloropropane        7.266   76    86871    18.3880 ug/L      98

   8260VMS.M Fri Sep 12 12:43:36 2014                                             Page:  1
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                            Quantitation Report    (Not Reviewed)

  Data Path : D:\MassHunter\GCMS\1\data\091014\
  Data File : 17M008119.D
  Acq On    : 10 Sep 2014  13:03
  Operator  : FJB
  Sample    : WG491746-03 20ug/L LCSDUP 8260
  Misc      : 1,1 STD66321
  ALS Vial  : 5   Sample Multiplier: 1

  Quant Time: Sep 12 12:43:36 2014
  Quant Method : D:\MassHunter\GCMS\1\methods\8260VMS.M
  Quant Title  : 8260B/624 SOP:OVL MSV01 WATER 08/12/14 HPMS17
  QLast Update : Fri Aug 15 15:53:53 2014
  Response via : Initial Calibration

          Compound                   R.T. QIon  Response  Conc Units Dev(Min)
   --------------------------------------------------------------------------
    50) 1,2-Dibromoethane           7.359  107    51447    18.2226 ug/L      98
    51) 2-Hexanone                  7.608   43    33544    18.9800 ug/L      98
    52) Chlorobenzene               7.790  112   171218    17.0030 ug/L      97
    53) 1-Chlorohexane              7.805   69    16606    18.3739 ug/L      92
    54) Ethylbenzene                7.828  106    97971    18.0319 ug/L      99
    55) 1,1,1,2-Tetrachloroethane   7.848  131    67425    17.8167 ug/L      99
    56) m-,p-Xylene                 7.932  106   231196    35.6781 ug/L      99
    57) o-Xylene                    8.207  106   109715    17.1490 ug/L      98
    58) Styrene                     8.242  104   189474    18.6163 ug/L      99
    59) Bromoform                   8.248  173    47489    17.8608 ug/L      99
    60) Isopropylbenzene            8.404  105   286120    17.4110 ug/L      99
    62) 1,3,5-Trimethylbenzene      8.752  105   269542    19.5846 ug/L      99
    64) Bromobenzene                8.610  156    80182    18.2745 ug/L      98
    65) n-Propylbenzene             8.642   91   331496    17.9844 ug/L      99
    66) 1,1,2,2-Tetrachloroethane   8.688   83    63801    19.5941 ug/L     100
    67) 2-Chlorotoluene             8.717   91   200939    18.2220 ug/L      99
    68) 1,2,3-Trichloropropane      8.749  110    16642    18.6988 ug/L      95
    69) 1,2,4-Trimethylbenzene      8.954  105   267530    19.4816 ug/L     100
    70) 4-Chlorotoluene             8.807   91   199132    17.6023 ug/L      99
    71) tert-Butylbenzene           8.917  134    45094    17.3082 ug/L      98
    72) sec-Butylbenzene            9.007  105   306073    17.9146 ug/L      99
    73) p-Isopropyltoluene          9.082  119   258329    17.9170 ug/L      99
    74) 1,3-Dichlorobenzene         9.111  146   136491    17.2433 ug/L      98
    75) 1,4-Dichlorobenzene         9.157  146   148213    18.0690 ug/L     100
    76) n-Butylbenzene              9.290   91   246926    19.8691 ug/L      98
    77) 1,2-Dichlorobenzene         9.363  146   134362    17.4097 ug/L     100
    78) 1,2-Dibromo-3-Chloropr...   9.742   75    11716    19.9528 ug/L      94
    79) Hexachlorobutadiene        10.043  225    56380    16.5498 ug/L     100
    80) 1,2,4-Trichlorobenzene     10.058  180   102968    18.7717 ug/L     100
    81) Naphthalene                10.205  128   180601    18.3002 ug/L      99
    82) 1,2,3-Trichlorobenzene     10.292  180    92193    18.5047 ug/L      99
   --------------------------------------------------------------------------

   (#) = qualifier out of range (m) = manual integration (+) = signals summed
```

```
                         Quantitation Report    (Not Reviewed)

Data Path : D:\MassHunter\GCMS\1\data\091014\
Data File : 17M008119.D
Acq On    : 10 Sep 2014  13:03
Operator  : FJB
Sample    : WG491746-03 20ug/L LCSDUP 8260
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Response via : Initial Calibration
```

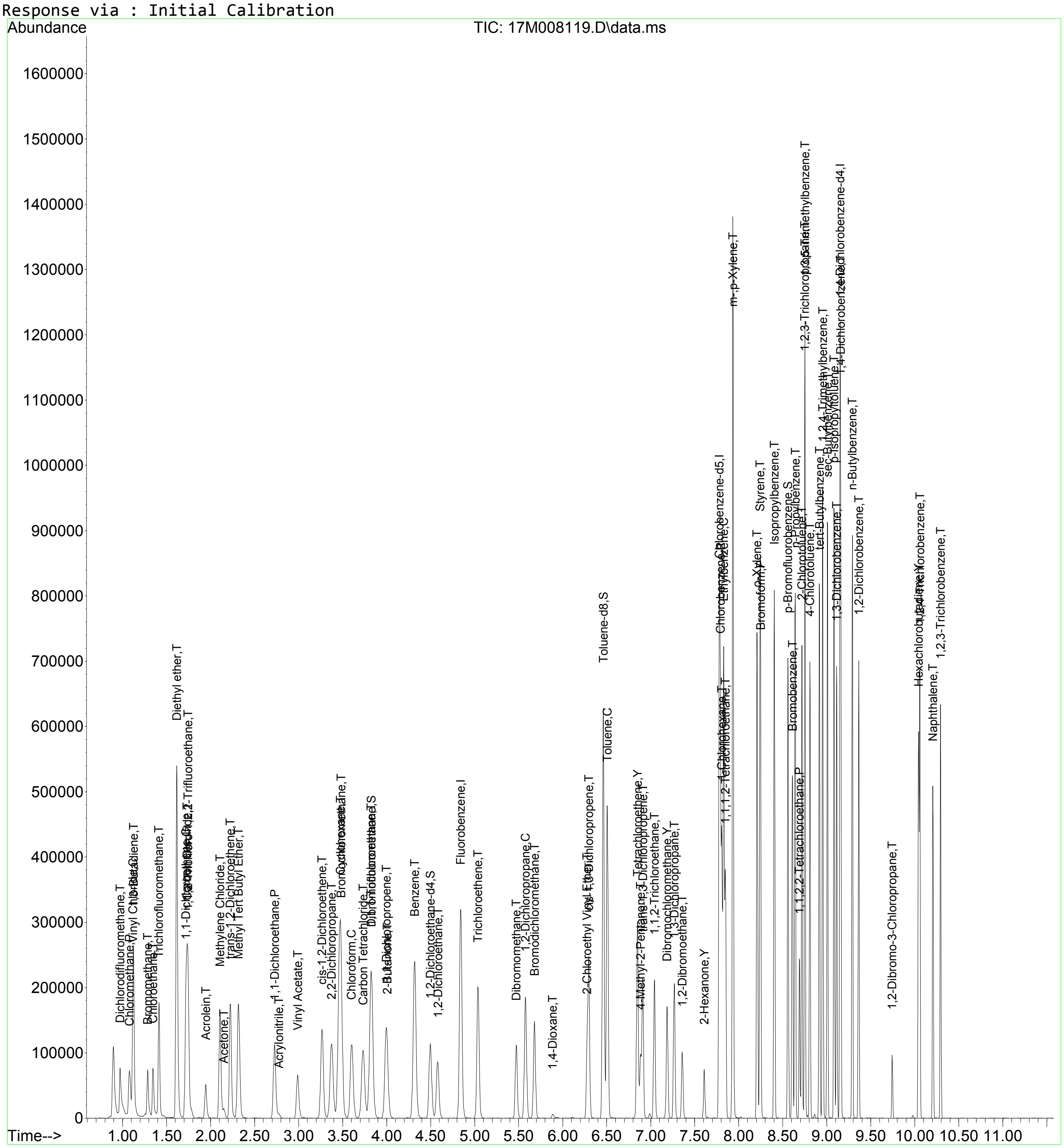

3.0 Attachments

Microbac Laboratories Inc.
Ohio Valley Division Analyst List
September 12, 2014

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001 - BIO-CHEM TESTING WVDEP 220
002 - REIC Consultants, Inc. WVDEP 060
003 - Sturm Environmental
004 - MICROBAC PITTSBURGH
005 - ES LABORATORIES
006 - ALCOSAN LABORATORIES
007 - ALS LABORATORIES
008 - BENCHMARK LABORATORIES
010 - MICROBAC CHICAGOLAND
ADC - ANTHONY D. CANTER
ADG - APRIL D. GREENE
ALS - ADRIANE L. STEED
AWE - ANDREW W. ESSIG
AZH - AFTER HOURS
BJO - BRIAN J. OGDEN
BKT - BRENDAN TORRENCE
BLG - BRENDA L. GREENWALT
BRG - BRENDA R. GREGORY
CAA - CASSIE A. AUGENSTEIN
CAF - CHERYL A. FLOWERS
CEB - CHAD E. BARNES
CJR - COURTNEY J. REXROAD
CLC - CHRYS L. CRAWFORD
CLS - CARA L. STRICKLER
CLW - CHARISSA L. WINTERS
CPD - CHAD P. DAVIS
CSH - CHRIS S. HILL
DAK - DEAN A. KETELSEN
DCM - DAVID C. MERCKLE
DEV - DAVID E. VANDENBERG
DIH - DEANNA I. HESSON
DLB - DAVID L. BUMGARNER
DLP - DOROTHY L. PAYNE
DSM - DAVID S. MOSSOR
ECL - ERIC C. LAWSON
ENY - EMILY N. YOAK
EPT - ETHAN P. TIDD
ERP - ERIN R. PORTER
FJB - FRANCES J. BOLDEN
JBK - JEREMY B. KINNEY
JDH - JUSTIN D. HESSON
JDS - JARED D. SMITH
JJS - JOHN J. STE MARIE
JLL - JOHN L. LENT
JMW - JEANA M. WHITE
JTP - JOSHUA T. PEMBERTON
JWR - JOHN W. RICHARDS
JWS - JACK W. SHEAVES
JYH - JI Y. HU
KAJ - KELLIE A. JOHNSON
KDW - KATHRYN D. WELCH
KEB - KATIE E. BARNES
KHR - KIM H. RHODES
KRA - KATHY R. ALBERTSON
KRB - KAELY R. BECKER
KRP - KATHY R. PARSONS
LEC - LAURA E. CARPENTER
LKN - LINDA K. NEDEFF
LLS - LARRY L. STEPHENS
LSB - LESLIE S. BUCINA
MBK - MORGAN B. KNOWLTON
MDA - MIKE D. ALBERTSON
MDC - MIKE D. COCHRAN
MES - MARY E. SCHILLING
MLB - MEGAN L. BACHE
MMB - MAREN M. BEERY
MRT - MICHELLE R. TAYLOR
MSW - MATT S. WILSON
PDM - PIERCE D. MORRIS
PIT - MICROBAC WARRENDALE
PRL - PAIGE R. LAMB
PSW - PEGGY S. WEBB
QX - QIN XU
RAH - ROY A. HALSTEAD
REK - BOB E. KYER
RLB - BOB BUCHANAN
RM - RAYMOND MALEKE
RNP - RICK N. PETTY
SAV - SARAH A. VANDENBERG
SDC - SHALYN D. CONLEY
SLM - STEPHANIE L. MOSSBURG
SLP - SHERI L. PFALZGRAF
TB - TODD BOYLE
TMB - TIFFANY M. BAILEY
TMM - TAMMY M. MORRIS
VC - VICKI COLLIER
WJB - WILL J. BEASLEY
WRR - WESLEY R. RICHARDS
WTD - WADE T. DELONG
XXX - UNAVAILABLE OR SUBCONTRACT

Microbac Laboratories Inc.

List of Valid Qualifiers

September 12, 2014

Qualkey: DOD

Qualifier	Description
*	Surrogate or spike compound out of range
+	Correlation coefficient for the MSA is less than 0.995
<	Result is less than the associated numerical value.
>	Greater than
A	See the report narrative
B	The reported result is associated with a contaminated method blank.
B1	Target analyte detected in method blank at or above the method reporting limit
B3	Target analyte detected in calibration blank at or above the method reporting limit
B4	The BOD unseeded dilution water blank exceeded 0.2 mg/L
C	Confirmed by GC/MS
CG	Confluent growth
CT1	The cooler temperature at receipt exceeded regulatory guidelines for requested testing.
DL	Surrogate or spike compound was diluted out
E	Estimated concentration due to sample matrix interference
EDL	Elevated sample reporting limits, presence of non-target analytes
EMPC	Estimated Maximum Possible Concentration
F, S	Estimated result below quantitation limit; method of standard additions(MSA)
F,CT1	Estimated value; the analyte concentration was less than the RL/LOQ. The cooler temperature at receipt exceeded regula
FL	Free Liquid
H1	Sample analysis performed past holding time.
I	Semiquantitative result (out of instrument calibration range)
J	Estimated concentration; sample matrix interference.
J	Estimated value ; the analyte concentration was greater than the highest standard
J	Estimated value ; the analyte concentration was less than the LOQ.
J	The reported result is an estimated value.
J,B	Analyte detected in both the method blank and sample above the MDL.
J,CT1	Estimated value; the analyte concentration was less than the RL/LOQ.
J,CT1	Estimated value; the analyte concentration was less than the RL/LOQ. The cooler temperature at receipt exceeded regula
J,H1	Estimated value ; the analyte concentration was less than the LOQ. Sample analysis performed past holding time.
J,H1	The reported result is an estimated value. Sample was analyzed past holding time.
J,P	Estimate; columns don't agree to within 40%
J,S	Estimated concentration; analyzed by method of standard addition (MSA)
JB	The reported result is an estimated value. The reported result is also associated with a contaminated method blank.
JQ	The reported result is an estimated value and one or more quality control criteria failed. See narrative.
L	Sample reporting limits elevated due to matrix interference
L1	The associated blank spike (LCS) recovery was above the laboratory acceptance limits.
L2	The associated blank spike (LCS) recovery was below the laboratory acceptance limits.
M	Matrix effect; the concentration is an estimate due to matrix effect.
N	Nontarget analyte; the analyte is a tentativlely identified compound (TIC) by GC/MS
NA	Not applicable
ND	Not detected at or above the reporting limit (RL/MDL).
ND, B	Not detected at or above the reporting limit (RL). Analyte present in method blank.
ND, CT1	Analyte was not detected. The concentration is below the reported LOD. The cooler temperature at receipt exceeded reg
ND, H1	Not detected; Sample analysis performed past holding time.
ND, L	Not detected; sample reporting limit (RL) elevated due to interference
ND, S	Not detected; analyzed by method of standard addition (MSA)
NF	Not found by library search
NFL	No free liquid
NI	Non-ignitable
NR	Analyte is not required to be analyzed
NS	Not spiked
P	Concentrations >40% difference between the two GC columns
Q	One or more quality control criteria failed. See narrative.
Q,H1	One or more quality control criteria failed. Sample analyzed past holding time. See narrative.
QNS	Quantity of sample not sufficient to perform analysis
RA	Reanalysis confirms reported results
RE	Reanalysis confirms sample matrix interference
S	Analyzed by method of standard addition (MSA)
SMI	Sample matrix interference on surrogate
SP	Reported results are for spike compounds only
TIC	Library Search Compound
TNTC	Too numerous to count
TNTC, B	Too numerous to count. Analyte present in method blank.
TNTC,CT1	Too numerous to count. The cooler temperature at receipt exceeded regulatory guidelines for requested testing.
TNTC,H1	Too numerous to count. Sample analysis performed past holding time.
U	Analyte was not detected. The concentration is below the reported LOD.
U,H1	Not detected; Sample analysis performed past holding time.

Microbac Laboratories Inc.
List of Valid Qualifiers
September 12, 2014

Qualkey: DOD

UJ	Undetected; the MDL and RL are estimated due to quality control discrepancies.
UQ	Undetected; the analyte was analyzed for, but not detected.
W	Post-digestion spike for furnace AA out of control limits
X	Exceeds regulatory limit
X, S	Exceeds regulatory limit; method of standard additions (MSA)
Z	Cannot be resolved from isomer - see below

AECOM

Chain of Custody Record

COC Number:

Laboratory: Microbac POC: Kathy Albertson
Address: 158 Starlite Drive
Marietta, OH 45750
Phone: 1-800-373-4071
Client: AECOM
Address: 112 East Pecan Ste. 400
San Antonio, TX 78205
Turn Around Time:
Project Name/Location: Longhorn
Project Number: 60274185-0011DA01

Project Manager: Dave Wacker
Phone/Fax Number: 210-296-2000
Sampler (print): Brian Ho 805-233-0569
Signature: Brian Ho
pH:

Mail to: Linda Raabe
112 East Pecan STE. 400
San Antonio, TX 78205
210-296-2000
Fed Ex Airbill No:
Program:

ERPIMS REQUIRED FIELDS

Site Name	Sample ID/Location ID	SBD	SED	Date	Time	Comp•	Grab	Matrix	Number of Containers	Perchlorate	VOCs 8260B		24hr TAT	Standard TAT				SA CODE	Cooler ID	LOT CONTROL NUMBERS ABLOT	EBLOT	TBLOT
	18CPTMW03SW(70)060914			9/6/14	15:30		X	Soil	1	X				X								
	12WW25(30)080914			9/8/14	12:40		X	Water	3		X		X									
	12TB080914			9/8/14	—			Water	1		X		X									

Comments: 8

(Signature) Brian Ho	Date 9/8/14	Time 1540	Received by: (Signature) Scott Beesinger
Relinquished by: (Signature) Scott Beesinger	Date 9/8/14	Time 1600	Received for Laboratory by: (Signature)

Microbac OVD
Received: 09/09/2014 09:37
By: COURTNEY REXROAD 221000059231
Courtney Rexroad

•Homogenize all composite samples prior to analysis

Distribution: White to Laboratory, Canary to Project Manager, Pink QA/QC Manager

Microbac Laboratories Inc.

Internal Chain of Custody Report

Login: L14090460
Account: 2551
Project: 2551.096
Samples: 2
Due Date: 10-SEP-2014

Samplenum	**Container ID**	**Products**
L14090460-01	432869	826-LOW

Bottle: 1

Seq.	Purpose	From	To	Date/Time	Accept	Relinquish	pH
1	LOGIN	COOLER	V1	09-SEP-2014 11:10	CLS		<2
2	ANALYZ	V1	ORG4	09-SEP-2014 11:14	JLL	CLS	

Bottle: 2

Seq.	Purpose	From	To	Date/Time	Accept	Relinquish	pH
1	LOGIN	COOLER	V1	09-SEP-2014 11:10	CLS		<2
2	ANALYZ	V1	ORG4	09-SEP-2014 11:14	JLL	CLS	

Bottle: 3

Seq.	Purpose	From	To	Date/Time	Accept	Relinquish	pH
1	LOGIN	COOLER		09-SEP-2014 11:10	CLS		<2

Samplenum	**Container ID**	**Products**
L14090460-02	432870	826-LOW

Bottle: 1

Seq.	Purpose	From	To	Date/Time	Accept	Relinquish	pH
1	LOGIN	COOLER	V1	09-SEP-2014 11:10	CLS		<2
2	ANALYZ	V1	ORG4	09-SEP-2014 11:14	JLL	CLS	

A1 - Sample Archive (COLD)
A2 - Sample Archive (AMBIENT)
F1 - Volatiles Freezer in Login
V1 - Volatiles Refrigerator in Login
W1 - Walkin Cooler in Login

NELAP Addendum - May 22, 2014

Non-NELAP LIMS Product and Description

The following is a list of those tests that are not included in the Microbac – OVL NELAP Scope of Accreditation:

Heat of Combustion (BTU)
Total Halide by Bomb Combustion (TX)
Particle Sizing - 200 Mesh (PS200)
Specific Gravity/Density (SPGRAV)
Total Residual Chlorine (CL-TRL)
Total Volatile Solids (all forms) (TVS)
Total Coliform Bacteria (all methods)
Fecal Coliform Bacteria (all methods)
Sulfite (SO3)
Thiodiglycol (TDG-LCMS)
Acetate (HPLC-UV)
Formate (HPLC-UV)
Acetaldehyde (HPLC-UV)
Propionaldehyde (HPLC-UV)
Fluoroborate (ISE)

SOLID AND HAZARDOUS CHEMICALS
Nitrogen, Ammonia by Method 350.1
Chromium, Hexavalent, Leachable by SM3500 Cr-B 2009
Phenolics, Total by Method 420.1

NELAP Accreditation by Laboratory SOP

NONPOTABLE WATER

<u>OVL HPLC02/HPLC-UV</u>

Nitroglycerin
Acetic acid
Butyric acid
Lactic acid
Propionic acid
Pyruvic acid

<u>OVL MSS01/GC-MS</u>

1,4-Phenylenediamine
1-Methylnaphthalene
1,4-Dioxane
Atrazine
Benzaldehyde
Biphenyl
Caprolactam

Hexamethylphosphoramide (HMPA)
Pentachlorobenzene
Pentachloroethane

NELAP Accreditation by Laboratory SOP

NONPOTABLE WATER

OVL MSV0I/GC-MS

1, 1, 2-Trichloro-1,2,2-trifluoroethane
1,3-Butadiene
Cyclohexane
Cyclohexanone
Dimethyl disulfide
Dimethylsulfide
Ethyl-t-butylether (ETBE)
Isoprene
Methylacetate
Methylcyclohexane
T-amylmethylether (TAME)
Tetrahydrofuran (THF)

OVL RSKOl/GC-FID

Isobutane
n-Butane
Propane
Propylene
Propyne

OVL HPLC07/HPLC-MS-MS

Hexamethylphosphoramide (XMPA-LCMS)

SOLID AND HAZARDOUS CHEMICALS

OVL MSS0I/GC-MS

1-Methylnaphthalene
Benzaldehyde
Biphenyl
Caprolactam
Pentachloroethane

NELAP Accreditation by Laboratory SOP

SOLID AND HAZARDOUS CHEMICALS

OVL MSV0I/GC-MS

1.3-Butadiene
Cyclohexane
Cyclohexanone
Dimethyl disulfide
Dimethylsulfide
Ethyl-t-butylether (ETBE)
Isoprene
Methylacetate
Methylcyclohexane
n-Hexane
T-amylmethylether (TAME)